UNDER GRADUATE PROGRAMME-B.Sc MATHEMATICS
LEARNING OUTCOME BASED CURRICULUM FRAMEWORK under CBCS PATTERN
SYLLABUS & SCHEME OF EXAMINATION
(for the candidates admitted from the academic year 2023-2024 onwards)

Sem	Part	Course Code	Title of the Course	Nature of Course	IH	CP	Exam Hrs	CIA	ESE	Total
	I	23UTAM101/ 23UHIN101/ 23UFRE101	TAMIL I/ HINDI I/ FRENCH I	LAN	6	3	3	25	75	100
	II	23UGEN101/ 23UAEN101	GENERAL ENGLISH I/ ADVANCED ENGLISH I	ENG	6	3	3	25	75	100
	III	23UMA1C01	CORE: CLASSICAL ALGEBRA WITH GEOGEBRA *[Entrepreneurship]*	CC	5	4	3	25	75	100
	III	23UMA1C02	CORE: CALCULUS WITH SCILAB *[Entrepreneurship & Industry 4.0]*	CC	4	4	3	25	75	100
	III	23UPH1A01	ALLIED: PHYSICS I	GEN	7	3	3	20	55	75
	IV	15UVAL101	VALUE EDUCATION	AEC	2	2			50	50
II	I	23UTAM202/ 23UHIN202/ 23UFRE202	TAMIL II/ HINDI II/ FRENCH II	LAN	6	3	3	25	75	100
	II	23UGEN202/ 23UAEN202	GENERAL ENGLISH II/ ADVANCED ENGLISH II	ENG	6	3	3	25	75	100
	III	23UMA2C03	CORE: DIFFERENTIAL EQUATIONS AND INTEGRAL TRANSFORMS WITH SCILAB *[Entrepreneurship & Industry 4.0]*	CC	5	4	3	25	75	100
	III	23UMA2C04	CORE: DISCRETE MATHEMATICS *[Employability]*	CC	4	3	3	25	75	100

22/4/24		23/04/24		Absent
Dr. D. Jayanthi	**Dr. N. Murugesan.**	**Dr. C. Janaki**	**Mr. T. Vibu**	**Ms. J. Magdalene**

	III	23UPH2A02	ALLIED: PHYSICS II	GEN	7	3	3	20	55	75
	III	23UPH2AP1	ALLIED PRACTICAL: PHYSICS	GEN		4	3	20	30	50
	IV	21UENS202	ENVIRONMENTAL STUDIES	AEC	2	2	-	-	50	50
III	I	23UTAM303/ 23UHIN303/ 23UFRE303	TAMIL III/ HINDI III/ FRENCH III	LAN	6	3	3	25	75	100
	II	23UGEN303/ 23UAEN303	GENERAL ENGLISH III/ ADVANCED ENGLISH III	ENG	6	3	3	25	75	100
	III	23UMA3C05	CORE: MECHANICS WITH GNU-FISICA LAB ***[Employability]***	CC	4	4	3	25	75	100
	III	24UMA3C06	CORE: MATLAB (THEORY) ***[Employability & Skill Development]***	CC	2	2	3	20	55	75
	III	24UMA3CP1	CORE PRACTICAL: MATLAB (PRACTICAL) (***Industry 4.0***)	CC	2	2	3	10	15	25
	III	23UMA3A05	ALLIED: COMPUTATIONAL PROBABILITY AND STATISTICS ***[Employability & Industry 4.0]***	CSA	5	6	3	25	75	100
	IV	23UMA3SB1	SKILL BASED I: MATHEMATICAL FOUNDATION FOR MACHINE LEARNING ***[Skill Development]***	SEC	3	2	3	25	75	100
	IV	22UBTA301/ 22UATA301/	BASIC TAMIL I / ADVANCED TAMIL I /	AEC	2	2	2	25	25	50
			INDIAN KNOWLEDGE SYSTEM	AEC			2	-	50	

22/4/24	22/4/24	22/04/24		Absent
Dr. D. Jayanthi	**Dr. N. Murugesan.**	**Dr. C. Janaki**	**Mr. T. Vibu**	**Ms. J. Magdalene**

	IV	**24UNCCWS1**	WOMEN STUDIES (Non- Credit Course)	AEC	2	-	2	-	50	50
IV	I	23UTAM404/ 23UHIN404/ 23UFRE404	TAMIL IV/ HINDI IV/ FRENCH IV	LAN	6	3	3	25	75	100
	II	23UGEN404/ 23UAEN404	GENERAL ENGLISH IV/ ADVANCED ENGLISH IV	ENG	6	3	3	25	75	100
	III	23UMA4C07	CORE: ANALYTICAL GEOMETRY OF 2D AND 3D WITH GEOGEBRA	CC	4	4	3	25	75	100
	III	23UMA4C08	CORE: TRIGONOMETRY, VECTOR CALCULUS AND NUMBER THEORY WITH MAPLE APPLICATIONS	CC	4	4	3	25	75	100
	III	23UMA4A06	ALLIED : STATISTICAL QUALITY CONTROL ***[Employability & Industry 4.0]***	CSA	5	6	3	25	75	100
	IV	23UMA4SB2	SKILL BASED II: MATHEMATICAL MODELING ***[Innovation & Employability]***	SEC	3	2	3	25	75	100
	IV	22UBTA402/ 22UATA402/	BASIC TAMIL II / ADVANCED TAMIL II /	AEC	2	2	2	25	25	50
		21UHUR404	HUMAN RIGHTS	AEC			2	-	50	
V	III	23UMA5C09	CORE: ABSTRACT ALGEBRA	CC	5	5	3	25	75	100
	III	23UMA5C10	CORE: REAL ANALYSIS I	CC	5	5	3	25	75	100
	III	23UMA5C11	CORE: COMPLEX ANALYSIS I	CC	5	5	3	25	75	100

23/4/24		Janaki C 23/04/24		Absent
Dr. D. Jayanthi	**Dr. N. Murugesan.**	**Dr. C. Janaki**	**Mr. T. Vibu**	**Ms. J. Magdalene**

	III	23UMA5E01/ 23UMA5E02	OPERATIONS RESEARCH *[Entrepreneurship & Industry 4.0]*/ ASTRONOMY I	DSE	5	4	3	25	75	100
	IV	23NMA5E01	APPLIED STATISTICAL SKILLS *[Skill Development]*	GE	4	4	3	25	75	100
	IV	24UMA5SB3	SKILL BASED III : DATA ANALYTICS WITH R PROGRAMMING PRACTICALS*[Skill Development Entrepreneurship & Employability & Industry 4.0]*	SEC	3	2	3	25	75	100
	IV	23IDSBMA1	SKILL BASED: SIMPLE MATHEMATICS FOR COMPETITIVE EXAMINATIONS *[Employability & Skill Development]*	SEC	3	2	3	25	75	100
VI	III	23UMA6C12	CORE: LINEAR ALGEBRA	CC	6	5	3	25	75	100
	III	23UMA6C13	CORE: REAL ANALYSIS II	CC	6	5	3	25	75	100
	III	23UMA6C14	CORE: COMPLEX ANALYSIS II	CC	6	5	3	25	75	100
	III	23UMA6E03/ 23UMA6E04	OPTIMIZATION TECHNIQUES AND ITS APPLICATIONS *[Entrepreneurship & Industry 4.0]*/ ASTRONOMY II	DSE	6	4	3	25	75	100
	IV	24UMA6SB4	SKILL BASED IV : NUMERICAL METHODS WITH C PRACTICALS*[Skill Development Entrepreneurship & Industry 4.0]*	SEC	3	2	3	25	75	100

23/10/24		Janaki 23/10/24		Absent
Dr. D. Jayanthi	**Dr. N. Murugesan.**	**Dr. C. Janaki**	**Mr. T. Vibu**	**Ms. J. Magdalene**

	IV	23IDSBMA1	SKILL BASED : SIMPLE MATHEMATICS FOR COMPETITIVE EXAMINATIONS *[Employability & Skill Development]*	SEC	3	2	3	25	75	100
	V	19UCYS605	CYBER SECURITY		2	2	2	-	50	50
			MOOC/SWAYAM COURSES			2				
			EXTENSION AND CO-CURRICULAR ACTIVITIES (NSS, NCC, SPORTS, NECTAR, RSP, YRC, AICUF, CHETNA WOMEN CELL)			1				**50**
			TOTAL		**180+2+2**	**140+2+2**				**3800+50**

IH- Instructional Hours, **CP**- Credit points,
CIA-Continuous Internal Assessment, **ESE**- End Semester Examination

22/4/24		Janaki 22/04/24		Absent
Dr. D. Jayanthi	**Dr. N. Murugesan.**	**Dr. C. Janaki**	**Mr. T. Vibu**	**Ms. J. Magdalene**

PART WISE TOTAL

MATHEMATICS				
			CP	TOTAL
1	PART 1	LANGUAGE COURSE	12	400
2	PART II	ENGLISH COURSE	12	400
3	PART III	CORE/ALLIED/PRACTICAL	95	2100
4	PART IV	BASIC TAMIL I & II ADVANCED TAMIL I & II INDIAN KNOWLEDGE SYSTEM & HUMAN RIGHTS	4	100
		WOMEN STUDIES	-	50
	PART IV	SKILL BASED (6 COURSES)	12	600
	PART IV	VALUE EDUCATION	2	50
5	PART IV	ENVIRONMENTAL STUDIES	2	50
	PART V	EXTENSION AND CO-CURRICULAR ACTIVITIES (NSS, NCC, SPORTS, NECTAR, RSP, YRC, AICUF, CHETNA WOMEN CELL)	1	50
	TOTAL		140	3800
		CYBER SECURITY	2	50
		MOOCS/ SWAYAM	2	
	GRAND TOTAL		140+2+2	3800+50

23/4/24		23/04/24		Absent
Dr. D. Jayanthi	**Dr. N. Murugesan.**	**Dr. C. Janaki**	**Mr. T. Vibu**	**Ms. J. Magdalene**

ABBREVIATIONS	NATURE OF COURSE
LAN	LANGUAGE
ENG	ENGLISH
CC	CORE
GEN	GENERIC (ALLIED)
AEC	ABILITY ENHANCEMENT COURSE
SEC	SKILL ENHANCEMENT COURSE
GE	GENERIC ELECTIVE (NME)
DSE	DISCIPLINE SPECIFIC ELECTIVE

VALUE ADDED COURSES

S.NO	NATURE OF COURSE	TITLE OF THE PAPER	INSTRUCTIONAL HOURS	INSTITUTION OFFERING THE COURSE
1	CERTIFICATE COURSE	Certificate Course in Astronomy	30	Aakam Industrial Training and Research Institute Coimbatore.
2		Job oriented Certificate Course in Banking & PSC Examinations	30	Sathish Explore Academy
3		Certificate Course in LATEX	30	Accent Techno Soft
4	DIPLOMA COURSE	Post Graduate Diploma in Operations Research	90	Department of Mathematics (Aided), Nirmala College for Women

23/4/24	23/4/24	Janaki 23/04/24		Absent
Dr. D. Jayanthi Assistant Professor(SG) , Department of Mathematics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore-43	**Dr. N. Murugesan** Assistant Professor(SS) , Department of Mathematics, Government Arts College, Coimbatore -18	**Dr. C. Janaki** Assistant Professor(SS) , Department of Mathematics, Government Arts College for Women, Coimbatore -18	**Mr. T. Vibu** Managing Partner, Rel Agencies, Coimbatore	**Ms. J. Magdalene** Project Manager, Robert Bosch, Keeranatham, Saravanampatti, Coimbatore-35

SEMESTER: I

COURSE CODE: 23UMA1C01

TITLE OF THE COURSE: CORE: CLASSICAL ALGEBRA WITH GEOGEBRA

[Entrepreneurship]

COURSE OBJECTIVES:

- To acquire knowledge about the convergence and divergence of a given series.
- To develop skills for solving algebraic equations.
- To understand and visualize the concepts of classical algebra through GEOGEBRA

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1	Identify the basic concept of Binomial, Exponential and Logarithmic theorems	**K2**
CO2	Discuss the basic knowledge of the convergent and divergent of the given series.	**K2**
CO3	Classifying the problem and finding its solution based on the theory of equatio	**K3**
CO4	Analyze the different methods to find the multiple roots of an equation.	**K3**
CO5	Compute the solutions of numerical equations.	**K3**

SYLLABUS

Credits: 4 **Instructional Hours: 75**

UNIT I: Binomial, Exponential and Logarithmic series theorems (K2) **15 hours** Summation of various series involving binomial coefficients- Binomial theorem for a rational index - Exponential theorem (statement only)-Application of the Binomial and Exponential theorems to the summation of series only. Logarithmic series theorem (statement only)-immediate application to Summation and approximation only-Introduction to FOSS – GEOGEBRA and evaluation of simple algebraic problems

.(Self- study: Exponential and Logarithmic series)

UNIT II: Convergency, divergency and Absolute Convergence of series(K2) 15 Hours

Convergency and divergency of series – definitions – elementary results – Comparison tests– Cauchy's condensation test – De Alembert's ratio test - Cauchy's root test – Raabe's test-Absolute convergence – series of positive terms-evaluation of simple algebraic problems using GEOGEBRA.

(Beyond The Curriculum: Uniform Convergence)

UNIT III: Theory of equations (K3) **15 Hours**

Theory of equations: Roots of an equation – Relations connecting the roots and coefficients - Symmetric function

of roots - Sum of the powers of the roots of an equation – Newton's theorem– Transformations of equations – Character and position of roots-evaluation of simple algebraic problems using GEOGEBRA
(Self- study: Roots of an equation)

UNIT IV: Multiple roots (K3) 15 Hours

Reciprocal equations – Removal of terms – Descartes' rule of signs – Rolle's theorem –Multiple roots– Strum's Theorem-evaluation of simple algebraic problems using GEOGEBRA (*Industry 4.0)*

UNIT V: Solutions of Numerical equations (K3) 15 Hours

Approximate solution of numerical equations – Newton's method of divisors and Horner's methods –Solution of cubic and biquadratic equation – Cardon's and Ferrari's methods-evaluation of simple algebraic problems using GEOGEBRA (*Industry 4.0)*

TEXT BOOKS:

1. Manicavachagam Pillai T.K. and Natarajan T (2017), Algebra, Divya Subramanian for Ananda Book Depot, Chennai.

Unit 1: Chapter 3: Sec1and Sec 6 (results only), Sec 10.

Chapter 4: Sec1, Sec 2, Sec 3, Sec 5, Sec 6, Sec 7, Sec 9 (results only).

Unit 2: Chapter 2: Sec8, Sec 9, Sec 10, Sec11, Sec12 (results only),

Sec 13, Sec14, Sec15, Sec16, Sec17, Sec18, Sec19, Sec 21, Sec 22, Sec 23, Sec 24.

Unit 3: Chapter 6: Sec 9, Sec 10, Sec 11, Sec 12, Sec 13, Sec 14, Sec 15.

Unit 4: Chapter 6: Sec 16, Sec 17, Sec 18, Sec19, Sec 24, Sec 25, Sec 26, Sec 27.

Unit 5: Chapter 6: Sec 28, Sec 29, Sec 30, Sec 34, Sec 35.

2.Geogebra Manual – The Official Manual of GeoGebra Research.shu.ac.uk/geogebra/GIF – Guides/official Geogebramanual.pdf(2011)

REFERENCE BOOKS:

1. Kandasamy, P. and Thilagavathy, K. (2004). Mathematics for B. Sc Branch I – Vol I, (For B. Sc-I semester), S. Chand and company Ltd, New Delhi.

2. Bali, N.P. (2000). Algebra, Laxmi Publications, New Delhi.

3. A. Abdul Rasheed, (2008). Allied Mathematics, Vijay Nicole Imprints Private limited, Chennai.

4.Narayanan, S. HanumanthaRao, R.and Manicavachagam Pillai, T.K. (2007). Ancillary Mathematics Volume – I, SV Publications.

5. Vittal, P.R. and Malini, V. (2003). Algebra and Trigonometry, Margham Publication, Chennai.

6.Judith and MarkovHohenwarter,(2013),Introduction to Geogebra Version 4.4, http://stategeogebra.org/book/intro.en.pdf

BLENDED LEARNING

UNIT	TOPICS	LINKS
III	Theory of Equations	https://youtu.be/V4fCrkWJ8tc
IV	Descartes rule of signs	https://youtu.be/nTjnon4W8Sg
	Reciprocal Equations	https://youtu.be/dppJ_iHcZsQ
	Multiple roots	https://youtu.be/dppJ_iHcZsQ
V	Horner's Method	https://youtu.be/Z393AcN_Gz0

MAPPING OF CO'S WITH PO's AND PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO1	3	3	3	2	3	3	3	2	3	2	2	2	2	3
CO2	3	3	3	2	3	3	3	2	3	2	2	2	2	3
CO3	3	3	3	2	3	3	3	2	3	2	2	2	2	3
CO4	3	3	3	2	3	3	3	2	3	2	2	2	2	3
CO5	3	3	3	2	3	3	3	2	3	2	2	2	2	3

(Correlation: 3-High ; 2-Medium ;1-Low)

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Group project/ Workshop- (Unit V)	Once in a semester

Course designed by Dr.F. Nirmala Irudayam	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC: Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER I

COURSE CODE: 23UMA1C02

TITLE OF THE COURSE: CORE - CALCULUS WITH SCILAB

[Entrepreneurship & Industry 4.0]

COURSE OBJECTIVES:

- To find the integration of different forms of functions and deriving reduction formulae.
- To acquire knowledge about evolute, involute and envelopes of plane curves.
- To apply double and triple integrals in finding areas and volumes of different closed irregular shapes.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1	Define curvature and describe evolute, involute and envelope for all the curves.	**K2**
CO2	Distinguish the different forms of polynomials and apply the appropriate integration methods for solving them.	**K2**
CO3	Calculate integration of irrational functions of specific type.	**K3**
CO4	Apply the double and triple integral to find the area and volume of any closed figure.	**K3**

CO5	Discriminate improper integrals from proper integrals and extend this idea using Beta and Gamma functions. Use computational tools like SciLab	**K3**

SYLLABUS

Credits: 4 **Instructional Hours: 60**

UNIT I: Curvature (K2) **15 hours**

Pedal equation of a curve, Curvature: The length of an arc and its derivatives - Radius of curvature in Cartesian and Polar forms - Radius of curvature in p- r coordinates, Evolutes: Centre and circle of curvature - Co-ordinates of the centre of curvature, Envelopes: One parameter family of curves, Analytical method of finding envelopes

(Beyond The Curriculum-Maxima and Minima of functions of two variables)

UNIT II: Types of Integration (K2) **15 hours**

Integrals of functions containing linear functions of x - Integrals of functions of the form $\frac{f'(x)}{f(x)}$, $f'(x)$, Integrals of functions of the form $a^2 \pm x^2$, $(px+q)\sqrt{ax^2+bx+c}$, $\sqrt{(x-\alpha)(x-\beta)}$, $\sqrt{\frac{x-\alpha}{\beta-x}}$, $\frac{1}{a\cos x + b\sin x + c}$, Integration of rational algebraic functions of the form $\sqrt{a^2 \pm x^2}$, Integration of irrational functions, Integration by parts.

(Self Study: Integration by parts)

UNIT III: Reduction Formulae (K3) **15 hours**

Reduction formula for the integrals $\int x^n e^{ax} dx$, where n is a positive Integer - Reduction formula for the functions of the form $\int x^n \cos axdx$, $\int \sin^n xdx$, $\int \cos^n xdx$, $\int \sin^m x \cos^n xdx$, where m,n are positive integers - finding the reduction formula for the integrals of the types $\int \tan^n xdx$, $\int \cot^n xdx$ $\int \sec^n xdx$, $\int \cos ec^n xdx$, $\int e^{ax} \cos bxdx$, a and b are constants.

UNIT IV: Double and Triple Integrals (K3) **15 hours**

Double and Triple Integrals: Double Integrals: Definition- Evaluation of double integral and Changing the order of integration in double integral, Triple Integrals: Definition and simple problems, Change of variables in double and triple integrals: Simple problems

(*Self Study: Evaluation of triple integrals-simple problems*)

UNIT V: Improper Integrals (K3) **15 hours**

Notion of improper integral: Beta and Gamma functions – Infinite integral and their convergence - Definition of Beta and Gamma functions and their convergence – Recurrence formula of Gamma Functions – Properties

of Beta function -

TEXT BOOKS:

1. Arumugam S and Thangapandi Isaac A(2014), Calculus, New Gamma Publishing House, Palayamkottai.

UNIT I : Part I : Section 3.3 – 3.6 (No theorems on envelope)

UNIT IV: Part II : Section 3.1 -3.4

2. Narayanan S and Pillai T.K.M (2018), Calculus Vol.II, S .Vishwanathan (Printers & Publishers) PVT. Ltd., Chennai.

UNIT II: Chapter I: Section 1-12

UNIT III: Chapter I : Section 13 -14

UNIT V :Chapter VII: Section 1-5

3. Er.HemaRamachandran and Achuthsankar S Nair, Scilab(A free Software to Matlab) (2015) (1 st Edition), S.Chand and Company.

REFERENCE BOOKS:

1. Vasishtha A.R and Dr. Gupta Krishna Prakashan R.K (1992), Differential calculus II (2nd edition), Krishna PrakashanMandir, Meerut.
2. Bali N.P (1991), Integral Calculus (8th edition), Laxmi Publications, New Delhi.
3. Santhi Narayanan, (1974), Differential Calculus, (13th edition), ShyamLal Charitable Trust, New Delhi.
4. Abate, Marco and Tovena, (2006), Curves and surfaces, Francesca, Springer - New York.
5. Dineen, (2004), Multivariate Calculus and Geometry, (2nd edition), Sean, Springer.

BLENDED LEARNING

UNIT	TOPICS	LINKS
III	Reduction Formulae	https://youtu.be/czt5Wmj_rvI https://youtu.be/xaAfMzRvuQY
V	Relation Beta Function	https://www.youtube.com/watch?v=yyo798JxN3c
	Gamma function	https://www.youtube.com/watch?v=9oBkACBHqYw

MAPPING OF CO'S WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	3	3	3	2	3	3	3	3	3	3	1
CO2	2	3	2	2	3	3	2	3	3	3	3	2	3	1
CO3	2	3	1	2	3	3	2	3	3	3	3	2	3	1
CO4	2	3	3	2	3	3	2	3	3	3	3	3	3	1
CO5	3	3	1	2	3	3	3	3	3	3	3	3	3	3

(Correlation: 3-High ; 2-Medium ;1-Low)

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Workshop/Group project (Unit V)	Once in a semester

Course designed by 1.Dr. Sr. A. Stanis Arul Mary, 2.Dr. L.Maria Presenti	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC: Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: II

COURSE CODE: 23UMA2C03
TITLE OF THE COURSE: CORE : DIFFERENTIAL EQUATIONS AND INTEGRAL TRANSFORMS WITH SCILAB
[Entrepreneurship & Industry 4.0]

COURSE OBJECTIVES:

- To demonstrate how differential equations can be used in solving many problems
- To solve the formulated differential equations with the given conditions and to interpret the solutions obtained.
- To gain knowledge of Scilab and use it in solving ordinary and partial differential equations.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1	Classify the differential equations with respect to their order and linearity.	**K2**
CO 2	Categorize the partial differential equation with suitable standard forms.	**K2**
CO 3	Define Laplace Transform and evaluate Laplace transform of derivatives, integrals and periodic functions.	**K3**
CO 4	Use the method of Laplace transform to solve differential equations with constant coefficients and also apply the concept to solve real life problems.	**K3**
CO5	Expand any periodic functions in terms of Fourier Series.	**K3**

SYLLABUS

Credits: 4 **Instructional Hours: 75**

UNIT I: Ordinary Differential Equations (K2) **15Hours** Ordinary differential equations – first order higher degree equations – solvable for x, y, px, y, p – Clairaut's form – simultaneous differential equations of the form

i) $f_1(D)x + f_2(D)y = F_1(t) f_1(D)x + f_2(D)y = F_1(t)$

ii) $g_1(D)x + g_2(D)y = F_2(t) g_1(D)x + g_2(D)y = F_2(t)$ where $f_1, f_2, g_1, g_2 f_1, f_2, g_1, g_2$ are rational functions of $D = \frac{d}{dt} D = \frac{d}{dt}$ with constant coefficients, F_1 and F_2 are explicit functions of t

(iii) $\frac{dx}{P} = \frac{dy}{Q} = \frac{dzdx}{R\ P} = \frac{dy}{Q} = \frac{dz}{R}$ Conditions of integrability.Solving simple problems using SciLab.

UNIT II: Partial Differential Equations(K2) **15 Hours**

Partial Differential Equations – Formations of equations by eliminating arbitrary function – Definition of general, particular and complete solutions– singular and general solutions of first order equations in the standard form

(i) $f(p,q) = 0 f(p,q) = 0$ (ii) $f(z,p,q) = 0 f(z,p,q) = 0$

(iii) $f(x,p) = g(y,q) f(x,p) = g(y,q)$ (iv) $z = px + qy + f(p,q) z = px + qy + f(p,q)$

Solving simple problems using SciLab.

(Beyond The Curriculum: Equations reducible to the standard forms)

UNIT III: Laplace Transforms(K3) **15 Hours** Laplace Transforms - Definition – Transforms of $e^{at}, cos\ at, sin\ sin\ at\ and\ t^n$ $e^{at}, cos\ at, sin\ sin\ at\ and\ t^n$ where n is an integer. First shifting theorem– Laplace transforms

of $e^{at}cos\ bt, e^{at}\ sin\ sin\ bt\ and\ e^{at}t^n$, $e^{at}cos\ bt, e^{at}\ sin\ sin\ bt\ and\ e^{at}t^n$ -

Theorems of $L\{f^1(t)\}, L\{f^n(t)\}.L\{f^1(t)\}, L\{f^n(t)\}.$Solving simple problems usingSciLab.

(Self- study:Problems in Laplace transforms)

UNIT IV: Inverse Laplace transformation (K3) 15 Hours

Lagrange method of solving linear partial differential EquationPp+Qq=R Inverse Laplace transformation – Application - Solution of differential equation with constant co-efficient using Laplace transformation-Solving simple problems using SciLab.

UNIT V: Fourier Series(K3) 15 Hours

Fourier Series – Definition - Finding Fourier coefficients for a given periodic function with period $2\pi 2\pi$- odd and even functions – Half range series – change of interval-Solving simple problems using Scilab.

(Self-Study: Problems in Half range series)

TEXT BOOKS:

1.Narayanan S. and ManicavachagamPillai T. K, (2007), Differential Equations and its Applications, Viswanathan. S (printers & publishers) PVT., LTD.
Unit I: Chapter 4: Sec 1, Sec 2, Sec 3, Sec 4.
Chapter 6: Sec 2, Sec 3, Sec 4, Sec 5, Sec 6.
Unit II: Chapter 12: Sec 1, Sec 2, Sec 3, Sec 5.1, Sec 5.2, Sec 5.3 and Sec 5.4.
Unit III: Chapter 9: Sec 1, Sec 2, Sec 3, Sec 4, Sec 5.
Unit IV: Chapter 9: Sec 6, Sec 7, Sec 8, Sec 9, Sec 10, Sec 11.
Chapter 12: Sec 4.
2. Narayanan .S and ManicavachagamPillai, (2018), Calculus Vol III, Viswanathan.S (Printers and Publishers) Pvt Ltd, Chennai.
Unit V: Chapter 6: Sec 1, Sec 2, Sec 3, Sec 4, Sec 5, Sec 6.
UNIT I and II - Differential Equations
UNIT III and IV -Laplace Transforms & Inverse Laplace transformation
UNIT V - Fourier Series
3.Er.HemaRamachandran &Dr.Achuthsankar S.Nair ,Scilab (A free Software to Matlab) (2015) (1st edition) ,S Chand and company
4.Lecture notes/Lab manual/Tutorials on Sci Lab

REFERENCE BOOKS:

1. Bali N.P, (2000), Differential Equations, Laxmi Publications, New Delhi.
2. Venkataraman M.K and Manorama Sridhar, (2004), Differential Equations and Laplace Transforms, The National Publishing company.
3.Sharma, J.N and Gupta.R.K. K, (2000), Differential Equations, Krishna PrakashanMandir, Meerut
4. Narayanan.S, HanumanthaRao.R and Manicavachagam Pillai, (20**15**), Ancillary Mathematics, Vol I**II**, Viswanathan .S (Printers and Publishers) Pvt Ltd, Chennai.
5.Vital P.R, (2002), Differential Equations and Laplace Transforms, Margham Publications (Third Revised Edition).
6.JohnnyHeikell,Scilab for real Dummies,http://www.heikell.fi/downloads/scilab .pdf

BLENDED LEARNING

UNIT	TOPICS	LINKS
III	Laplace Transforms	https://www.youtube.com/watch?v=cMrYJICdcSs
IV	B Inverse Laplace transformation	https://www.youtube.com/watch?v=zczBU4fsEkY

MAPPING OF CO'S WITH PO's AND PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	3	3	3	3	3	3	2	3	3	2	2	2	3
CO2	3	3	3	3	3	3	3	2	3	2	2	2	2	3
CO3	3	3	3	3	3	3	3	2	3	2	2	3	2	3
CO4	3	3	3	3	3	3	3	2	3	2	2	3	2	3
CO5	3	3	3	3	3	3	3	2	3	2	2	3	2	2

(Correlation: 3-High ; 2-Medium ;1-Low**)**

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Hands on training/Group project (Unit V)	Once in a semester

Course designed by Dr. F. Nirmala Irudayam	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC: Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: II

COURSE CODE: 23UMA2C04

TITLE OF THE COURSE: CORE: DISCRETE MATHEMATICS

[Employability]

COURSE OBJECTIVES

- To understand the concepts of theory of inference, lattices and Boolean algebra.
- To inculcate the knowledge to design the deterministic finite state and non- deterministic finite state automata
- To recall relations and functions and to extend the idea of graphs.

COURSE OUTCOMES:

At the end of the course the students will be able to

Co 1	Understand the theory of inference for the statement calculus and predicate calculus	**K2**
Co 2	Designing some special lattices and extending the idea of Boolean algebra.	**K2**
Co 3	Apply different types of grammars in deterministic and non- deterministic finite state automata.	**K3**
Co 4	Demonstrate structural designs using various patterns of graphs.	**K3**
Co 5	Applying algorithms to understand the concepts of trees in real life.	**K3**

SYLLABUS

Credits: 3 **Instructional Hours: 60**

UNIT I: Theory of inference for the statement calculus and predicate calculus (**K2**) **12 hours**

The theory of inference for the statement calculus: Validity using truth tables – Rules of Inference – Consistency of premises and Indirect method of proof – Automatic theorem proving. The predicate calculus: Predicates - The statement function, variables and quantifiers - Predicate formulas – Free and bound variables - The universe of discourse. Inference theory of predicate calculus: Valid formulas and equivalences – Valid formulas over finite universes, involving quantifiers and formulas involving more than one quantifier.

UNIT II Lattices and Boolean algebra (**K2**) **12 hours**

Lattice: Lattice as partially ordered sets: some properties of Lattices, Lattices and Algebraic Systems**: S**ub lattices - direct product and homomorphism – some special Lattices.

Boolean Algebra: Definition and examples – subalgebra, Direct product and homomorphism

(Self Study:Direct Product and homomorphism of Boolean Algebra)

UNIT III Formal Languages And Automata Theory(K3) 12 hours

Formal languages: Equality of words-Concatenation of languages- Kleene closure. **Grammars**: phrase-structure grammar- Derivations of Grammar-Backus Normal form(BNF)- Chomsky Grammar- Ambiguous Grammar. **Finite State automation(FSA):**Counting to five- Process of getting up in the morning (Alarm)-Traffic light-Vending machine. **Finite state Machine (FSM)**.**Finite State Automata:** Deterministic Finite-State automata - Non-deterministic finite-state automata - Equivalent Non-deterministic finite state automata.

UNIT IV Basics of Graph Theory(**K3**) **12 hours**

Graph, Digraphs, Path-Trail-walk-vertex sequence, Subgraph, Circuit and cycle, Cycles and multiple paths, Connected graph, Spanning subgraph and induced subgraph, Eulerian graph, Hamiltonian graph, Biconnected graph, **Algebraic terms and operations in graph theory:**Graph isomorphism- union of two graphs-intersection of two graphs- addition of two graphs- direct sum or ring sum of two graphs- product of two graphs-composition of two graphs- complement of a graph- fusion of a graph- rank and nullity- adjacency matrix.

(Theorems: no proof only statement)

(Self study: product and composition of two graphs)

UNIT V Trees (**K3**) **12 hours**

Definition of tree- forest-rooted graph- parent, child, sibling and leaf- rooted plane tree- binary trees- spanning trees- breadth- Minimal spanning trees:Kruskal's algorithm- Prims algorithm-directed trees.

(Beyond the Curriculum:Planar Graphs)

TEXT BOOKS:

1.Tremblay J.P and Manohar,R.P, (2008), Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill Publications, New Delhi.

Unit I: Section: 1.4.1 - 1.6.5

Unit II: Section: 4.1.1 – 4.2.2

2. Yadav S.K, (2016),Discrete Mathematics with Graph theory, Ane Books Pvt Ltd, New Delhi.

Unit III: Section 9.2 -9.6

Unit IV : Section 10.1 -10.12and 10.13.1 – 10.13.11

Unit V : Section 11.1- 11.11

REFERENCE BOOKS:

1. Sundaresan V, Ganapathy Subramanian K.S and Ganesan K, Discrete Mathematics, A.R. Publications, Tamil Nadu.
2. NarSinghDeo, (1979), Graph Theory for Computer Science & Engineers, PHI, India.
3. Sharma J.K, (2005), Discrete Mathematics, (2nd edition), MacMillan India Ltd.
4. Richard Johnsonbaugh, (1997), Discrete Mathematics (4th edition), Prentice Hall, New York.

BLENDED LEARNING

UNIT	TOPICS	LINKS
III	Properties of lattices	https://www.youtube.com/watch?v=c6ARWh6lVgc
IV	Basic concept of graph theory	https://youtu.be/HkNdNpKUByM
	Matrix representation of graphs	Mhttps://youtu.be/LUDNz2bIjWI https://youtu.be/fRK32potpPk

MAPPING OF CO'S WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	3	2	3	2	3	3	2	2	3	3	2
CO2	2	3	3	3	2	3	2	3	3	2	2	2	2	2
CO3	3	3	2	3	3	3	2	2	2	3	2	3	3	2
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	2
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	2

(Correlation: 3-High ; 2-Medium ;1-Low**)**

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Group project (Unit V)	Once in a semester

Course designed by 1.Dr. Sr.A. Stanis Arul Mary 2.Dr.L. Maria Presenti	**Verified by HOD** Dr. K.Julia Rose Mary

Checked by CDC: Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: I

COURSE CODE: 23UMA1A01

ALLIED - STATISTICS FOR GEOGRAPHY I

(*Employability*)

COURSE OBJECTIVES:

- To analyse the characteristics of various distributions.

- To inculcate the techniques for solving all simple problems.
- To apply statistical results in solving practical problems.

COURSE OUTCOMES:

At the end of the course the students will be able to:

CO1	Collect data , organize and represent it diagrammatically	**K2**
CO2	Create the knowledge about various measures of central tendencies	**K2**
CO3	Explore the concepts of dispersion and deviation	**K2**
CO4	Analyze the idea of skewness	**K3**
CO5	Master on various theoretical distributions	**K3**

SYLLABUS

Credits: 5 **Instructional Hours: 90**

UNIT I : Data collection(K2) **18 hours**

Data collection: Primary data and secondary data - Classification and tabulation of data -Graphical and diagrammatic representation of statistical data: Frequency curve - Ogives - Histogram - Bar diagram - Pie diagram - Cartogram.

[Self Study : Graphical and Diagrammatic representation of data]

UNIT II :Measures of central tendency(K2) **18 hours**

Measures of central tendency: Mean - Median – Mode – Computation – merits and demerits- Relationship among the averages.

[Self Study : Merits and Demerits of Mean, Median Mode, Harmonic Mean and Geometric Mean]

UNIT III :Measures of Dispersion (K2) **17 hours**

Measures of dispersion: Range - Mean deviation - Standard deviation - Quartile deviation Coefficient of Variation.

UNIT IV : Skewness (K3) **19 hours**

Skewness: Bowley's coefficient of skewness - Karl's Pearson's coefficient of Skewness - Kurtosis – Simple problems.

UNIT V: Theoretical Distributions(K3) **18 hours**

Theoretical Distributions: Binomial - Poisson distributions (statements only)- Simple problems.

TEXTBOOK:

Treatment as in R.S.N Pillai and V. Bagavathi: "Statistics" S.Chand& Company, Delhi.

UNIT I Chapter 4, 6, 7

UNIT II Chapter 9

UNIT III Chapter 10

UNIT IV Chapter 11

UNIT V Chapter 19

REFERENCE BOOKS:

1. Gupta S.P, "Statistical Methods" Sultan Chand, Delhi.
2. Gupta S.C and Kapoor: V.K "Fundamentals of Mathematical Statistics", Sultan Chand, Delhi.
3. Murthy T. S. R.,(2011) "Probability and statistics", I.K. International *Publishing* House Pvt. Ltd – Zustand.
4. Edwards A.L,(1960) "Statistical Analysis", Holt Rinehard& Winston.
5. Veerarajan.T, "Probability, Statistics and Random Processes", (Third Edition), Tata McGraw- Hill Publishing Company Ltd, New Delhi.

BLENDED LEARNING

UNIT	TOPIC	LINK
I	Graphical and Diagrammatic representation of data	https://www.youtube.com/watch?v=uHRqkGXX55I https://www.youtube.com/watch?v=hrZyWTDGuJU
IV	Types of Skewness	https://youtu.be/BsVtMnp3vks
IV	Introduction to Kurtosis	https://youtu.be/1da4auXziT8

MAPPING OF CO'S WITH PO's AND PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	3	3	3	3	3	2	2	3	2	3	2	3	1
CO2	3	3	3	2	3	3	2	2	3	2	3	2	3	1
CO3	3	3	3	2	3	3	2	2	3	3	3	2	3	1
CO4	3	3	3	2	3	3	2	2	3	3	3	2	3	1
CO5	3	3	3	2	3	3	2	2	3	3	3	2	3	1

(**Correlation:** 3 – High; 2 – Medium; 1 - Low **)**

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Case study (Unit V)	Once in a semester

Course designed by Dr. Sr. Stanis Arul Mary	**Verified by HOD** Dr. K.Julia Rose.Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: II
COURSE CODE: 23UMA2A02

ALLIED - STATISTICS FOR GEOGRAPHY II

(*Employability*)

COURSE OBJECTIVES:

- To estimate population parameters using simple statistical and correlation techniques.
- To use different sampling tools to characterize the significance of the various distributions.

COURSE OUTCOMES :

At the end of the course the students will be able to:

CO1	Give diagrammatic representation of the measure of association between two variables.	**K2**
CO2	Examine the relationship between one dependent and one independent variable.	**K2**
CO3	Collect data from a large populations for statistical analysis	**K3**
CO4	Test the significance of the collected data and evaluate it.	**K3**
CO5	Test the goodness of fit and independence of data and evaluate it.	**K3**

SYLLABUS

Credits: 5 **Instructional Hours: 90**

UNIT I : Linear Correlation(K2) **17 Hours**

Linear Correlation: Scatter diagram- Limits of Correlation-Karl-Pearson's moment correlation coefficient – Spearman's Rank Correlation.

[Self Study : Limits of Correlation]

UNIT II : Regression equations(K2) **19 Hours**

Prediction using Regression equations-Simple problems.

UNIT III : Sampling techniques(K3) **18 Hours**

Simple random sampling- Stratified random sampling -systematic sampling- Sampling and non-sampling errors.

(Self Study : Sampling and non-sampling errors.)

UNIT IV: Tests of significance for attributes (K3) **17 Hours**

Test of significance for Large Sample- Mean between two samples-Proportions- Test of significance of small samples – Student's-t-distributions.

UNIT V: Chi square distributions (K3) **19 Hours**

Degrees of freedom- Test of goodness of fit- Test of independence- Simple Problems.

TEXT BOOK:

Treatment as in: R.S.N. Pillai and V.Bagavathi: “Statistics”, S.Chand & Company, Delhi.

UNIT I Chapter 12

UNIT II: Chapter 13

UNIT III & IV Chapter 20

UNIT V Chapter 21

REFERENCE BOOKS:

1. Gupta S.P, “Statistical Methods” Sultan Chand, Delhi.
2. Gupta S.C and V.K.Kapoor, “Fundamentals of Mathematical Statistics”

   Sultan Chand, Delhi.

3. Navanithan P A, “Business Mathematics and Statistics”,Jai publications,Trichy.
4. Vittal P .R , “Business Mathematics and Statistics”.
5. Ramakrishna Ghosh and SuranjanSaha, “Business Mathematics and Statistical Methods”.

BLENDED LEARNING

UNIT	TOPIC	LINK
II	Basic concepts of correlation	https://youtu.be/xTpHD5WLuoA
II	Linear Regression	https://youtu.be/8PJ24SrQqy8?list=RDCMUC2nvtxeY_rJLnlJKEg-J82g
III	Sampling Techniques	https://youtu.be/_VFnFX29m60 https://youtu.be/qNqrHO3woyE

MAPPING OF CO'S WITH PO’s AND PSO’s

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2	3	3	3	3	1	2	3	2	3	2	3	3
CO2	3	2	2	2	3	3	1	2	3	2	3	2	3	3
CO3	3	2	2	2	3	3	1	2	2	3	3	2	3	3

CO4	3	2	2	2	3	3	1	2	2	3	3	2	3	3
CO5	3	3	2	2	3	3	1	2	2	3	3	2	3	3

(**Correlation:** 3 – High; 2 – Medium; 1 - Low)

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Case study (Unit V)	Once in a semester

Course designed by Dr. Sr. Stanis Arul Mary	**Verified by HOD** Dr.K.Julia Rose.Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: III

COURSE CODE: 23UMA3C05

TITLE OF THE COURSE: CORE: MECHANICS with GNU-FISICA Lab

[Employability]

COURSE OBJECTIVES:

- To provide a strong foundation in understanding the concepts of mechanics
- To know how friction regulates the motion of objects
- To have a deep knowledge about the motion of particles under the influence of various forces like gravitational force, central force, impulsive force etc.,

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1	reduce any number of coplanar forces into manageable quantities	K2
CO2	be aware of the concept of friction and its various forms and its applications	K3
CO3	be familiar about the various types of velocities and accelerations under central orbits	K3
CO4	acquire knowledge on simple harmonic motion	K3
CO5	relate the idea of impulsive forces in real life situations	K3

SYLLABUS

Credits: 4 **Instructional Hours: 60**

STATICS

UNIT I Coplanar forces(K2) **12 Hours**

Coplanar forces acting on a rigid body: Reduction of any number of coplanar forces –Condition for a system of forces to reduce to a single force or to a couple –change of the base point - Equation to the line of action of the resultant - General conditions of equilibrium- Simple Problems using GNU- fisicaLab.

(Self study: Coplanar forces acting on a body(Theory))

UNIT II : Friction(K3) 12 Hours

Friction: Statical, Dynamical and Limiting friction - Laws of friction – Angle of friction, co-efficient of friction and cone of friction - Equilibrium of a body on a rough inclined plane - Equilibrium of a body on a rough inclined plane under a force parallel to the plane - Equilibrium of a body on a rough inclined plane under any force- Simple Problems using GNU- fisicaLab.

(Self study: Statical, Dynamical and Limiting friction(Theory))

DYNAMICS

UNIT III Central Orbits(K3) 12 Hours

Central Orbits - Radial and transverse components of velocity - Radial and transverse components of acceleration - areal velocity – central orbits - Differential equation of a central orbit in polar coordinates – circular and elliptic orbits- Simple Problems using GNU- fisicaLab.

UNIT IV Simple Harmonic Motion (K3) 12 Hours

Simple harmonic motion: Amplitude, periodic time and phase - composition of two simple harmonic motions of the same period in a straight line - composition of two simple harmonic motions of the same period in two perpendicular lines- Simple Problems using GNU- fisicaLab.

(Beyond the Curriculum:Simple Harmonic Motion Sec 10.8-10.10)

UNIT V Impact on a Fixed Surface : (K3) 12 Hours

Impulsive force, Impact on a smooth fixed plane - Direct impact of two smooth spheres - Oblique impact of two smooth spheres - loss of kinetic energy during direct impact - loss of kinetic energy during oblique impact- Simple Problems using GNU- fisicaLab

TEXT BOOKS:

1. Venkataraman M.K, Statics, (1999), Agasthiar Publications

UNIT I: Chapter VI – (Sec 1 - 12)

UNIT II : Chapter VII – (Sec 1 – 12)

2. Venkataraman M.K, Dynamics, (1999), Agasthiar Publications

UNIT III : Chapter XI (Sec 11.1- 11.11)

UNIT IV : Chapter X (Sec 10.1 – 10.7)

UNIT V : Chapter VII and VIII (8.1 - 8.8)

3. https://www.gnu.org/software/fisicalab/manual/en/fisicalab.pdf

REFERENCE BOOKS:

1. Bali N.P – "Dynamics", Golden Series, Laxmi Publications, New Delhi.
2. Bali N.P – "Statics", Golden Series, Laxmi Publications, New Delhi.
3. Sharma H.C – "Statics", A.S. Prakash And Mandir, Meerut.
4. Goyal J.K & Gupta K.P – "Statics", KrishnaPrakash And Mandir Publications, Meerut.Duraipandian P, LaxmiDuraipandian, Muthamizh Jaya Pragasam,(2009) "Mechanics", S. Chand Publications, New Delhi.

BLENDED LEARNING

UNIT	TOPICS	LINKS
IV	General Solution of S.H.M equation, Geometrical representation of simple harmonic motion and problems	https://youtu.be/AhfH7M8pfmM
IV	Composition of two Simple Harmonic Motions of the same period and in the same straight Line	https://youtu.be/yxJXREddKd8
V	Direct impact of two smooth spheres, Loss of kinetic energy due to direct impact of two smooth spheres and problems	https://youtu.be/k6yq0oXwfrw

MAPPING OF CO'S WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**1**	**2**	**3**	**2**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**1**	**2**	**3**	**2**	**3**	**3**	**3**	**3**

(Correlation: 3- High, 2 – Medium, 1 – Low)

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester

3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
8.	Real time problem solving (Unit V)	Once in a semester

Course designed by 1.Dr.M.Trinita Pricilla 2.Dr. L. Elvina Mary	**Verified by HOD** Dr. .K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER III

COURSE CODE: 24UMA3C06

TITLE OF THE COURSE: CORE- MATLAB (THEORY)

Objectives:

- To learn the new features and commands of Matlab
- To solve Numerical problems with the aid of Matlab

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1	Describe the basics of MATLAB, input - output, file types along with general commands	**K2**
CO2	Define matrices& vectors, create in line and built in functions and design simple graphs using matlab commands	**K3**
CO3	Explain concept of scripts, functions and language specific features and to develop program using MATLAB	**K3**
CO4	Implement the concept of MATLAB for solving linear and non-linear equations and analyze the error	**K4**
CO5	Demonstrate the application of MATLAB through simple programs, construct the concept of advanced data objects for creating student array and solve integral and quadratic equations	**K4**

SYLLABUS

Credits: 2 **Instructional Hours: 30**

UNIT I INTRODUCTION: (K2) **(6 hours)**

Introduction: Basics of MATLAB, Input – Output, File types- Platform dependence- General commands.

UNIT II INTERACTIVE COMPUTATION(K3) **(6 hours)**

Interactive Computation: Matrices and Vectors-Matrix and Array Operations-Creating and using Inline functions-Using Built-in functions and on-line help-saving and loading data-Plotting simple graphs.

UNIT III PROGRAMMING IN MATLAB (K3) (6 hours)

Programming in MATLAB: Scripts and functions-Script files-Functions files-Language specific features-Advanced data objects.

UNIT IV APPLICATIONS (K4) (6 hours)

Applications-Linear algebra-Curve fitting and Interpretation-Data analysis and Statistics-Non Linear algebraic equations

(Beyond the Curriculum: The Symbolic Math tools)

UNIT V GRAPHICS (K4) (6 hours)

Graphics: Basic 2-D Plots-Using subplot to layout multiple graphs-3-D Plots-Handle Graphics-Saving and Printing graphs-Errors.

(Self study:Handle Graphics)

TEXT BOOK:

Rudra Pratap, *Getting started with MATLAB-A Quick Introduction for Scientists and Engineers*, Oxford University Press(2003).

REFERENCE BOOKS:

1. William John Palm, *Introduction to Matlab 7 for Engineers*, McGraw-Hill Professional(2005).
2. Dolores M. Etter, David C. Kunoicky, *Introduction to Matlab*, Prentice Hall (2007).
3. Amos Gilat, *Matlab: Introduction with applications, (6th edition)*, publisher Kindle edition
4. Agam Kumar Tyagi, *Matlab and Simulink for engineers*, Oxford university press
5. Stormy Attaway, *Matlab a practical approach to programming and problem solving by(3rd edition)* , Boston university, Amsterdam.

BLENDED LEARNING

UNIT	TOPICS	LINKS
III	Script files	https://youtu.be/025XHJHeJtA

III	Advanced data objects	https://youtu.be/0xC0ZO_zaYs
V	Graphics: Basic 2-D Plots	https://youtu.be/OejFFzJrF-8
V	Using subplot to layout multiple graphs-3-D Plots	https://youtu.be/OUwfE_-tcfo

MAPPING OF CO'S WITH PO'S / PSO'S:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
CO 1	H	M	H	M	M	M	M	M	M	M	M	L	H	H
CO 2	H	M	H	H	H	H	M	M	M	M	H	H	M	H
CO 3	H	M	H	H	H	M	H	H	H	M	H	H	H	H
CO 4	H	H	H	H	M	H	M	H	H	H	H	H	H	H
CO 5	H	H	M	H	H	H	M	H	H	M	H	H	H	H

(Correlation: L-Low, M-Medium, H-High)

ASSESSMENT TOOLS:

S.No	**INTERNAL MARKS**	**EXTERNAL MARKS**
1.	CIA I – 5 marks CIA II – 5 marks Assignment I – 2 marks Assignment II – 2 marks Online Quiz I – 2 marks Online Quiz II – 2 marks Other Component – 2 marks **Total Marks: 20**	Section: A 5 x 1 = 5 Section: B 5 x 3 =15 Section: C 5 x 7= 35 **Total Marks 55**

Course designed by: 1.Dr.K.Mohana 2.Dr. F.Nirmala Irudayam	**Verified by HOD:** Dr. K. Julia Rose Mary
Checked by CDC: Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

MEMBERS OF BOARD STUDIES

Dr. D. Jayanthi Assistant Professor(SG) , Department of Mathematics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore-43	**Dr. N. Murugesan** Assistant Professor(SS) , Department of Mathematics, Government Arts College, Coimbatore -18	**Dr. C. Janaki** Assistant Professor(SS) , Department of Mathematics, Government Arts College for Women, Coimbatore -18	**Mr. T. Vibu** Managing Partner, Rel Agencies, Coimbatore	**Ms. J. Magdalene** Project Manager, Robert Bosch,Keeranatham, Saravanampatti, Coimbatore-35

SEMESTER III

COURSE CODE: 24UMA3CP1

TITLE OF THE COURSE: CORE- MATLAB (PRACTICAL)

COURSE OBJECTIVES:

- To learn the new features and commands of Matlab
- To solve Numerical problems with the aid of Matlab coding.

COURSE OUTCOMES:

At the end of the course the student will be able to

CO1	Utilize the concepts and maintain record or observation	K3
CO2	To identify, creating and evaluate mathematical concepts using Matlab	K3
CO3	Evaluate the given program, list the procedures and analyze the outputs	K4
CO4	To apply mathematical concepts to analyze matrix operations	K4
CO5	To apply statistical concepts to study mean, median and standard deviation	K4

SYLLABUS

Credits: 2 **Instructional Hours: 30**

LIST OF PRACTICALS

1. Create matrices A, B and C and check whether the addition of the matrices is

i) Commutative ii) Associative iii) Distributive

2. Write a script file to execute a MATLAB program to draw a unit circle
3. Create a MATLAB program to plot a spiral graph for a given function
4. Write a MATLAB program which converts the given temperature from Fahrenheit to Celsius
5. Plot a graph of the following $f(t)= e^{t/10} \sin(t), 0 \leq t \leq 20.$
6. Write a function named cosine – series to evaluate the cosine series
7. Create a square matrix to find eigen values and eigen vectors.
8. Create structure array to contain the following types of student data.**)**

Student name, Admission number, E mail address, Test scores

9. Draw a filled circle and view it in 3D
10. Draw a Pie chart for the given values of world population of various continents.**)**

11. To find mean, median and standard deviation of the given data.

12. To find the integration value for the given function**.**

13. To find the solution of a quadratic equation.

14. Write and execute a script file to generate an interpolated surface

15. Write a MATLAB program to make a straight line fit through the given data for the spring experiment and hence find the spring constant

MAPPING OF CO'S WITH PO'S / PSO'S:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO 1	3	2	2	2	2	2	2	2	2	2	2	2	2	2
CO 2	3	3	3	3	3	3	3	3	3	2	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	2	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Correlation: L-Low, M-Medium, H-High

ASSESSMENT TOOLS:

S.NO	**INTERNAL MARKS**	**EXTERNAL MARKS**
1.	CIA I – 5 marks CIA II – 5 marks **Total Marks: 10**	Practical - 2 * 5 = 10 marks Record = 5 marks **Total Marks: 15**

Course designed by: 1.Dr.K.Mohana	**Verified by HOD:** Dr. K. Julia Rose Mary
2.Dr. F. Nirmala Irudayam	
Checked by CDC: Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

MEMBERS OF BOARD OF STUDIES

Dr. D. Jayanthi Assistant Professor(SG) , Department of Mathematics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore-43	**Dr. N. Murugesan** Assistant Professor(SS) , Department of Mathematics, Government Arts College, Coimbatore -18	**Dr. C. Janaki** Assistant Professor(SS) , Department of Mathematics, Government Arts College for Women, Coimbatore -18	**Mr. T. Vibu** Managing Partner, Rel Agencies, Coimbatore	**Ms. J. Magdalene** Project Manager, Robert Bosch,Keeranatham, Saravanampatti, Coimbatore-35

SEMESTER: III

COURSE CODE: 23UMA3A05

ALLIED 3- COMPUTATIONAL PROBABILITY AND STATISTICS

[Employability & Industry 4.0]

- **COURSE OBJECTIVES:**

- To learn the measures of Central Tendency, Dispersion etc., to apply them in different fields of study and to understand the relationship between them.
- To test the hypothesis in order to extend the sample inference to the population.
- To know the random variables and their different distributions.

COURSE OUTCOMES:

At the end of the course the students will have the able to:

CO1	Compute measures of central tendency and dispersion for the given data	**K2**
CO2	Construct a curve using the method of least squares and to analyse relationship between the variables	**K2**
CO3	Compute the theoretical distributions and to obtain its characteristics.	**K2**
CO4	Define a random variable and its distributions with its characteristics.	**K3**
CO5	Identify Normal, t, F, chi-square tests based on small sample test and to apply analysis of variance for the day-to-day life problems	**K3**

SYLLABUS

Credits: 6 **Instructional Hours: 75**

UNIT I Measures of Central Tendency and Dispersion 15 Hours

Measures of central value - Mean, Median, Mode G.M, H.M -Measures of Dispersion – Range, Quartiles deviation and Standard deviation Coefficient of variation, moments, Skewness and Kurtosis.

(Self Study: Measures of central value - Mean, Median and Mode)

UNIT II Correlation and Regression Analysis 15 Hours

Curve fitting and Principles of Least squares – Straight-line, Second-degree parabola and power curve, Correlation and Regression.

UNIT III Random variable 15 Hours

Random variable – continuous and discrete random variable – function of a random variable – probability density function – mathematical expectation – moment generating function.

(Self Study- Random Variable)

UNIT IV Theoretical Distributions 15 Hours

Theoretical Distributions – Binomial, Poisson and Normal - moments, mean,Standard deviation, MGF and fitting of distribution.

UNIT V Testing the Hypothesis and Analysis of Variance 15 Hours

Tests of significance of small sample tests based on normal t, F and chi-square tests, goodness of fit. Analysis of variance – one way and two way classifications (Problems only)

TEXT BOOK:

1. Gupta S.C, Kapoor V. K, (2002), Fundamentals of Mathematical Statistics (11^{TH} Edition), Sultan Chand Sons, New Delhi. (Unit I, II, III , IV – Sample Tests)

Unit I: Chapter 2 Sec 2.1 to Sec 2.17

Unit II: Chapter 10 Sec: 10.1 to Sec 10.4, 10.7,

Chapter 11 Sec 11.1 to Sec 11. 3(only problems)

Unit III: Chapter 5 Sec 5.1 to 5.4 (till pg no 5.15), 5.4.3

Chapter 6 Sec 6.1 to 6.6(till pg.6.14)

Unit IV: Chapter 8 Sec 8.4 (from pg. no 8.1 to 8.16, 8.19 to 8.21),

Sec 8.5(from pg. no 8.28 to 8.40, 8.45 to 8.47)

Chapter 9 Sec 9.1 (pg. 9.1 to 9.8, 9.14 to 9.25)

2.Gupta S. P,(2011), Statistical Methods, (41 st revised Edition), Sultan Chand & Sons, New Delhi. (Unit V- Analysis of Variance)

Unit V: Chapter 3,4, 5 fully (only problems)

REFERENCE BOOKS:

1. Gupta S.C., Kapoor V.K., (2004), Elements of Mathematical Statistics, (3^{rd} edition), Sultan Chand Sons, New Delhi.
2. Grewal P. S., (1990), Methods of Statistical Analysis, (2^{nd}Edition), Sterling Publishers.
3. Edwards A. L., (1960), Statistical analysis, Holt Rinehard & Winston.
4. Murthy T.S.R., (2011), Probability and statistics, I.K. International *Publishing* House Pvt. Ltd, New Delhi.

5. Pillai R. S. N, Bagavathi, (1993), Statistics Theory and Practice, (3rd Edition), Sultan Chand Sons, New Delhi

BLENDED LEARNING

UNIT	TOPICS	LINKS
II	Correlation	https://youtu.be/xTpHD5WLuoA
II	Regression	https://youtu.be/ZkjP5RJLQF4
IV	Geodesics – Some simple problems	https://youtu.be/f8ACx2iN6fk
IV	Meusnier Theorem	-https://youtu.be/jIsn2M-A-t8

MAPPING OF CO'S WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	1	1	1	2	3	2	2	3	3	3
CO2	3	3	2	3	1	1	1	2	3	2	3	3	3	3
CO3	3	3	2	3	1	1	1	2	3	2	2	3	3	3
CO4	3	3	2	3	1	1	1	2	3	2	3	3	3	3
CO5	3	3	2	3	1	1	1	2	3	2	2	3	3	3

(Correlation: 3- High, 2 – Medium, 1 – Low)

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester

7.	Case study (Unit V)	Once in a semester

Course designed by Dr.A.ArokiaLancy	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER III

COURSE CODE: 23UMA3SB1
SKILL BASED 1- MATHEMATICAL FOUNDATION FOR MACHINE LEARNING
[Skill Development]

COURSE OBJECTIVES:

- To provide a strong foundation in understanding basics concepts of Linear Algebra
- To know the concepts of vector spaces and matrices
- To understand the applications of Linear Algebra in Machine Learning

COURSE OUTCOMES :

At the end of the course the students will be able to

CO 1	Understand the basics of Linear Programming structures	**K2**
CO 2	Apply vector spaces and their applications in Machine Learning	**K2**
CO 3	Implement the properties of Determinants	**K3**
CO 4	Evaluate the concepts of Difference equations	**K3**
CO 5	Apply the concepts of Linear Algebra in Machine Learning Algorithms	**K3**

SYLLABUS

Credits: 2 **Instructional Hours: 45**

UNIT I :(K1) Matrices and Gaussian Elimination 9 hours
The Geometry of Linear Equations- An Example of Gaussian Elimination- Matrix Notation and Matrix Multiplication - Triangular Factors and Row Exchanges- Inverses and Transposes
[Self Study: Matrix Multiplication]

UNIT II : Vector Spaces 9 hours
Vector Spaces and Subspaces – Solving Ax=0 and Ax=b - Linear Independence, Basis and Dimension- The Four Fundamental Subspaces

UNIT III : Determinants 9 hours
Introduction- Properties of the Determinant- Formulas for the Determinant - Applications of Determinants
[Self Study: Properties of the Determinant]

UNIT IV :Eigenvalues and Eigenvectors 9 hours
Introduction- Diagonalization of a Matrix .- Difference Equations and Powers A^k

UNIT V:Positive Definite Matrices **9 hours**

Minima, Maxima, and Saddle Points - Tests for Positive Definiteness Singular Value Decomposition – Machine Learning Applications

Text Book :

Gilbert Strang(2006). Linear Algebra and Its Application, (Fourth Edition,) Academic Press.

Unit I : Chapter 1 : 1.1- 1.6

UnitII : Chapter 2 : 2.1 - 2.4

Unit III : Chapter 4 : 4.1 - 4.4

Unit IV: Chapter 5 : 5.1- 5.3

Unit V: Chapter 6: 6.1 - 6.3

Reference Books

1. David C. Lay, Steven R. Lay, Judi J. McDonald (2014). Linear Algebra and Its Applications, Pearson Education.

2. Peter D. Lax(2007). Linear Algebra and Its Applications, Second Edition, Wiley Publication.

BLENDED LEARNING

UNIT	TOPICS	LINKS
IV	Eigenvalues and EigenVectors	https://www.youtube.com/watch?v=EjOhv4MdzBA)
IV	Difference Equations	https://www.youtube.com/watch?v=DEbJDjre59Q)
V	Positive Definite Matrices	https://www.youtube.com/watch?v=ojUQk_GNQbQ

MAPPING OF CO'S WITH PO's AND PSO's

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	2	2	2	1	2	1	1	3	3	3	1
CO2	3	2	2	2	3	2	2	3	1	2	3	3	3	3
CO3	3	2	3	3	3	3	3	3	2	3	3	3	3	3
CO4	3	2	2	2	3	3	2	2	2	1	3	3	3	1

CO5	3	2	3	3	3	3	3	3	3	3	3	3	3	3

(Correlation: 3- High, 2 – Medium, 1 – Low)

ASSESSMENT TOOLS:

S.No	**Assessment methods**	**Frequency of Assessment**
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Group Project/ Hands on training (Unit V)	Once in a semester

Course designed by Dr. K. Julia Rose Mary	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: IV

COURSE CODE: 23UMA4C07

TITLE OF THE COURSE: CORE: ANALYTICAL GEOMETRY OF 2D AND 3D WITH GEOGEBRA

COURSE OBJECTIVES:

1. To visualize geometric ideas in two and three dimensions.
2. To apply the concepts in the advanced level subjects like Differential Geometry, Mechanics, Fluid Dynamics etc.

COURSE OUTCOMES :

At the end of the course the students will be able to

CO1	acquire knowledge of various types of conics in two dimensional polar co-ordinates	**K2**
CO2	be familiar with the characteristics of straight lines	**K2**
CO3	study on spheres and its properties	**K2**
CO4	analyze the concept of cone and enveloping cone	**K3**
CO5	understand cylinder and conicoid and their types	**K3**

SYLLABUS

Credits: 4 **Instructional Hours: 60**

UNIT I Polar co-ordinates **12 Hours**

Polar co-ordinates – distance between the points (r_1,θ_1) and (r_2,θ_2) –Transformations of polar co-ordinates into Cartesian co-ordinates and vice-versa-Polar equation of a conic – to find the equation of the chord of the conic $\frac{l}{r} = 1 + e\cos\theta$ joining the points whose vectorial angles are

and $\alpha-\beta$ – some properties of the general conic-executing simple geometrical problems $\alpha+\beta$

using GEOGEBRA.

(Beyond the Curriculum: Polar Equations: Section 9.4-9.8)

UNIT II Analytical Geometry of three dimensions 1**2 Hours**

Analytical Geometry of three dimensions: Straight lines - Co-planarity of straight lines – shortest distance (S.D) and Equation of S.D between two lines – Simple problems-executing simple geometrical problems using GEOGEBRA.

(Self study: Shortest Distance)

UNIT III Sphere **12 Hours**

Sphere:Standard equation of a sphere – results based on the properties of a sphere – Tangent plane to a sphere – Equations of a circle-executing simple geometrical problems using GEOGEBRA.

UNIT IV Cone **12 Hours**

Cone: Cone whose vertex is at the origin – Enveloping Cone of a sphere – Right circular cone-executing simple geometrical problems using GEOGEBRA.

UNIT V Cylinder and Conicoids **12 Hours**

Cylinder and Conicoids: . – Equation of a cylinder – Right circular cylinder - Nature of a Conicoid - Standard equation of a central conicoid – Enveloping cone – Tangent plane –Conditions for tangency – Director sphere and director plane-executing simple geometrical problems using GEOGEBRA.

(Self –study: Right circular cylinder)

TEXT BOOKS:

1. Manicavachagam Pillay and Natarajan, (2009), A Text book of Analytical Geometry – Part I – 2D, Sec.: 9.1 – 9.3, 9.9 – 9.10, 9.13
2. Duraipandian P, (1968), Analytical Geometry – 3D,
UNIT II Sec. 4.1 – 4.6

UNIT III Sec. 5.2 – 5.4, 5.6

UNIT IV Sec 6.1 – 6.5 and problems

UNIT V Sec 6.6 – 6.12 and problems

3.Geogebra Manual – The Official Manual of Geogebra

Research.shu.ac.uk/geogebra/GIF – Guides/official Geogebramanual.pdf(2011)

REFERENCE BOOKS:

1. Vittal P. R, (2013), Analytical Geometry 2D and 3D, Pearson Publication.
2. Pandey.H.D, Khan,M.Q and Gupta,B.N,(2000), Text book of Analytical Geometry and Vector Analysis, Dominant Publishers and distributers.
3. Venkatachalapathy S.G, Analytical Geometry (2D and 3D), Margham Publishers.
4. R.M.Khan, (2010), Analytical Geometry of two and three dimensions and Vector Analysis,New Central Book Agency.
5. Arup Mukherjee,Naba Kumar Bej,(2010), Analytical Geometry of two and three dimensions(Advanced Level), Kolkata Shreetara.

BLENDED LEARNING

UNIT	TOPICS	LINKS
I	To find the equation of the chord of the conic $\frac{l}{r} = 1 + e\cos\theta$ joining the points whose vectorial angles are $\alpha + \beta$ and $\alpha - \beta$	https://youtu.be/fsypY7-VttE
V	Right Circular Cylinder	https://youtu.be/Y4lXNOL6oG4

V	Enveloping Cone	https://youtu.be/a9zlOnc1xps

MAPPING OF CO'S WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	1	3	3	2	3	3	3	3
CO2	3	3	3	3	3	3	2	2	3	2	3	3	3	3
CO3	3	3	3	3	3	3	1	2	3	2	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	2	3	3	3	3
CO5	3	3	3	3	3	3	2	2	3	2	3	3	3	3

(Correlation: 3- High, 2 – Medium, 1 – Low)

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Real time problem solving/ hands on training (Unit V)	Once in a semester

Course designed by 1.Dr.M.Trinita Pricilla 2.Dr. L. Elvina Mary	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: IV

COURSE CODE: 23UMA4C08

TITLE OF THE COURSE: CORE: TRIGONOMETRY, VECTOR CALCULUS, NUMBER THEORY WITH MAPLE APPLICATIONS

COURSE OBJECTIVES:

- To acquire knowledge about the expansion of trigonometric and hyperbolic functions with MAPLE applications.
- To apply these concepts in the advanced level subjects like Mechanics, Fluid Dynamics etc.
- To introduce students to the fundamentals of vector calculus with MAPLE applications.

COURSE OUTCOMES :

At the end of the course the students will be able to

CO1	Expand the trigonometric functions which are the basic tools for solving many real life problems.	**K2**
CO2	To find the sum of trigonometric series and complex quantities	**K3**
CO3	Define the scalar and vector point functions and differential operators	**K3**
CO4	Compute the length, area and volume of surfaces using vector integration.	**K3**
CO5	study divisibility in number theory.	**K3**

Credits: 4 **Instructional Hours: 60**

UNIT I: EXPANSION OF TRIGONOMETRIC FUNCTIONS 12 Hours

Expansions of $\cos n\phi, \sin n\phi, \cos^n \phi, \sin^n \phi$, Hyperbolic functions separation of real and imaginary parts of $\sin(\alpha + i\beta)$, $\alpha + i\beta$, $\cos(\quad)$, $\tan(\quad i\beta)$, $\sinh(\alpha + i\beta)$, $\cosh(\alpha + i\beta)$, $\tanh(\alpha + i\beta)$ and $\tan^{-1}(\alpha + i\beta)$ - MAPLE Application for branches and branch cuts of inverse trigonometric and hyperbolic functions.

(Self Study-Examples in expansion of $\sin n\phi$)

UNIT II: LOGARITHM OF TRIGONOMETRIC FUNCTIONS 12 Hours

Logarithm of complex numbers – Summation of trigonometric series - Sum of sines of n angles in A.P - Sum of Cosines of n angles in A.P- Summation using Complex Quantities (Series in G.P, Binomial and Exponential series only).

(Self Study: Problems in Summation of Binomial Series)

UNIT III: SCALAR AND VECTOR POINT FUNCTIONS 12 Hours

Scalar and vector point functions - Differentiation of vectors - differential operators - Directional derivatives, gradient, Divergence and Curl- MAPLE Applications - Stepwise Solutions of Vector Calculus.

UNIT IV: LINE, SURFACE AND VOLUME INTEGRALS 12 Hours

Integration for vectors - Line, Surface and Volume integrals - Theorems of Gauss, Green, Stokes (statements only) – Verification-MAPLE Applications- Stokes Theorem

UNIT V : Number Theory 12 Hours

Divisibility: Introduction – Divisibility, Greatest Common Divisor, Euclid‟s Algorithm, Greatest Common Divisor via Euclid‟s Algorithm – Least Common Multiple – Representation of Integers, Decimal Representations of Integers, Binary Representations of Integers (Chapter 2: Sections 2.1 to 2.4, Related Problems)

(Beyond the Curriculum: The Theory of Congruence)

TEXT BOOKS:

1. S.Narayanan and ManicavachagamPillai, (2009), Trigonometry, Viswanathan S, Printers *&Publishers* Pvt Ltd, Chennai.
2. Duraipandian P, (1990), Vector Analysis, Emerlad Publishers Pvt.Ltd, Chennai
3. S.Narayanan and ManicavachagamPillai, (2004), Calculus Vol II, S.Viswanathan (Printers and Publishers) Pvt Ltd, Chennai.
4. Neville Robinns, Beginning Number Theory, (2nd Ed)., Narosa Publishing House Pvt. Limited, Delhi, 2006.
5. http://www.maplesoft.com/applications/

UNIT I and II - Trigonometry

UNIT III and IV - Vector Calculus

UNIT V - Number Theory

REFERENCE BOOKS:

1. Shaikh, Absos Ali &Jana,Sanjib Kumar, (2009), Vector analysis with applications, Narosa Publishing House, pvt Ltd, New Delhi.
2. Duraipandian P, Laksmi Duraipandian, (1984), Trigonometry, Emerald Publications,Chennai.
3. Vittal P.R, (1988), Trigonometry, Margham Publications, Chennai.
4. Narayanan S, (1995), Trigonometry, ViswanathanPrinters.S and Publishers, Chennai.
5. Manickavachagam Pillai.T.K., Natarajan.T and Ganapathy.K.S, (2007), Calculus Volume III, S.ViswanathanPrinters and Publishers, Chennai.
6. Manickavachagam Pillai.T.K., Natarajan.T and Ganapathy.K.S, (2012), Algebra Volume II, S.ViswanathanPrinters and Publishers, Chennai.
7. David M. Burton, Elementary Number Theory 6th Dd., Tata McGraw-Hill Edition, Indian reprint, 2007. 2.
8. http://www.intmath.com/

BLENDED LEARNING

UNIT	TOPICS	LINKS
II	Summation of trigonometric series	*https://youtu.be/Gk70xiGQlw8*
III	Scalar and vector point functions	https://www.youtube.com/watch?v=MdlT561A8_8
IV	Green's Theorem	https://www.youtube.com/watch?v=a_zdFvYXX_c

MAPPING OF CO'S WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	1	3	3	2	3	3	3	2
CO2	3	3	3	3	3	3	2	2	3	2	3	3	3	2
CO3	3	3	3	3	3	3	2	2	3	2	3	3	3	2
CO4	3	3	3	3	3	3	2	3	3	2	3	3	3	2
CO5	3	3	3	3	3	3	2	2	3	2	3	3	3	2

(Correlation: 3- High, 2 – Medium, 1 – Low)

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Real time problem solving (Unit V)	Once in a semester

Course designed by 1.Dr.K.Mohana 2.Dr. L. Elvina Mary	**Verified by HOD** Dr K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER IV

COURSE CODE: 23UMA4A06

ALLIED 4 - STATISTICAL QUALITY CONTROL

[Employability & Industry 4.0]

COURSE OBJECTIVES:

- To learn the purpose and function of Statistical Quality Control.
- To know the difference between attributes and variables
- To understand the applications of statistical techniques for Process control and Sampling acceptance.

COURSE OUTCOMES :

At the end of the course the students will be able to

CO1	describe the concepts of Control charts	**K2**
CO2	Construct the control charts for variables	**K2**
CO3	Construct The control charts for attributes.	**K3**
CO4	apply the single and double sampling plans to check the quality of attributes.	**K3**
CO5	analyze the single and double sampling Lot Tolerance and AOQL tables	**K3**

SYLLABUS

Credits: 6 **Instructional Hours: 75**

UNIT I Basic Concepts of Statistical Quality Control 15 Hours

Quality –meaning - concepts – Quality of design – Quality of conformance – Quality of performance - Statistical Quality Control – Meaning – Basic concepts of SQC – Uses – Causes of variation – Process Control – Basis of Control Charts – Uses of control charts - 3sigma control Limits.

(Self Study: Uses of SQC)

UNIT II Control Charts for Variables 15 Hours

Control Chart – Definition- Objectives – Relationship between Variables –Choice of Variables- Control Limits- Some control chart patterns- Group Control charts- Reject Limits – Difference control charts.

UNIT III Control Charts for Attributes 15 Hours

Practical Limitation of the Control chart for variables –Choice between p and np charts - Control Charts for number of defects - c Charts (for fixed and varying sample size) - Comparison between attribute and variable control charts

(Self study: C Charts)

UNIT IV Acceptance Sampling 15 Hours

Sampling Methods – OC curve- Producer's and Consumer's risk – Quality indices for acceptance sampling plans- AOQL- Sampling Plans – ATI curve .

UNIT V Dodge-Romig System 15 Hours

Single and Double sampling Lot Tolerance tables- Single and Double sampling AOQL tables – Multiple continuous sample plans-

TEXT BOOKS:

1. GuptaS. C, and Kapoor V.K - Fundamentals of Applied Statistics, Sultan Chand & Sons Publishers, New Delhi, (4th Thoroughly Revised Edition), Jan (2007), Reprint (2015).

Unit I – Section 1.2 to 1.6

Unit II – Section 1.8

Unit II – Section 1.9

2. Mahajan.M - Statistical Quality Control DhanpatRai& Co (P) Ltd, Delhi, (2009).

Unit I – Section 1.1-1.4, 1.18 & 4.1

Unit II – Section 7.1 to 7.11 & 6.2 to 6.20

Unit III – Section 8.1 to 8.7

Unit IV – Section 10.1 to 10.10

Unit V – Section 11.1 to 11.9

REFERENCE BOOKS:

1. Duncan. A.J. - Quality Control and Industrial Statistics, Irwin Homewood

2. Montgomery, D.C. (1991) Statistical Quality Control (2nd Edition) John Wiley and Sons, New York.

3. Eugene L. Grant, and Richard S. Leavenworth (1988) Statistical Quality Control (Sixth Edition), McGrawhill Book co, New York.

4. Goon, A. M., M.K. Gupta and B. Dasgupta (1987) Fundamentals of Statistics, Vol. II. World Press, Kolkata.

5. Juran, J.M.(1988) Quality Control Handbook, McGraw Hill, New York.

BLENDED LEARNING

UNIT	TOPICS	LINKS
I	Introduction to Statistical Quality Control	https://youtu.be/c18FKHUDZv8
I	Statistical Quality Control – Meaning – Basic concepts of SQC	https://youtu.be/ypZGDxjSM60
V	Analysis of variance	https://youtu.be/ITf4vHhyGpc
V	Chi-square tests - goodness of fit	https://youtu.be/b3o_hjWKgQw

MAPPING OF CO'S WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	1	1	1	2	3	2	2	3	3	3
CO2	3	3	2	3	1	1	1	2	3	2	3	3	3	3
CO3	3	3	2	3	1	1	1	2	3	2	2	3	3	3
CO4	3	3	2	3	1	1	1	2	3	2	3	3	3	3
CO5	3	3	2	3	1	1	1	2	3	2	2	3	3	3

(Correlation: 3- High, 2 – Medium, 1 – Low)

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Case study/ Field Survey (Unit V)	Once in a semester

Course designed by Dr.G.Sindhu	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER IV

COURSE CODE: 23UMA4SB2

SKILL BASED 2- MATHEMATICAL MODELING

[Innovation & Employability]

COURSE OBJECTIVES:

- To provide a strong foundation in understanding the basic concepts of mathematical modeling
- To solve the differential equations which arise in the field of Science and Engineering in a simpler way.
- To apply the difference equations and to solve them in Economics and Finance mathematical models

COURSE OUTCOMES :

At the end of the course the students will be able to

CO 1	Acquire the basic knowledge of in Mathematical model concepts	**K2**
CO 2	Investigate linear and non -linear Growth and Decay models by differential equations	**K2**
CO 3	Estimate the Mathematical models through system of ordinary differential equations	**K3**
CO 4	Evaluate the Difference equations	**K3**
CO 5	Implement Difference equations in Economics and Finance Mathematical models	**K3**

SYLLABUS

Credits: 2 **Instructional Hours: 45**

Unit I :**Mathematical Modeling** **9 hours**

Simple situations requiring mathematical modeling, characteristics of mathematical model.

[Self Study : Characteristics of Mathematical Model]

Unit II: Mathematical Modeling through differential equations **9 hours**

Linear Growth and Decay Models. Non-Linear growth and decay models, Compartment models.

Linear Growth and Decay Models :**https://youtu.be/M4jHMV05QCg**

[Self Study : Linear Growth and Decay Model]

Unit III: Mathematical Modeling through system of Ordinary differential equations of first order: 9 hours

Prey-predator models, Competition models, Epidemics: simple epidemic model, Susceptible- infected-susceptible(SIS) model, SIS model with constant number of carriers.

Unit IV :**Mathematical Modeling through difference equations: 9 hours**

The need for mathematical modeling through difference equations- Basic theory of linear difference equations with constant coefficients

Unit V :Mathematical Modeling through difference equations: 9 hours

Mathematical Modeling through difference equations in Economics and Finance

TEXT BOOKS:

Content and treatment as in:

Kapur J.N, Mathematical Modeling, New Age International Publishers, (2005)

Unit I : Chapter 1 Sections 1.1 to 1.4

Unit II: Chapter 2 Sections 2.1 to 2.4

Unit III: Chapter 3 Sections 3.11,3.12 and 3.2

Unit IV: Chapter 5 Sections 5.1 and 5.2

Unit V: Chapter 5 Section 5.3

Reference Books :-

1. Mathematical Modeling by Bimal K Mishra and DipakK.Satpathi, Ane Books Pvt Limited, (2009)

2 Mathematical Modeling by Mark M.Meerschaert, Academic Press, Fourth Edition,(2013)

BLENDED LEARNING

UNIT	TOPICS	LINKS
III	Mathematical Modeling through system of Ordinary differential equations	https://youtu.be/QsYVZFkNQ_M

MAPPING OF CO'S WITH PO's AND PSO's

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	2	3	3	3	2	3	3	3	3
CO2	3	3	3	3	3	2	3	3	3	2	3	3	3	3

CO3	3	3	3	3	3	3	3	3	3	2	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	2	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	2	3	3	3	3

(Correlation: 3- High, 2 – Medium, 1 – Low)

ASSESSMENT TOOLS:

S.No	**Assessment methods**	**Frequency of Assessment**
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Case study (Unit V)	Once in a semester

Course designed by Dr. K. Julia Rose Mary	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: V

COURSE CODE: 23UMA5C09

TITLE OF THE COURSE: CORE: ABSTRACT ALGEBRA

COURSE OBJECTIVES:

- To make the students gain knowledge on the basic concepts of algebraic structures such as Groups and Rings.
- To acquire a deeper understanding of the theory.

COURSE OUTCOMES :

At the end of the course the students will be able to

CO1	Analyze group, subgroup and cyclic groups	**K2**
CO2	Develop the aspects of Normal subgroups and Quotient groups	**K3**
CO3	Be familiar with the mappings on Group Theory	**K3**
CO4	Be thorough with the concepts of Ring theory	**K3**
CO5	Be exposed to the basic concepts of Ideals and Quotient rings	**K3**

SYLLABUS

Credits:5 **Instructional Hours: 75**

UNIT I :GROUPS AND SUBGROUPS **15 hours**

Group Theory - Definition of a Group – Examples of Groups - Preliminary Lemmas based on groups – Subgroups - cyclic group - Lagrange theorem - Euler theorem - Fermat theorem.

(Self Study:Examples of Groups)

UNIT II: TYPES OF SUBGROUPS **15 hours**

A counting Principle - Normal subgroups and Quotient groups.

UNIT III: HOMOMORPHISM OF GROUPS **15 hours**

Homomorphism – Automorphisms - Cayley's theorem - Permutation group.

(Beyond the Curriculum: Another counting Principle: Conjugate-Normalizer-Counting Principle-applications)

UNIT IV: RINGS **15 hours**

Ring Theory - Definitions and Examples of Rings - Basic properties - Special

classes of rings - Integral domains and fields, homomorphism of rings.

(Self Study - Examples of Rings)

UNIT V: IDEALS AND QUOTIENT RINGS **15 hours**

Ideals and Quotient rings - Maximal Ideal, Principal ideal – field - The field of quotients of an integral domain.

TEXT BOOK:

1. Herstein I.N, Topics in Algebra, Second Edition, Wiley Publications.

UNIT I : 2.1-2.4

UNIT II : 2.5 – 2.6

UNIT III : 2.7 (till theorem 2.7.1), 2.8, 2.9, (till theorem 2.9.1), 2.10

UNIT IV : 3.1-3.3

UNIT V : 3.4 – 3.6

BOOKS FOR REFERENCES:

1. Surjeethsingh and Zameeruddin, (1990), Modern Algebra, Vikas Publication.

2. Sahai,Vivek and BistVikas, (2008), Algebra, Ed.3, Narosa Publishing House.

3. Fraleigh, John.B, (2003), First Course in Abstract Algebra, Ed.7, Pearson Publications.

4. Sharma, Rajendra Kumar, Shah, Sudesh Kumari and Asha Gauri Shankar, (2012),

Algebra -1: A Basic Course in Abstract Algebra, Pearson Publications.

BLENDED LEARNING

UNIT	TOPICS	LINKS
IV	Homomorphism rings	https://youtu.be/qmSDR8G-hpE
V	The field of quotients of an integr domain	https://youtu.be/TZeOCMfotCI https://youtu.be/B0AiHa3lAXY

MAPPING OF CO'S WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	3	3	3	2	2	3	3	3	3	3	1
CO2	2	2	3	3	3	3	1	2	3	3	3	2	2	1
CO3	2	2	3	3	3	3	1	2	3	3	3	3	2	1
CO4	2	2	3	3	3	3	2	2	3	3	3	3	3	1
CO5	2	2	3	3	3	3	2	2	3	3	3	2	3	1

(Correlation: 3- High, 2 – Medium, 1 – Low)

ASSESSMENT TOOLS:

S.No	**Assessment methods**	**Frequency of Assessment**
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Real time problem solving/ group Discussion (Unit V)	Once in a semester

Course designed by 1.Dr.K.Julia Rose Mary 2.Dr. L. Elvina Mary	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER V

COURSE CODE :23UMA5C10

TITLE OF THE COURSE: CORE: REAL ANALYSIS I

COURSE OBJECTIVES:

- To inculcate knowledge about the real number system.
- To study different notions of set theory and extend the idea to point set topology.
- To acquire the ideas of the limit of the functions, continuous functions etc., and to connect the above ideas with convergence and divergence.

COURSE OUTCOMES:

At the end of the course the students will be able to

Co 1	Define and describe the real number system along with its properties.	**K2**
Co 2	Extend the basic idea of set theory to countable and uncountable sets. Further to relate functions with finite and infinite sets.	**K2**
Co 3	Express the structure of open sets and closed sets in R^n	**K3**
Co 4	Demonstrate the properties of compactness in metric spaces.	**K3**
Co 5	Examine any sequence for its convergence and investigate limit of the function and continuity of functions.	**K4**

SYLLABUS

Credits: 5 **Instructional Hours: 75**

UNIT I THE REAL NUMBER SYSTEM AND ITS PROPERTIES 15hours

The real and complex number systems – the field axioms, the unique factorization theorem for integers – Rational numbers – irrational numbers – upper bounds, maximum elements, least upper bound the completeness axioms, some properties of the supremum – properties of the integers deduced from the completeness axioms – The Archimedian 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.

(Beyond the Curriculum: Section 1.21 Complex Numbers)

UNIT II BASIC NOTIONS OF SET THEORY 15 hours

Basic notions of set theory, Notations – ordered pairs – Cartesian product – sets relations and functions – further terminology concerning functions – one – one functions and inverse function – composite functions – sequences – similar sets – finite and infinite sets – countable and uncountable sets – unaccountability of the real number system – set algebra – countable collection of countable sets.

(Self study: Basic notions of set theory)

UNIT III ELEMENTS OF POINT SET TOPOLOGY 15 hours

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 and adherent points – The Bolzano – Weierstrass theorem, The Cantor intersection theorem.

UNIT IV COVERING AND COMPACTNESS IN METRIC SPACE 15 hours

Covering Lindelof Covering theorem – Heine – Borel theorem – Compactness in R^n. - Metric spaces - point set topology in metric spaces - Compact subsets of a metric space – Boundary of a set.

UNIT V LIMITS AND CONTINUITY 15 hours

Convergent sequences – Cauchy sequences - Complete metric space -Limit of a function - Continuous function – Continuity of composite function - Examples of continuous function.

(Self study* : *Limit of a function)

TEXT BOOK:

Apostol T.M , (2002),Mathematical Analysis (20^{th} Reprint), Narosa Publishing House, New Delhi.

UNIT I 1.1 to 1.20

UNIT II 2.1 to 2.15

UNIT III 3.1 to 3.9

UNIT IV 3.10 to 3.16

UNIT V 4.1 to 4.11

REFERENCE BOOKS:

1. Shanthi Narayanan, (1983),Elements of Real Analysis(6^{th} revised edition reprint), S. Chand and Co, New Delhi.
2. Jain P. K and Kaushik S.K , An Introduction to real Analysis –S.Chand and Co, New Delhi.
3. Royden HL,(1995),Real Analysis(3^{rd} edition), Macmillan Publishing Company, New York.
4. Sharma JN and Vasistha,(2008), Real Analysis (36^{th} edition), Krishna Prakashan Media (P) Ltd, New Delhi.

Golden Maths Series, (1979), Real Analysis,Laxmi Publications, New Delhi.

BLENDED LEARNING

UNIT	TOPICS	LINKS
III	The Cantor intersection theorem TheWeierstrass theorem-	https://youtu.be/PybSLopesaE https://youtu.be/nM9tb-HrIB4
IV	Lindelof covering theorem Heine Borel Theorem-	https://youtu.be/WUoEKHykMHg 1.https://youtu.be/2scjzHT1VWI 2.https://youtu.be/L8xHHYOrJUg

MAPPING OF CO'S WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2

CO1	3	3	2	2	3	2	2	3	2	2	3	3	3	1
CO2	3	3	2	2	2	3	2	3	2	2	3	3	3	1
CO3	3	3	2	2	3	2	2	3	3	2	3	3	3	1
CO4	3	3	3	2	3	3	2	3	3	3	3	3	3	1
CO5	3	3	2	2	3	3	2	3	3	3	3	3	3	1

(Correlation: 3- High, 2 – Medium, 1 – Low)

ASSESSMENT TOOLS:

S.No	**Assessment methods**	**Frequency of Assessment**
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Case study/ Group Discussion (Unit V)	Once in a semester

Course designed by Dr. A. Francina Shalini Dr.L.MariaPresenti	**Verified by HOD** Dr.K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: V

COURSE CODE: 23UMA5C11

TITLE OF THE COURSE: CORE: COMPLEX ANALYSIS I

COURSE OBJECTIVES:

- To understand the concept of complex numbers and its plane.
- To understand the important concepts such as continuity, differentiability and analyticity of a complex function.
- To extend these concepts in proving various theorems involving complex Integration.

COURSE OUTCOMES :

At the end of the course the students will be able to

Co 1	Compute the Modulus, Argument and Conjugate of a complex number.	**K2**
Co 2	Define the concepts of differentiability and continuity of a Complex Function.	**K2**
Co 3	Apply the concepts of Convergence in Power Series.	**K3**
Co 4	Analyze the different types of Special Linear Transformations.	**K3**
Co 5	Manipulate the Complex integration using Cauchy's Theorem.	**K3**

SYLLABUS

Credits: 5 **Instructional Hours: 75**

UNIT I: COMPLEX NUMBER SYSTEM AND COMPLEX PLANE 15 Hours

Complex Number System - Complex number- field of complex numbers –conjugation- absolute value – argument – simple mappings. i) w = z + d ii) w = az iii) w = 1/z - Invariance of cross- ratio under bilinear transformation – definition of extended complex plane – stereographic projection.

(Self Study: Problems in Complex Numbers)

UNIT II: ANALYTIC FUNCTIONS 15 Hours

Complex functions - Limit of a function – Continuity – Differentiability – Analytic function defined in a region – necessary conditions for differentiability – sufficient conditions for

differentiability – Cauchy – Riemann equation in polar coordinates – definition of entire function.

(Self Study: Problems in Analytic Functions using C-R equations)

UNIT III: POWER SERIES AND ELEMENTARY FUNCTIONS 15 Hours

Power series: Absolute convergence – circle of convergence (term by term differentiation of a series) - Elementary function - Exponential, logarithmic, trigonometric and Hyperbolic functions

(Beyond the Curriculum: Complex exponents- Some properties of complex exponents- exponential function with a non-zero complex constant base)

UNIT IV: ELEMENTARY AND CONFORMAL MAPPINGS 15 Hours

Conjugate Harmonic function - Definition and determination - conformal mapping – Isogonal mapping – conformal mapping $z \rightarrow f(z)$ where f is analytic, particularly the mapping $w = e^z$, $w = \cos z$, $w = (1/2)(z+1/z)$

UNIT V: COMPLEX INTEGRATION 15 Hours

Complex Integration - simply and multiply connected regions in the complex plane - Integration of f(z) – definition – along a curve joining z_1 and z_2 - Proof of Cauchy's theorem (using Goursat' s lemma for a simply connected region). Cauchy's integral formula for higher derivatives (statement only) – Morera's theorem.

TEXT BOOK:

Duraipandian Pandiyan , Kayalal Pachaiyappa, (2014), Complex Analysis, (1st Edition), S.Chand& Company Pvt Ltd, New Delhi.

UNIT I	Chapter 1	Sections 1.1 to 1.3, 1.6 to 1.9
	Chapter 2	Sections 2.1 to 2.2, 2.6 to 2.9
	Chapter 7	Sections 7.1
UNIT II	Chapter 4	Section 4.1 to 4.10
UNIT III	Chapter 6	Section 6.1 to 6.11
UNIT IV	Chapter 6	Section 6.12 to 6.13
	Chapter 7	Section 7.6 to 7.9

UNIT V Chapter 8 Section 8.1 to 8.9

REFERENCE BOOKS:

1. Duraipandian P, LaxmiDuraipandian and D Muhilan, (1999), Complex Analysis, Emerald Publishers, Chennai

2. Tyagi B.S, (1991), Functions of a Complex Variable (16th Edition), KedarnathRamnath, Meerut.

3. Arumugam S A,Thangapandi Isaac, A.Somasundaram, (2012), Complex Analysis, SCITECH Publications (India) Pvt Ltd, Chennai.

4. Goyal J.K, Gupta K.P, (2000), Functions of a Complex Variable (14th Edition), PragatiPrakashan, Meerut.

5. Karunakaran V., (2005), Complex Analysis(1st Edition), Narosa Publishing home, New Delhi.

BLENDED LEARNING

UNIT	TOPICS	LINKS
I	Stereographic projection	https://www.youtube.com/watch?v=WXIacwOmdkY
IV	Conformal mapping	https://www.youtube.com/watch?v=48aerHs9wL0
V	Cauchy Goursat Lemma Simply and multiply connected regions: Cauchy Integral theorem Cauchy's integral formula for derivative	https://www.youtube.com/watch?v=Lg-vVeTcGRA 1.https://www.youtube.com/watch?v=ZUjzb26qkZ8 2.https://www.youtube.com/watch?v=sEyVa_W1Syo https://www.youtube.com/watch?v=qTDDFMAt7j4 https://www.youtube.com/watch?v=UYDoDKBll5w

MAPPING OF CO'S WITH PO's AND PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	3	2	3	3	1	2	3	3	3	2	3	1
CO 2	3	2	3	2	3	2	1	2	3	3	2	2	3	1
CO 3	3	3	3	2	3	3	1	3	3	3	3	3	3	1
CO 4	3	3	3	2	3	2	1	2	3	3	2	3	3	1
CO 5	3	3	3	2	3	3	1	3	3	3	2	3	3	1

(Correlation: 3- High, 2 – Medium, 1 – Low)

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Case study/ Group Discussion (Unit V)	Once in a semester

Course designed by 1.Sr.Stephy Stephen 2.Dr.G.Sindhu	**Verified by HOD** Dr. Dr.K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: V
COURSE CODE: 23UMA5E01

ELECTIVE 1 - OPERATIONS RESEARCH

[Entrepreneurship & Industry 4.0]

COURSE OBJECTIVES:

- To learn the applications of Operations Research invariably in all fields of Management and Business activities in an organization.
- To enable the students to take optimal managerial decisions pertaining to the optimistic time schedule in a real time problem.
- To evaluate the computational performance of optimization and algorithms.

COURSE OUTCOMES :

At the end of the course the students will be able to

Co 1	Identify the problem environment observation.	**K2**
Co 2	Solve the linear programming problems by using Big-M-method ,Two phase method and dual simplex method.	**K3**
Co 3	Estimate the Optimum transportation schedule keeping in mind cost of transportation to be minimized.	**K3**
Co 4	Estimate the replacement policy when value of money changes and does not change with respect to time.	**K3**
Co 5	Find the solution of project involves planning, scheduling and controlling a number of interrelated activities with use of limited resources.	**K4**

SYLLABUS

Credits :4 **Instructional Hours: 75**

Unit I LINEAR PROGRAMMING PROBLEM 15 Hours

Linear Programming problem: Mathematical formulation of the problem – Graphical Solution – some exceptional cases – Simplex method (only problems).

[Self study : Graphical solution]

Unit II USE OF ARTIFICIAL VARIABLES 15 Hours

Use of artificial variables: Two phase simplex method – Big M method – Duality in linear programming - General primal – dual pair – formulating a Dual problem – Primal – Dual pair in a matrix form – Duality and Simplex method (only problems).

[Self study : Examples in Two phase Simplex method]

Unit III TRANSPORTATION PROBLEM 15 Hours

Transportation problem(TP): Mathematical formulation of the problem – Existence of a solution in TP – Duality in TP – Loops in transportation tables – solution of a TP – NWC method, Least cost method, VAM – test for Optimality – Degeneracy in TP – MODI method – some exceptional cases - Assignment problem: Mathematical formulation of the problem – solution methods of Assignment problem – special cases in Assignment problems – The traveling salesman problem.

Unit IV REPLACEMENT PROBLEM 15 Hours

Replacement problem: Replacement Policy when value of money does not change with time – Replacement Policy when value of money changes with time – Replacement of equipments that fails suddenly

Unit V NETWORK SCHEDULING BY PERT/CPM 15 Hours

Network Scheduling by PERT/CPM: Basic Components – Logical Sequencing – Rules of Network construction – Critical path Analysis – probability considerations in PERT – Distinction between PERT and CPM - Resource Analysis in Network Scheduling: project cost – Time cost optimization algorithm

TEXT BOOK:

Kantiswarup,P.K.Gupta and Manmohan, (2008), Operations Research,(14th Edition), Sultan Chand & Sons Eucational Publishers, New Delhi.

Unit I : Chapter 2, Chapter 3:3.1-3.3 &

Chapter 4:4.1 – 4.3

Unit II : Chapter4:4.4 & 4.5,

Chapter 5:5.1 – 5.4 & 5.7

Unit III : Chapter 10:10.1 – 10.13,10.15 &

Chapter 11: 11.1 – 11.4,11.7

Unit IV : Chapter 18:18.1 -18.3

Unit V : Chapter 25 & Chapter 26:26.1 – 26.3

REFERENCE BOOKS:

1. Hamdy A. Taha, (2007),Operations Research 8th Edition, Pearson Education, Asia Gupta.P.K, Hira D.S, (2013),Operations Research ,S.Chand& Co, Delhi.
2. Sharma.J.K, (2000), Operations Research Theory and applications, (5th edition,) Publisher
3. Macmillian
4. 4.Kalavathy.S, (2012), Operations Research,PaperbackPublisher Kindle edition.
5. 5.Gupta.P.K, (1996),Operations ResearchPaperback, HiraKindle D.S edition.

BLENDED LEARNING

UNIT	TOPICS	LINKS
IV	Replacement Policy when value of mon changes with time Replacement of equipments that fails suddenly	https://www.youtube.com/watch?v=fW5 https://www.youtube.com/watch?v=de0y 5uIa4U VYQqcSpY
V	Time cost optimization algorithm	https://www.youtube.com/watch?v=U7 kXfNnAjcE

MAPPING OF CO'S WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	3	2	3	3	3	2	3	3	3	3
CO2	2	3	3	2	3	2	3	3	3	2	3	3	3	3
CO3	2	3	2	2	3	2	3	3	3	2	3	3	3	3
CO4	2	3	3	2	3	2	3	3	3	2	3	3	3	3
CO5	2	3	3	2	3	2	3	3	3	2	3	3	2	3

(Correlation: 3- High, 2 – Medium, 1 – Low)

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Case Study (Unit V)	Once in a semester

Course designed by 1. Dr. A.SahayaSudha 2. Dr.C. Priyadharshini Infanta	**Verified by HOD** Dr Dr.K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: V

COURSE CODE: 23UMA5E02

ELECTIVE 2 - ASTRONOMY-I

COURSE OBJECTIVES:

- The course will familiarize the learner with the important features of the planets, sun, moon and stellar universe.
- The course will enable the students to understand the Astronomical aspects and about the laws governing the planet movements
- Astronomy gives students a strong background in physics and math, and is useful for students looking to pursue a professional career in Astronomy.

COURSE OUTCOMES :

At the end of the course the students will be able to

Co 1	Identify the solar system and its environment.	**K2**
Co 2	The students understand the different theories in the movement of stars and comets.	**K3**
Co 3	The students relate the movement of Earthly Bodies with the Earth.	**K3**
Co 4	The students analyse the Tangent formula in the estimation of Milky way in relation to the Earth	**K4**
Co 5	The students analyse the Kepler's Law in the Astronomical calculations to find out the different anomalies	**K4**

SYLLABUS

Credits: 4 **Instructional Hours: 75**

Unit I Solar system (K2) **15 Hours**

General description of the Solar System. Comets and meteorites – Spherical trigonometry.

(Self Study-Solar System)

Unit II Celestial Environment (K3) **15 Hours** Celestial sphere – Celestial co – ordinates– Diurnal motion – Variation in length of the day.

Unit III: Dip – Twilight (K3) **15 Hours**

Dip – Twilight – Geocentric parallax

UNIT IV: Refraction (K4) **15 Hours**

Refraction – Tangent formula – Cassini's formula.

UNIT V:Kepler's laws(K4) **15 Hours**

Kepler's laws – Relation between true eccentric and mean anomalies.

(Self Study-Kepler's law)

TEXT BOOK:

"ASTRONOMY" by Kumaravelu S and SusheelaKumaravelu.(7thedition).Publisher: Sivakasi: Janki, (1986)

REFERENCE BOOKS:

1.Mathew,K.C.&Thiruvenkatacharya, ., (1974)A Text Book of Astronomy for degree classes, S.Chand& Co

2.Ramachandran,G.V. (1970.)A Text Book of Astronomy for post graduate classes,(7th edition) Rukmani Publishers,

3.The rough guide to universe by John Scalzi, Rough guides' ltd, London

BLENDED LEARNING

UNIT	TOPICS	LINKS
II	Celestial sphere Celestial co – ordinates	https://www.youtube.com/watch?v=FHDq5LvPUIo https://www.youtube.com/watch?v=cOB7e6AlpfE
V	Kepler's laws	https://www.youtube.com/watch?v=rsa8ooonUvc

MAPPING OF CO'S WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	1	1	1	1	1	1	1	1	2	3
CO2	2	1	3	3	1	1	2	L	2	1	1	1	2	3

CO3	2	1	3	3	1	1	2	2	2	1	1	2	2	3
CO4	2	1	3	3	1	1	2	2	2	1	1	2	3	3
CO5	2	1	3	3	1	1	2	3	2	1	1	2	3	3

(Correlation: 3- High, 2 – Medium, 1 – Low)

ASSESSMENT TOOLS:

S.No	**Assessment methods**	**Frequency of Assessment**
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
8.	Term paper presentation (Unit V)	Once in a semester

Course designed by Dr.A.Sahayasudha	**Verified by HOD** Dr. Dr.K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER V

COURSE CODE: 23NMA5E01

NON MAJOR ELECTIVE- APPLIED STATISTICAL SKILLS

[Skill Development]

COURSE OBJECTIVES:

- To make use of statistical methods in practical situations.
- To understand statistics as an instrument in a variety of applications.
- To evaluate the graphs such as Bar graphs, Pie charts and Line graphs for analysis.

COURSE OUTCOMES:
At the end of the course the students will be able to

CO1	Understand the Statistical survey, Collection of data, classification and Tabulation.	**K2**
CO2	Represent the data as diagrams and graphs.	**K3**
CO3	Calculate the Measures of Central Tendency for the given data.	**K3**
CO4	Identify the type of Deviations and Evaluate Skewness.	**K3**
CO5	Estimate the data interpretation from a Bar graph, Pie Chart and Line graph.	**K3**

SYLLABUS

Credits: 4 **Instructional Hours: 60**

UNIT I: Statistical Survey, Collection of Data, Classification and Tabulation 12Hours

Statistical Survey - Planning and Execution - Collection of Data - Primary and Secondary Data - Classification-Types of Classification - Statistical Series - Array – Discrete frequency distribution - Continuous frequency distribution - Cumulative frequency distribution.

UNIT II: Diagrams and Graphs 12 Hours

Diagrams and Graphs: Diagrams - Merits and De-merits of diagrammatic representation - Types of Diagrams - Simple Bar diagram - Multiple Bar diagram - Subdivided Bar diagram - Pie diagram - Pictograms and Cartograms

Graphs: General Rules - Difference between Graphs and Diagrams - Graphs and frequency distribution (Only equal class intervals) - Frequency Polygon, Frequency curve - Histogram.

UNIT III: Measures of Central Tendency 12 Hours

Measures of Central Tendency - Mean, Median, Mode and Quartiles.

UNIT IV: Measures of Dispersion **12 Hours**

Measures of Dispersion - Range, Mean Deviation, Standard Deviation, Quartile Deviation, Coefficient of Variation, Skewness and Kurtosis- Simple problems.

(Self Study: Problems in Coefficient of Variation)

UNIT V: Data Analysis **12 Hours**

Data Analysis using Bar graphs, Pie charts and Line graphs.(Simple Problems)

(Self Study: Simple Problems in Line graphs)

TEXT BOOKS:

1..NavanithamP.A (2015), Business Mathematics and Statistics, Jai Publishers, Trichy.

2. Dr..Aggarwal R.S (2015), Quantitative Aptitude, S.Chand and Company Pvt Ltd, New Delhi.

Unit I to Unit IV- Business Mathematics and Statistics by Navanitham P.A

Unit I: Chapters 2, 3 and 5 (Section 5.1-5.4)

Unit II- Chapter 6

Unit III-Chapter 7

Unit IV-Chapter 8 and 9

Unit V- Quantitative Aptitude by Dr.R.S.Aggarwal

Chapters 37, 38 and 39.

REFERENCE BOOKS:

1. Gupta S.P, (2013), Statistical Methods, Sultan Chand & Sons, New Delhi.

2. Gupta S.C , Kapoor V.K, (2006), Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.

3. Pillai R.S.N. and Bhagawathi, (1998), Statistics Theory and Practice, S.Chand and Company Limited, New Delhi.

4.Arumugam S and Thangapandi Isaac S, (2016), Statistics, New Gamma Publishing House, Palayamkottai.

5. Abhijit Guha, (2011), Quantitative Aptitude for competitive examinations, Tata McGraw Hill Education Pvt. Ltd., New Delhi.

BLENDED LEARNING

UNIT	TOPICS	LINKS
III	Mean, Median, Mode	https://youtu.be/VbbIAAmYrEM
IV	Measures of dispersion Measures of dispersion Coefficient of variation Skewness	https://youtu.be/E4HAYd0QnRc https://youtu.be/mk8tOD0t8M0 https://youtu.be/b_dafTU6opk https://youtu.be/XSSRrVMOqlQ
V	Various types of graphs Pie chart	https://youtu.be/RPIKUvl92X4 https://youtu.be/p_nPxTRuLxo

MAPPING OF CO'S WITH PO's AND PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	2	2	2	2	2	2	2	3	3	2	2	2	2
CO2	2	2	2	2	2	2	2	2	3	2	2	2	2	2
CO3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
CO4	3	2	2	2	2	3	2	2	3	2	2	2	2	2
CO5	3	2	2	2	2	3	2	2	3	2	2	2	2	2

(Correlation: 3- High, 2 – Medium, 1 – Low)

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester

7.	case study (Unit V)	Once in a semester

Course designed by 1. Dr. F. Nirmala Irudayam 2.Ms .Mythili	**Verified by HOD** Dr. Dr.K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: V

COURSE CODE: 24UMA5SB3

TITLE OF THE COURSE: SKILL BASED PRACTICAL - DATA ANALYTICS WITH R PROGRAMMING

[Skill Development]

COURSE OBJECTIVES:

- To introduce R language with its features that makes it useful as data-analysis platform.
- To show how to summarize data using descriptive statistics.

COURSE OUTCOMES:

At the end of the course the students will have the able to:

CO 1	To identify the basic variables and data structures available in R	**K2**
CO 2	To design programmes in R language for data analysis.	**K3**
CO 3	Implement programs and present results through a record presentation.	**K3**
CO 4	To apply mathematical concepts to analyze matrix operations	**K4**
CO 5	To apply statistical concepts to study correlation ,regression and various plots	**K4**

Credits: 2 **Instructional Hours: 45**

LIST OF PRACTICALS:

1. Construct a R program to import data into R.

2. Construct a R program to find mode by sorting the column of the data frame.

3. Construct a program to create a matrix and execute the basic operations of addition and subtraction.

4. Construct a program to execute the transpose and inverse of a matrix.

5. Construct a program to picturize frequency tables as a pie chart.

6.Construct a program to picturize frequency tables as a histogram.

7.Construct a program to evaluate Mean, Median and Mode.

8.Construct a program to evaluate Variance and Box plot.

9.Construct a program to evaluate correlation.

10.Construct a program to evaluate regression.

11.Construct a program to evaluate t -test.

12.Construct a program to evaluate Chi – square test and design ANOVA.

TEXT BOOK:

Robert I. Kabacoff *R in Action-Data analysis and graphics with R*, Manning Publications Co, New Delhi, Reprint (2020)

REFERENCE BOOK:

Paul Teetor, *R Cookbook*, O'Reilly Media, Inc, (2011).

MAPPING OF CO'S WITH PO's AND PSO's

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	3	2	3	3	3	3	2	3	3	2
CO2	3	3	3	3	3	2	3	3	3	3	3	3	3	2
CO3	3	3	3	3	3	2	3	3	3	3	2	3	3	2
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3

(Correlation: 3- High, 2 – Medium, 1 – Low)

ASSESSMENT TOOLS:

S.No	INTERNAL MARKS	EXTERNAL MARKS
1.	CIA I – 15 marks CIA II – 15 marks Record and Observation Note book – 10 marks **Total Marks 40**	Practical = 60 marks **Total Marks: 60**

Course designed by 1. Dr.M.Trinita Pricilla 2. Dr. A.Arokia Lancy	**Verified by HOD** Dr. Dr.K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

MEMBERS OF BOARD OF STUDIES

Dr. D. Jayanthi Assistant Professor(SG) , Department of Mathematics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore-43	**Dr. N. Murugesan** Assistant Professor(SS) , Department of Mathematics, Government Arts College, Coimbatore -18	**Dr. C. Janaki** Assistant Professor(SS) , Department of Mathematics, Government Arts College for Women, Coimbatore -18	**Mr. T. Vibu** Managing Partner, Rel Agencies, Coimbatore	**Ms. J. Magdalene** Project Manager, Robert Bosch, Keeranatham, Saravanampatti, Coimbatore-35

SEMESTER: V and VI

COURSE CODE: 23IDSBMA1

TITLE OF THE COURSE: SKILL BASED : SIMPLE MATHEMATICS FOR COMPETITIVE EXAMINATIONS

[Employability & Skill Development]

COURSE OBJECTIVES:

- To assist the students in sharpening their reasoning skills
- To enhance their speed and accuracy in arriving at solutions for problems
- To prepare the students for competitive exams

At the end of the course the students will be able to

CO1	understand the idea of matrices	**K2**
CO2	evaluate the concepts of Area and Volume in 2-D and 3-D aspects	**K2**
CO3	solve the problems on Profit and Loss	**K2**
CO4	relate the concepts of time with Work and Distance	**K3**
CO5	understand the idea of velocity in trains, boats and streams. Also to evaluate problems in clock and calendar	**K3**

SYLLABUS

Credits: 2 **Instructional Hours: 45 hours**

UNIT I: MATRICES **9 Hours**

Order – Addition – subtraction – multiplication

(Self Study: Problems in Subtraction of Matrices)

UNIT II: MENSURATION **9 Hours**

Area - Square - Rectangle - Triangle - Circle

Volume - Cube - Cuboid - Sphere

UNIT III: PROFIT AND LOSS **9 Hours**

Profit – Loss– C.P - S.P - Gain % - Loss %

(Self Study: Problems in Profit and Loss)

Unit IV: TIME ,WORK AND DISTANCE **9 Hours**

Problems on (i) Time and work (ii)Time and distance

Unit V:PROBLEMS ON TRAINS,STREAMS AND CALENDAR **9 Hours**

Problems on Trains, Boats and streams, Calendar and Clock

TEXT BOOKS:

1. P.A.Navanitham, (2015), Business Mathematics and Statistics, Jai Publishers, Trichy.

2. Dr.R.S.Aggarwal, (2015), Quantitative Aptitude, S.Chand and Company Pvt Ltd, New Delhi.

Unit I - Business Mathematics and Statistics.

Unit II to V - Quantitative Aptitude.

REFERENCE BOOKS:

1. Abhijit Guha, (2011), Quantitative Aptitude for competitive examinations, Tata Mc Graw Hill Education Pvt. Ltd., New Delhi.

2. Mohen Singh and M.Gagan, (2010), UGC – CSIR NET JRF / Lectureship, Danika Publishing Company, New Delhi.

3. Praveen R V, (2012), Quatitative Aptitude and Reasoning, PHI Learning Pvt Ltd, New Delhi.

4. Thorpe, Edgar, (2000), Course in Mental ability and Quatitative Aptitude for Competitive Examinations (2nd Edition), Tata Mc Graw- Hill Education Pvt Ltd, New Delhi.

5. Rao, Udayagiri Mohan, (2012), Quantitative Aptitude for competitive examinations, SCITECH Publication India Pvt Ltd, Chennai

BLENDED LEARNING

UNIT	TOPICS	LINKS
II	Area	https://www.youtube.com/watch?v=xCdxURXMdFY
V	Clock Calender Boat & Stream Problems in Train	https://www.youtube.com/watch?v=gLh3eFGu-xk https://www.youtube.com/watch?v=mLD41elDRTE https://www.youtube.com/watch?v=Agnaf5cv9lY https://www.youtube.com/watch?v=tZ2eRwVF-tM

MAPPING OF CO'S WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	2	3	2	1	1	3	1	1	2	3	1
CO2	1	2	2	2	3	2	1	1	3	2	1	2	3	1
CO3	2	2	2	3	3	2	1	3	3	2	1	2	3	1
CO4	2	2	2	3	3	2	1	3	3	2	1	2	3	1
CO5	2	2	2	3	3	2	1	3	3	2	1	2	3	1

(Correlation: 3- High, 2 – Medium, 1 – Low)

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester

6.	Seminar (Unit III & IV)	Twice in a semester
7.	Online Aptitude mock test (Unit V)	Once in a semester

Course designed by Sr.Stephy Stephen Dr.K.Vaiyomathi	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER VI

COURSE CODE: 23UMA6C12

TITLE OF THE COURSE: CORE - LINEAR ALGEBRA

COURSE OBJECTIVES:

- To study different types of matrices and their characteristics.
- To make the students learn the basic concepts of the Vector spaces and linear transformations.
- To acquire a deeper understanding of the theory.

COURSE OUTCOMES :

At the end of the course the students will be able to

CO1	Distinguish the types of Matrices	**K2**
CO2	Apply the concept of Vector spaces	**K3**
CO3	Acquire knowledge on Dual Spaces	**K3**
CO4	Construct mappings on Vector spaces	**K3**
CO5	Be familiar with Linear transformations and its properties.	**K3**

SYLLABUS

Credits:5 **Instructional Hours: 90**

UNIT I : MATRICES (K2) **18 Hours**

Matrices: Algebraic operation – triangular – diagonal scalar and unit matrices transpose, adjoint and inverse of a matrix – Symmetric and Skew symmetric matrices. Hermitian and Skew Hermitian matrices – Orthogonal and Unitary matrices – Rank of a matrix – characteristic roots - characteristic vectors of a square matrix.

[Self Study : Problems on Algebraic operations of Matrices]

UNIT II: VECTORS SPACES (K3) **18Hours**

Definition and examples – Basic properties – homomorphism of vector spaces. Linear Independence and Bases – Finite dimensional vector spaces.

UNIT III: DUAL SPACES(K3) **18 Hours**

Dual spaces –Inner product spaces.

UNIT IV: MATRICES (K3) **18 Hours**

Matrices and Modules

[Beyond the Curriculum:Fields:Extension Fields- Sec 5.1]

UNIT V: LINEAR TRANSFORMATIONS (K3) **18 Hours**

Algebra of Linear transformations – Characteristic roots.

[Self Study :Examples in Characteristic Roots]

TEXT BOOKS:

1.Units I and II: Balakrishnan.R and Ramabhadran.M, (1978), Modern Algebra

Unit I :Chapter 1-Sec 1.1-1.9

Unit II:Chapter 2 -Sec 2.1-2.7,2.9, Chapter 3: Sec 3.9

2.Units III, IV and V: I.N.Herstein,Topics in Algebra, Wiley Publications.

Unit III:Chapter 4-Sec 4.3-4.4

Unit IV: Chapter 4-Sec 4.5, Chapter 6- Sec 6.3

Unit V:Chapter 6 - Sec 6.1,6.2

REFERENCE BOOKS:

1. Surjeet Singh,(1978),Modern Algebra,Vikas Publication.

2. Singh Surjeeth,(1997),Linear Algebra,Vikas Publication.

3. Gilbert Jimmie and Gilbert Linda, (2005), Linear Algebra and Matrix Theory, Academic Press,2000.

4. Lay, David, (2003),Linear Algebra and its applications,(Edition.3),Pearson Publications.

5. Kwak,Jin Ho and Hong, Sungpyo,Springer, (2004), Linear Algebra, (Edition 2,) International Publications.

BLENDED LEARNING

UNIT	TOPICS	LINKS
IV	Modules	https://youtu.be/IvukAijXgLE
V	Finding Characteristic Roots	https://youtu.be/kqf86dlgTFU

MAPPING OF CO'S WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	3	3	2	2	3	3	3	3	3	1
CO2	3	2	3	3	3	3	2	2	3	3	3	3	2	1
CO3	3	2	3	3	3	3	1	2	3	3	3	2	2	1
CO4	3	2	3	3	3	3	2	2	3	3	3	2	3	1
CO5	3	2	3	3	3	3	1	2	3	3	3	3	3	1

(Correlation: 3- High, 2 – Medium, 1 – Low)

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Group Discussion (Unit V)	Once in a semester

Course designed by Dr.K.Julia Rose Mary Dr. L. Elvina Mary	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER VI

COURSE CODE 23UMA6C13

TITLE OF THE COURSE: CORE: REAL ANALYSIS II

COURSE OBJECTIVES:

- To understand the idea of inverse images of open and closed sets.
- To study the derivatives and continuity of functions and to evaluate them for a given function.
- To acquire knowledge about Riemann Stieltjes integral and to reduce it to Riemann Integral.

COURSE OUTCOMES :

At the end of the course the students will be able to

CO1	Define the ideas of continuity and inverse images of open and closed sets	**K2**
CO2	Apply connectedness and arc wise connectedness to implement the uniform continuity on various sets	**K2**
CO3	Express the derivatives of functions and apply Rolle's theorem, Mean value theorem and Taylor's theorem for different functions.	**K3**
CO4	Demonstrate the properties of the monotonic functions and to find the relation between monotonicity, bounded variation and total variation.	**K3**
CO5	Define the properties of Riemann Steiltjes integral and express the reduction of Riemann Integral from Riemann Steiltjes integral.	**K3**

SYLLABUS

Credits: 5 **Instructional Hours: 90**

UNIT I Continuity and Inverse Image of a Set **18 hours**

Continuity and Inverse image of open or closed sets – Function continuous on compact sets – Topological Mapping – Bolzano's theorem.

UNIT II Connectedness and Uniform Continuity 18hours

Connectedness – Components of a Metric Space – Arc wise Connectedness-Uniform continuity – Uniform continuity and compact sets - Fixed point theorem for contractions and monotonic functions.

UNIT III Derivatives 18 hours

Definition of derivative – Derivatives and continuity – Algebra of derivatives, Chain rule – One sided derivatives and infinite derivatives – functions with non zero derivative – Zero derivative and Local Extrema – Rolle's theorem – Mean value theorem for derivatives – Taylor formula with Reminder.

(Self study : Problems under Rolle's theorem, Mean value theorem)

UNIT IV Functions of Bounded Variation 18 hours

Properties of monotonic functions – Functions of bounded variation – total variation – additive property of total variation - total variation on [a, x] as a function of x – functions of bounded variation expressed as the difference of increasing functions – Continuous functions of bounded variation.

[Beyond the Curriculum:Curves and Paths,Rectifiable paths and Arc length,Additive and Continuity Properties of Arc length]

UNIT V Riemann – Stieltjes Integral 18 hours

The Riemann – Stieltjes integral – Definition – Linear properties – Integration by parts – Change of variables in Riemann – Stieltjes integral – Reduction to Riemann integral.

(Self Study:Problems of Linear Properties in Riemann – Stieltjes integral)

TEXT BOOK:

Apostol T. M, (2002),Mathematical Analysis(20th Reprint), Narosa Publishing House , New Delhi.

UNIT I 4.12 to 4.15

UNIT II 4.16 to 4.23 omit 4.22

UNIT III 5.1 to 5.12

UNIT IV 6.1 to 6.8

UNIT V 7.1 to 7.7

REFERENCE BOOKS:

1. Shanthi Narayanan, (1998), Elements of Real Analysis(6^{th} revised edition reprint), S.Chand and Co, New Delhi.

2. Jain P.K and S.K Kaushik, (2000), An Introduction to real Analysis, S.Chand and Co, New Delhi.

3. Royden H.L, (1995), Real Analysis (3^{rd} edition), Macmillan Publishing Company, New York.

4.Sharma J.N and Vasistha, (2008),Real Analysis (36^{th} edition), Krishna Prakashan Media (P) Ltd, New Delhi.

5.Golden Maths series, (1999), Real Analysis,Laxmi Publications, New Delhi.

BLENDED LEARNING

UNIT	TOPICS	LINKS
III	Theorem 5.3	https://youtu.be/eQQaU5ET49Y
III	Algebra of derivative	https://youtu.be/COLwYhEAt7Q
III	Differentiability of real valued function, Mean value theorem	https://youtu.be/agtYi4UNKsw
V	Monotonic functions	https://youtu.be/O0UxhbZQD4M
V	Bounded variation	https://youtu.be/SLQ7pjD2Gjk

MAPPING OF CO'S WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	3	3	2	1	3	2	3	3	3	1
CO2	3	2	3	2	3	3	2	1	2	3	3	3	3	1

CO3	3	2	2	2	3	3	2	1	2	3	3	3	3	1
CO4	3	2	3	2	3	3	2	1	3	3	3	3	3	1
CO5	3	2	3	2	2	3	2	1	3	2	3	3	3	1

(Correlation: 3- High, 2 – Medium, 1 – Low)

ASSESSMENT TOOLS:

S.No	**Assessment methods**	**Frequency of Assessment**
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Group Discussion (Unit V)	Once in a semester

Course designed by Dr. A. Francina Shalini Dr.L.MariaPresenti	**Verified by HOD** Dr. Dr.K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: VI

COURSE CODE: 23UMA6C14

TITLE OF THE COURSE: CORE - COMPLEX ANALYSIS II

COURSE OBJECTIVES:

- To understand the concept of Taylor's and Laurent's Series.
- To study the types of Singularities and Residues.
- To evaluate the real definite integrals.

COURSE OUTCOMES :

At the end of the course the students will be able to

CO1	Extend the Cauchy's Fundamental Theorem.	**K2**
CO2	Expand a Complex function using Taylor's and Laurent's Series.	**K2**
CO3	Classify the Singularities and compute the Residues.	**K3**
CO4	Extend the concept of zeros and poles in Meromorphic function.	**K3**
CO5	Compute the real definite integrals using residues.	**K3**

SYLLABUS

Credits :5 **Instructional Hours: 90**

UNIT I: Cauchy's – Related Integral Theorems **18 Hours**

Results based on Cauchy's theorem (I): Zeros – Cauchy's inequality – Lioville's Theorem – Fundamental theorem of Algebra – Maximum modules theorem – Gauss theorem on the mean of the values of a harmonic function on a circle.

UNIT II: Taylor's and Laurent's Series **18 Hours**

Results based on Cauchy's theorem (II): - Taylor's series- Zeros of an analytic function- Laurent's series – Cauchy product and division.

(Self Study: Problems in finding the zeros of an analytic function)

UNIT III: Singularities and Residues **18 Hours**

Singularities and residues – Zeros – Isolated singularities- Removable Singularity- pole - Essential Singularity- Behaviour of a function at an isolated singularity- Determination of nature of singularities-Nature of singularity at ∞ - Residues- Residue theorem.

(Self Study: Problems in finding the residues)

UNIT IV: Real Definite Integrals **18 Hours**

Real definite integrals: Evaluation by calculus of residues – Integration on the unit circle – Integral with – and + lower and upper limits with the followings integrands:

(i) P(x) / Q(x) where the degree of Q(x) exceeds that of P(x) atleast by 2.

(ii) Sin(ax) f(x), cos(ax) f(x) where a>0 and f(z) is such that f(z) $\rightarrow 0$ as z $\rightarrow 0$

and f(z) does not have a pole on the real axis.

(iii) f(x) where f(z) has a finite number of poles on the real axis. Integrals of the

types $\int_0^\infty \frac{x^{a-1}}{1+x}dx$, 0 < a < 1 and $\int_0^\infty \frac{x^{a-1}}{1-x}dx$, 0 < a < 1.

(Beyond The Curriculum:Line integrals as functions of arcs)

UNIT V: Meromorphic Functions **18 Hours**

Meromorphic functions: Theorem on number of zeros minus number of poles – Principles of arguments – Rouche's theorem – Theorem that a function which is meromorphic in the extended plane is a rational function.

TEXT BOOK:

Duraipandian P and Kayalal Pachaiyappa, (2014), Complex Analysis (1st Edition), S.Chand& Company Pvt Ltd, New Delhi.

UNIT I	Chapter 8	Sections 8.10,8.11
UNIT II	Chapter 9	Section 9.1 to .3, 9.13
UNIT III	Chapter 9	Section 9.5 to 9.13

	Chapter 10	Section 10.1, 10.2 and 10.4
UNIT IV	Chapter 10	Section 10.3 and 10.4
UNIT V	Chapter 11	Section 11.1 to 11.3

REFERENCE BOOKS:

1. Duraipandian P, LaxmiDuraipandian and D. Muhilan, (1999), Complex Analysis, Emerald Publishers, Chennai

2. Tyagi B.S , (1991), Functions of a Complex Variable, (16th Edition), KedarnathRamnath, Meerut.

3. Arumugam S , Thangapandi Isaac A, A.Somasundaram, (2012), Complex Analysis, SCITECH Publications(India) Pvt Ltd, Chennai.

4. Goyal J.K , Gupta K P, (2000), Functions of a Complex Variable (14th Edition), PragatiPrakashan, Meerut.

5. Karunakaran V, (2005), Complex Analysis (1st Edition), Narosa Publishing home, New Delhi.

BLENDED LEARNING

UNIT	TOPICS	LINKS
I	Fundamental Theorem of Algebra	https://www.youtube.com/watch?v=d8-LO6FCna0 -
	Cauchy's Inequality Liovilles theorem	https://www.youtube.com/watch?v=3xuAmv3G4bc -
III	Zeros and poles	https://www.youtube.com/watch?v=UhZ5UjR5NPE -
III	Residues	https://www.youtube.com/watch?v=sSj7z-pz-yY -
V	Rouche's Theorem	https://www.youtube.com/watch?v=uib3WLvIUuM -

MAPPING OF CO'S WITH PO's AND PSO's

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3	3	1	3	3	3	3	3	3	1
CO 2	3	3	3	2	3	3	1	3	3	3	3	3	3	1
CO 3	3	3	3	2	3	3	1	3	3	3	3	3	3	1
CO 4	3	3	3	2	3	3	1	3	3	3	3	3	3	1
CO 5	3	3	3	2	3	3	1	3	3	3	3	3	3	1

(Correlation: 3- High, 2 – Medium, 1 – Low)

ASSESSMENT TOOLS:

S.No	**Assessment methods**	**Frequency of Assessment**
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Group discussion (Unit V)	Once in a semester

Course designed by 1.Sr.Stephy Stephen 2.Dr.G.Sindhu	**Verified by HOD** Dr. Dr.K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: VI

COURSE CODE: 23UMA6E03

ELECTIVE 3- OPTIMIZATION TECHNIQUES AND ITS APPLICATIONS

[Entrepreneurship & Industry 4.0]

COURSE OBJECTIVES:

- To develop the knowledge in basic techniques to deal with sequencing problems.
- To enhance student's knowledge in game theory, performance measures of queues, optimal use of inventory and network scheduling with applications.
- To gain knowledge on techniques for solving ILPP,GLPP,DLPP

COURSE OUTCOMES :

At the end of the course the students will be able to

CO1	Discuss the concept of LPP, construct IPP, Gomory's constraint and evaluate all integer and mixed Integer programming using LPP	**K2**
CO2	Remember the concept of probability, define the transient and steady state, make queuing models based on Poisson arrivals and evaluate the concept based on Poisson models	**K2**
CO3	Discuss various types of inventory, create cost associated with inventory, estimate the deterministic inventory with and without shortages	**K3**
CO4	Develop recursive equation approach and solve using DPP	**K3**
CO5	Remember concept of matrix, design games with and without saddle point , develop mixed strategy and plot graphs for 2xn and mx2 games	**K4**

SYLLABUS

Credits 4 **Instructional Hours: 60**

UNIT I :Integer programming **18 Hours**

Integer programming: introduction – Gomory's all-IPP method – Construction of Gomory's constraint – fractional cut method – all-integer and fractional cut method – Mixed integer – branch and bound method

[Self Study : Integer Programming]

UNIT II :Queuing theory 18 Hours

Queuing theory: Introduction– Elements of a queuing system – operating characteristics of queuing system – probability distributions in queuing system – classification of queuing models – Definition of transient and steady states – Poisson queuing system (Model I to Model V).

UNIT III :Inventory 18 Hours

Inventory: Introduction – Inventory decisions – cost associated with inventories – economic order quantity – deterministic inventory problems with shortages and without shortages

UNIT IV :Dynamic Programming 18 Hours

Dynamic Programming: introduction – recursive equation approach – Characteristics of dynamic programming - dynamic programming algorithm- solutions of discrete D.P.P

[Self Study : Examples in dynamic programming]

UNIT V :Games and strategies 18 Hours

Games and strategies: Introduction – two-person zero-sum game – the maximin and minimax principle – games without saddle points – mixed strategies – graphical solution of 2xn and mx2 games.

TEXT BOOK:

Operations Research - Kantiswarup, P.K. Gupta and Man Mohan, (13^{th} Edition).

Publisher Sultan Chand & Sons.

UNIT I Chapter 7: 7.1 – 7.7

UNIT II Chapter 21: 21.1 – 21.9

UNIT III Chapter 19:19.1 – 19.11

UNIT IV Chapter 13:13.1 – 13.5

UNIT V Chapter 17: 17.1 – 17.6

REFERENCE BOOKS:

1. HamdyA. Taha., (2007),Operations Research(8th Edition), Pearson Education, Asia

2. Gupta.P.K, Hira D.S, (2013),Operations Research ,S.Chand& Co, Delhi.

3.Sharma.J.K, (2000),Operations Research Theory and applications,(5th edition), Publisher Macmillian

4.Kalavathy.S, (2012),(2010), Operations Research,PaperbackPublisher Kindle edition.

5.Gupta.P.K, (1996) ,Operations Research Paperback,D.S HiraKindle edition.

BLENDED LEARNING

UNIT	TOPICS	LINKS
II	Queuing theory	https://www.youtube.com/watch?v=xGkpXk-AnWU&feature=youtu.be
III	Deterministic inventory problems with shortages and without shortages	https://www.youtube.com/watch?v=jf7UkRWZoDY
IV	Solutions of discrete D.P.P	https://www.youtube.com/watch?v=C2vYcnOqJUQ

MAPPING OF CO'S WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	2	3	3	3	2	1	3	3	3
CO2	3	3	3	3	2	2	3	3	3	2	1	3	3	3
CO3	3	3	3	3	2	2	3	3	3	2	1	3	3	3

CO4	3	3	3	3	2	2	3	3	3	2	1	3	3	3
CO5	3	3	3	3	2	2	3	3	3	2	1	3	3	3

(Correlation: 3- High, 2 – Medium, 1 – Low)

ASSESSMENT TOOLS:

S.No	**Assessment methods**	**Frequency of Assessment**
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Case study (Unit V)	Once in a semester

Course designed by 1. Dr. K. Julia Rose Mary 2.Dr.C. Priyadharshini Infanta	**Verified by HOD** Dr. Dr.K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER VI

COURSE CODE: 23UMA6E04

ELECTIVE 4 - ASTRONOMY II

COURSE OBJECTIVES:

- To introduce the students to space science.
- To enable the students to learn about the interesting facts of Moon, Sun Planetary Motion.
- It focuses on the Time, Annual Parallax, Precession, Nutation and The Moon, Eclipses.

COURSE OUTCOMES :

At the end of the course the students will have the ability to:

CO1	Describe the different types of seasons and the discrepancy between two kinds of solar time	**K2**
CO2	Integrate different forms of the angle subtended at a star by the mean radius of Earth's orbit around the Sun.	**K2**
CO3	Acquire the knowledge of equatorial bulge of the earth and irregularity in the precession of the equinoxes	**K2**
CO4	Classify different forms of eclipses	**K3**
CO5	Investigate the properties of two giant **planets** orbiting a **star** similar to the Sun bound by gravitational attraction.	**K3**

Syllabus

Credits: 4 **Instructional Hours: 60**

UNIT-I: **12 Hours**

Time: Equation of time – Conversion of time – Seasons – Calendar.

(Self Study-Calendar)

UNIT-II: **12 Hours**

Annual Parallax – Aberration.

UNIT-III: **12 Hours**

Precession – Nutation.

UNIT-IV: **12 Hours**

The Moon – Eclipses.

(Self Study- The Moon)

UNIT-V: **12 Hours**

Planetary Phenomenon – The Stellar system.

TEXT BOOK:

1. Treatment as in "ASTRONOMY" by Mr.S.Kumaravelu and Susheela Kumaravelu.

UNIT-I: Chapter VII:1-4

UNIT-II: Chapter VIII & Chapter IX

UNIT-III: Chapter X

UNIT-IV: Chapter XII & Chapter XIII

UNIT-V: Chapter XIV &Chapter XVIII

Question paper setters to confine to the above text book only

BOOKS FOR REFERENCE:

1. Mathew.K.C and Thiruvenkatacharya,(1974) A Text Book of Astronomy for degree classes, S.Chand and co.

2. Ramachandran,G.V, (1970)A Text Book of Astronomy for post graduate classes, (7^{th} edition) Rukmani Publishers.

BLENDED LEARNING

UNIT	TOPICS	LINKS
I	Equation of time Seasons	https://www.youtube.com/watch?v=YgL18AqHM-s https://www.youtube.com/watch?v=tX3Y5bzNDiU

II	Annual Parallax	https://youtu.be/XUQAIldqPww

MAPPING OF CO'S WITH PO's AND PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2
CO1	3	3	3	2	2	2	2	2	3	3	3	2	2	2
CO2	2	2	3	2	2	2	2	2	3	2	3	3	2	2
CO3	3	2	2	2	2	3	2	2	3	2	3	3	2	2
CO4	2	2	3	2	2	2	2	2	3	3	3	3	2	2
CO5	2	3	3	2	2	2	2	2	3	3	3	3	2	2

(Correlation: 3- High, 2 – Medium, 1 – Low)

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Term paper presentation (Unit V)	Once in a semester

Course designed by Dr. A. Francina Shalini	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER VI

COURSE CODE: 24UMA6SB4

TITLE OF THE COURSE: SKILL BASED PRACTICAL: NUMERICAL METHODS WITH C PROGRAMMING

[Skill Development]

COURSE OBJECTIVES:

- To determine the knowledge in implementing numerical methods using the C programming.
- To solve Numerical problems with the aid of C Programming.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1	Utilize the concepts and maintain record or observation	K3
CO2	To identify and implement various numerical methods using the C programming	K3
CO3	Evaluate the given program, list the procedures and analyze the outputs	K3
CO4	Apply C Programming to find the solution of linear systems by using Direct methods, Matrix inversion method, Gaussian elimination methods, Gauss-Jordan Method	K4
CO5	Apply C Programming to find the solution of ordinary differential equation of first order by Euler, Taylor and Runge-Kutta methods	K4

Credits: 2 **Instructional Hours: 45**

LIST OF PRACTICALS

1. Write a C-Program to find the roots of the given polynomial using bisection method.
2. Write a C-Program to find the roots of the given polynomial using Regula Falsi method.
3. Write a C-Program to find the roots of the given polynomial using Newton Raphson method.
4. Write a C-Program to solve a system of linear algebraic equations, using Gauss Elimination method.
5. Write a C-Program to solve a system of linear algebraic equations, using Gauss Jordan method.
6. Write a C-Program to solve a system of linear algebraic equations, using Gauss Seidal method of Iteration.

7. Write a C-program to interpolate and extrapolate using the given pairs of values of x and y, by Newton's forward interpolation.
8. Write a C-program to interpolate and extrapolate using the given pairs of values of x and y, by Newton's back interpolation.
9. Write a C-program to evaluate the given integral using trapezoidal and Simpson's rule.
10. Write a C-program to evaluate the second order differential equations, using Runge-Kutta method of fourth order.

TEXT BOOK:

1. Venkataraman. M. K, *Numerical Methods in Science and Engineering,* The National Publishing Company, Madras (1999).

2. J.B. Dixit, *Programming in C and Numerical Analysis***,** Firewall Media, New Delhi, (2006).

MAPPING OF CO'S WITH PO'S / PSO'S:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
CO1	3	2	2	2	2	2	2	2	2	2	2	2	2	3
CO2	3	3	3	3	2	3	3	3	3	2	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	2	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Correlation: L-Low, M-Medium, H-High

ASSESSMENT:

S.NO	**INTERNAL MARKS**	**EXTERNAL MARKS**
1.	CIA I – 15 marks CIA II – 15 marks Record and Observation – 10 marks **Total Marks 40**	Practicals = 60 marks **Total Marks 60**

Course designed by: Dr.K.Mohana Dr. M.Trinita Pricilla	**Verified by HOD:** Dr. K. Julia Rose Mary
Checked by CDC: Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

MEMBERS OF BOARD OF STUDIES

Dr. D. Jayanthi Assistant Professor(SG) , Department of Mathematics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore-43	**Dr. N. Murugesan** Assistant Professor(SS) , Department of Mathematics, Government Arts College, Coimbatore -18	**Dr. C. Janaki** Assistant Professor(SS) , Department of Mathematics, Government Arts College for Women, Coimbatore -18	**Mr. T. Vibu** Managing Partner, Rel Agencies, Coimbatore	**Ms. J. Magdalene** Project Manager, Robert Bosch, Keeranatham, Saravanampatti, Coimbatore-35

SEMESTER: III

COURSE CODE: 24UMA3A03/24UMA3A11/24UMA3A15/24UMA3A16/24UMA3A17

TITLE OF THE COURSE: ALLIED PAPER III- BUSINESS MATHEMATICS
(For II B. Com, II B. Com CA, II B. Com PA, II B. Com E-Commerce & II BA)

(Employability)

COURSE OBJECTIVES:

- To help the students to develop their abilities in logical reasoning and problem solving.
- To use Mathematical concepts such as Differentiation, Integration, Mathematical Finance and linear Programming problem which add to the credibility in understanding the subject.

COURSE OUTCOMES:

At the end of the course the students will be able to:

CO1	Understand mathematics of finance based on Simple Interest and Compound Interest.	**K2**
CO2	Solve Matrices and its different types of Matrices.	**K2**
CO3	Analyze Differentiation and its uses in real life	**K2**
CO4	Summarize Integral Calculus and determine definite and indefinite integrals.	**K3**
CO5	Investigate Linear Programming Problem and solution by graphical and Simplex method.	**K3**

SYLLABUS

Credits :4 **Instructional hours: 75**

Unit I: Mathematics of Finance (K2) **15 Hours**

Basic Concepts - Simple Interest and Compound Interest – Effective rate and Nominal rate of interest- Depreciation – Annuities: Present value of an immediate annuity and annuity due – Amount of an immediate annuity and annuity due – Sinking Fund – Amortisation - Discounting of Bills -True Discount-Bankers Gain**.**

(Self-Study: Problems in Simple interest)

Unit II: Matrices (K2) 15 Hours

Definition – Importance and notation – Order of a matrix – Types of matrices – Matrix Operations: Addition, Subtraction, Multiplication and Transpose of matrices – Properties – A system of linear equations – Determinants – Minor and cofactor - Inverse of a Matrix – Solving a system of simultaneous linear equations - Rank of a matrix - Input – Output Analysis.

Unit III: Differentiation & Uses of Derivative (K2) 15 Hours

Introduction – Derivatives of standard functions – Rules of differentiation - Simple Differentiation problems – Function of a function rule or Chain rule – Differentiation of Implicit functions – Uses of Derivative: Marginal concepts – Elasticities – Increasing and decreasing functions – Maxima and minima

Unit IV: Integration (K3) 15 Hours

Indefinite integrals – Standard forms – Determination of the constant – Definite integrals – Method of Substitution — Method of integration by parts – Uses in economics.

(Self-Study: Problems using integration by parts method)

Unit V: Linear Programming Problem (K3) 15 Hours

Introduction to Linear Programming Problem – Formulation of LPP – Solution of LPP by Graphical method – Slack and Surplus variables – Standard form of LPP – Solution of LPP by Simplex method – Simple problems.

(Beyond the curriculum: Charnes method of penalty)

TEXTBOOK:

Navanitham.P.A., *Business Mathematics and Statistics*, Jai Publishers, Trichy, (2018)

Unit I: Chapter 2

Unit II: Chapter 4

Unit III: Chapter 6 (Page No:247-268) & Chapter 7(Page No:282-295)

Unit IV: Chapter 8 (Page 303-310 & 315-322)

Unit V: Chapter 9 (Page No: 328-366)

REFERENCE BOOKS:

1. Sunderesan & Jayaseelan, *'An introduction to Business Mathematics and Statistical Methods*, S.Chand & Company Ltd, New Delhi, (2013)
2. Vittal P.R, "*Business Mathematics and Statistics*", Margham Publications, Chennai, (2012)
3. Pillai R.S.N., Bhagawathi, *Statistics Theory and Practice*, S. Chand and Company Limited, New Delhi, (1998)
4. Ramkrishna Gbosh, Suranjan Suha, *"Business Mathematics and Statistical methods*", New Central Book Agency Private Ltd, New Delhi, (2019)

BLENDED LEARNING:

UNIT	TOPIC	LINK
IV	Integration basic problem -	https://youtu.be/lQdM476Z0XE
IV	Integration By parts	https://youtu.be/6cTV83EO3G4
IV	Integration By Partial Fraction Method	https://youtu.be/jEXpidJddZ4

V	Linear Programming Problem – Graphical Method	https://www.youtube.com/watch?v=reKV1lRn_uw
V	Linear Programming Problem – Solution by Graphical Method	https://www.youtube.com/watch?v=Bzzqx1F23a8
V	Linear Programming Problems – Simplex Method	https://www.youtube.com/watch?v=M8POtpPtQZc

MAPPING OF CO'S WITH PO's AND PSO's

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO 1	3	3	3	3	3	3	2	2	3	2	3	2	3	1
CO 2	3	3	3	2	3	3	2	2	3	2	3	2	3	1
CO 3	3	3	3	2	3	3	2	2	3	3	3	2	3	1
CO 4	3	3	3	2	3	3	2	2	3	3	3	2	3	1
CO 5	3	3	3	2	3	3	2	2	3	3	3	2	3	1

(**Correlation:** 3 – High; 2 – Medium; 1 - Low)

ASSESSMENT TOOLS:

S. No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Case study (Unit V)	Once in a semester

Course Designed by 1. Dr.Sr.A. Stanis Arul Mary 2. Dr.K.Vaiyomathi	**Verified by HOD** Dr. K. Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

MEMBERS OF BOARD OF STUDIES

Dr. D. Jayanthi Assistant Professor(SG) , Department of Mathematics, Avinashilingam Institute for Home	**Dr. N. Murugesan** Assistant Professor(SS) , Department of Mathematics, Government Arts College,	**Dr. C. Janaki** Assistant Professor(SS) , Department of Mathematics,	**Mr. T. Vibu** Managing Partner, Rel Agencies, Coimbatore	**Ms. J. Magdalene** Project Manager, Robert Bosch,Keeranatham, Saravanampatti, Coimbatore-35

Science and Higher Education for Women, Coimbatore-43	Coimbatore -18	Government Arts College for Women, Coimbatore -18		

SEMESTER: IV

COURSE CODE:

24UMA4A04/24UMA4A11/24UMA4A15/24UMA4A16/24UMA4A17TITLE OF THE COURSE: ALLIED PAPER IV - BUSINESS STATISTICS

(For II B.Com, II B.Com CA, II B.Com PA, II B.Com E-Commerce & II BA)

(Employability)

COURSE OBJECTIVES:

- To learn the measures of central tendency, dispersion etc., and to apply them in different fields of study.
- To analyze sampling techniques and use it appropriately
- To understand time series and index numbers.

COURSE OUTCOMES:

At the end of the course the students will be able to:

CO1	Understand the meaning, scope of Statistics and its mode of collection andorganizing.	**K2**
CO2	Solve problems using the measures of central tendency.	**K2**
CO3	Analyze measures of dispersion and work over it.	**K2**
CO4	Investigate over Index Numbers and Simple linear correlation.	**K3**
CO5	Summarize Time Series and compute business forecasting.	**K3**

SYLLABUS

Credits :4 **Instructional hours:75**

UNIT I Introduction to Statistics (K2) 15 Hours

Meaning and Scope : Origin and growth- Meaning- Definitions- Functions- Characteristics- Scopeand Users- Limitations. Statistical Survey: Planning- Execution. Collection of Data: Primary and Secondary Data – Methods of collection of Primary Data – Sources of Secondary Data – Precautions in the use of secondary Data. Sampling Techniques: Census Survey- Sample Survey –Sampling – Principles of Sampling – Methods of Sampling –Merits- Non-Random Sampling Methods – Sampling and Non-Sampling errors.

[Self Study : Sampling and Non Sampling Errors]

UNIT II Measures of Central Tendency (K2) 15 Hours Classification and Tabulation of Data - Diagrams and Graphs : Diagrams- Rules for Construction – Types of Diagrams – Drawing Diagrams . Graphs: Fundamentals of Graphs – General Rules –

Graphs of Time Series – Histograms – Graphs of Frequency Distribution – Another Graph : The Zee Chart or Z curve

Measures of central tendency: Arithmetic Mean, Median, Mode, Geometric and Harmonic mean.

UNIT III Measures of Dispersion (K2) 15 Hours

Measures of dispersion: Range, Quartile deviation, Mean Deviation, Standard deviation and coefficient of Variation - Variance.

[Self-Study : Coefficient of Variation]

UNIT IV Index Numbers and Simple Correlation (K3) 18 Hours Index Numbers: Characteristics of Index Numbers – Uses – General Problem in the Construction of Index Numbers – Tests of Consistency and Adequacy -

Simple Linear Correlation : Introduction to Simple Correlation – Scatter diagram – Karl Pearson's coefficient of correlation – Rank correlation – Coefficient of Correlation by Concurrent Deviation Method.

UNIT V Simple Linear Regression and Analysis of Time Series (K3) 18 Hours

Simple Linear Regression: Introduction - Regression lines into two variables – Methods of formingthe Regression equations – Properties of Regression lines and Co-efficient – Standard error of Estimates.

Analysis of time series: Introduction - Uses – Components – Secular Trends – SeasonalFluctuations.

[Beyond the Curriculum: Interpolation and Extrapolation by Graphic method]

TEXT BOOK:

Navnitham P.A., *Business Mathematics and Statistics*, Jai Publishers, Trichy, (2022)Unit 1: Chapter 1, Chapter 2, Chapter 3 & Chapter 4

Unit 2: Chapter 5, Chapter 6 & Chapter 7

Unit 3: Chapter 8

Unit 4: Chapter 10 (Page No 444-463)& Chapter 12.

Unit 5: Chapter 13 & Chapter 14

REFERENCE BOOKS:

1) Gupta S.P, *Statistical Methods*, Sultan Chand & Sons, New Delhi, (2013)

2) Asim Kumar Manna, *Business Mathematics and Statistics*, McGraw Hill Education (India)Private Limited, Chennai, (2018)

3) Pillai R.S.N., Bhagawathi, *Statistics Theory and Practice*, S. Chand and Company Limited, New Delhi, (1998)

4) Vittal P.R. – "Business Mathematics and Statistics", Margham Publications, Chennai, (2012)

5) Saha – *"Practical Business Mathematics and Statistics"*, Material Type Label Book Publisher,Chicago, (2019)

BLENDED LEARNING:

UNIT	TOPIC	LINK
I	Types of Sampling	https://youtu.be/m6HtYHWScFk

I	Sampling and non-sampling errors	https://youtu.be/AJdt2_qxulo
II	Classification and tabulation of data	https://www.youtube.com/watch?v=O_G2MaNOY_Y
IV	Simple correlation	https://www.youtube.com/watch?v=11c9cs6WpJU
V	Analysis of Time Series	https://www.youtube.com/watch?v=opgTF9Yf3Dk

MAPPING OF CO'S WITH PO's AND PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	3	3	3	3	3	2	2	3	2	3	2	3	2
CO2	3	3	3	2	3	3	2	2	3	2	3	2	3	2
CO3	3	3	3	2	3	3	2	2	3	3	3	2	3	2
CO4	3	3	3	2	3	3	2	2	3	3	3	2	3	2
CO5	3	3	3	2	3	3	2	2	3	3	3	2	3	2

(**Correlation:** 3 – High; 2 – Medium; 1 - Low)

ASSESSMENT TOOLS:

S. No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Case study (Unit V)	Once in a semester

Course designed by 1. Dr.Sr.A.Stanis Arul Mary 2. Dr.K.Vaiyomathi	**Verified by HOD** Dr. K. Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

MEMBERS OF BOARD OF STUDIES

Dr. D. Jayanthi Assistant Professor(SG) , Department of Mathematics, Avinashilingam Institute for Home Science and HigherEducation for Women, Coimbatore-43	**Dr. N. Murugesan** Assistant Professor(SS) , Department of Mathematics, Government Arts College, Coimbatore -18	**Dr. C. Janaki** Assistant Professor(SS) , Department of Mathematics, Government Arts College for Women, Coimbatore -18	**Mr. T. Vibu** Managing Partner, Rel Agencies, Coimbatore	**Ms. J. Magdalene** Project Manager, Robert Bosch,Keeranatham, Saravanampatti, Coimbatore-35

SEMESTER: II / IV

ALLIED - MATHEMATICS PAPER II

COURSE CODE: 23UMA2A10/23UMA4A08
(For I B.Sc Physics & II B.Sc Chemistry students)

(Entrepreneurship)

COURSE OBJECTIVES:

- To introduce the concept of Integration and Differential equations and to solve Partial Differential equations.
- To study the method of solving the integration by reduction formulas.
- To provide an exposure on Fourier series.

COURSE OUTCOMES:

At the end of the course the students will be able to:

CO1	Describe the different types of integration and solve them	**K2**
CO2	Integrate different forms of trigonometric functions by reduction formula and integration by parts	**K2**
CO3	Acquire the knowledge of linear differential equations with constant coefficients	**K2**
CO4	Classify different forms of functions and forming the partial differential equations	**K3**
CO5	Investigate the properties of full range and half range Fourier series	**K3**

SYLLABUS

Credits : 5 **Instructional Hours: 90**

UNIT I: **Types of Integration** **18 hours**

Integration - Definite integral-Methods of Integration - Integrals of functions containing linear functions of x- Integrals of the form f(ax+b), $a^2 \pm x^2$, $f(x^n)$, $(f(x))^n$, $F(f(x))$

[Self Study : Basics of Integration]

UNIT II: Reduction Formula **18 hour**

Integration by parts - Reduction formula for $\int x^n e^{ax}\,dx$, $\int x^n \cos ax\,dx$, $\int \sin^n x\,dx$, $\int \cos^n x\,dx$,

$\int \sin^m x \cos^n x\,dx$, $\int \tan^n x\,dx$, $\int \cot^n x\,dx$, $\int \sec^n x\,dx$, $\int \operatorname{cosec}^n x\,dx$ *and* $\int x^m (\log x)^n\,dx$

UNIT III: Linear Differential Equations **18 hours**

$(aD^2+bD+c)y= e^{ax}\varphi(x)$ Linear Differential equations with constant coefficients of the form where a,b,c are constants, $\varphi(x)$= sin mx or cos mx or x^m .

[Self Study : Linear Differential equations $(aD^2+bD+c)y= e^{ax}\varphi(x)$***with constant coefficients where*** $\varphi(x)$ ***is the form*** x^m***]***

UNIT IV: Partial Differential Equations **18 hours**

Formation of Partial Differential equations by eliminating arbitrary constants and arbitrary functions-Solutions of standard types of first order equations

$f(p,q) = 0,\quad f(x,p,q) = 0,\quad f(z,p,q) = 0,\quad f_1(x,p) = f_2(y,q)$.

UNIT V: Fourier Series **15 hours**

Fourier series: Definition – finding Fourier coefficients for given periodic functions with period 2π ,odd and even functions- Half range Fourier series

TEXT BOOKS:

1.Narayanan S,. Hanumantha Rao R and Manicavachagom Pillay T.K. (2007), Ancillary Mathematics Volume II by SV Publications, Anand Book Depot,Chennai [UNIT I, II, IV, V].

2 Narayanan S and. Pillai. T. K. M , (1996) Differential Equation and its applications, S.Viswanathan Printers and Publishers.[UNIT-III]

UNIT I	Chapter 1	Section 1.1 to 6.5
UNIT II	Chapter 1	Section 12,13.1-13.10
UNIT III	Chapter 5	Section 1- 4.1
UNIT IV	Chapter 6	Section 1 - 5.3
UNIT V	Chapter 2	Section 1 - 5.2

REFERENCE BOOKS:

1. Bali.N.P, (1987) Differential Equations.,Laxmi Publications, New Delhi,
2. Shanti Narayanan, (1997) Shyam Lal Charitable Trust Differential Calculus –, New Delhi
3. Manickavachagom Pillay.T.K, Natarajan.T and Ganapathy.K.S., (1996) Calculus Volume II, S.Viswanathan Printers and Publishers.
4. Manickavachagom Pillay.T.K, Natarajan.T and Ganapathy.K.S.,(2007) Calculus Volume III, S.ViswanathanPrinters and Publishers.
5. T.Natarajan Engineering Mathematics for Semester IV, (2001) Tata McGraw Hill Publishing Company Limited , New Delhi,

BLENDED LEARNING:

UNIT	TOPIC	LINK
IV	Formation of Partial Differential equations by eliminating arbitrary constants	https://youtu.be/3c71y8N9qj0
IV	First order partial differential equation	https://youtu.be/JvXd_jw6umw

V	Fourier coefficients for given periodic functions with period 2π	https://youtu.be/MV0iuBtEtQU
V	Half range Fourier series	https://youtu.be/XrWlr9BdzRQ

MAPPING OF CO'S WITH PO's AND PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2
CO1	2	3	3	3	3	3	2	3	3	2	3	3	3	1
CO2	2	3	3	3	3	3	2	3	3	2	3	3	3	1
CO3	2	3	3	3	3	3	2	3	3	2	3	3	3	1
CO4	2	3	3	3	3	3	2	3	3	2	3	3	3	1
CO5	2	3	3	3	3	3	2	3	3	2	3	3	3	1

(**Correlation:** 3 – High; 2 – Medium; 1 - Low)

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
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6.	Seminar (Unit III & IV)	Twice in a semester
7.	Case study (Unit V)	Once in a semester

Course designed by Dr. A. Stanis Arul Mary	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

UNDER GRADUATE PROGRAMME-B.Sc MATHEMATICS
LEARNING OUTCOME BASED CURRICULUM FRAMEWORK under CBCS PATTERN
SYLLABUS & SCHEME OF EXAMINATION
(for the candidates admitted from the academic year 2024-2025 onwards)

Sem	Part	Course Code	Title of the Course	Nature of Course	IH	CP	Exam Hrs	CIA	ESE	Total
	I	23UTAM101 / 23UHIN101/ 23UFRE101	TAMIL I/ HINDI I/ FRENCH I	LAN	6	3	3	25	75	100
	II	23UGEN101/ 23UAEN101	GENERAL ENGLISH I/ ADVANCED ENGLISH I	ENG	6	3	3	25	75	100
	III	24UMA1C01	CORE: CLASSICAL ALGEBRA WITH GEOGEBRA *[Entrepreneurship]*	CC	5	4	3	25	75	100
	III	23UMA1C02	CORE: CALCULUS WITH SCILAB *[Entrepreneurship & Industry 4.0]*	CC	4	4	3	25	75	100
	III	23UPH1A01	ALLIED: PHYSICS I	GEN	7	3	3	20	55	75
	IV	15UVAL101	VALUE EDUCATION	AEC	2	2			50	50
II	I	23UTAM202 / 23UHIN202/ 23UFRE202	TAMIL II/ HINDI II/ FRENCH II	LAN	6	3	3	25	75	100
	II	23UGEN202/ 23UAEN202	GENERAL ENGLISH II/ ADVANCED ENGLISH II	ENG	6	3	3	25	75	100
	III	24UMA2C03	CORE: DIFFERENTIAL EQUATIONS AND INTEGRAL TRANSFORMS WITH SCILAB *[Entrepreneurship & Industry 4.0]*	CC	5	4	3	25	75	100
	III	24UMA2C04	CORE: DISCRETE MATHEMATICS *[Employability]*	CC	4	3	3	25	75	100

23/4/24	23/4/24	23/04/24		Absent
Dr. D. Jayanthi	Dr. N. Murugesan.	Dr. C. Janaki	Mr. T. Vibu	Ms. J. Magdalene

	III	23UPH2A02	ALLIED: PHYSICS II	GEN	7	3	3	20	55	75
	III	23UPH2AP1	ALLIED PRACTICAL: PHYSICS	GEN		4	3	20	30	50
	IV	**24UENS202**	ENVIRONMENTAL STUDIES(MOOC)	AEC	2	2	-	-	50	50
III	I	23UTAM303 / 23UHIN303/ 23UFRE303	TAMIL III/ HINDI III/ FRENCH III	LAN	6	3	3	25	75	100
	II	23UGEN303/ 23UAEN303	GENERAL ENGLISH III/ ADVANCED ENGLISH III	ENG	6	3	3	25	75	100
	III	23UMA3C05	CORE: MECHANICS WITH GNU-FISICA LAB ***[Employability]***	CC	4	4	3	25	75	100
	III	24UMA3C06	CORE: MATLAB (THEORY) ***[Employability & Skill Development]***	CC	2	2	3	20	55	75
	III	24UMA3CP1	CORE PRACTICAL: MATLAB (PRACTICAL) (***Industry 4.0***)	CC	2	2	3	10	15	25
	III	23UMA3A05	ALLIED: COMPUTATIONAL PROBABILITY AND STATISTICS ***[Employability & Industry 4.0]***	CSA	5	6	3	25	75	100
	IV	23UMA3SB1	SKILL BASED I : MATHEMATICAL FOUNDATION FOR MACHINE LEARNING ***[Skill Development]***	SEC	3	2	3	25	75	100

22/4/24		23/04/24		Absent
Dr. D. Jayanthi	**Dr. N. Murugesan.**	**Dr. C. Janaki**	**Mr. T. Vibu**	**Ms. J. Magdalene**

	IV	22UBTA301/ 22UATA301/	BASIC TAMIL I / ADVANCED TAMIL I /	AEC	2	2	2	25	25	50
			INDIAN KNOWLEDGE SYSTEM	AEC		2	2	-	50	
	IV		WOMEN STUDIES (Non- Credit Course)	AEC	2	-	2	-	50	50
IV	I	23UTAM404 / 23UHIN404/ 23UFRE404	TAMIL IV/ HINDI IV/ FRENCH IV	LAN	6	3	3	25	75	100
	II	23UGEN404/ 23UAEN404	GENERAL ENGLISH IV/ ADVANCED ENGLISH IV	ENG	6	3	3	25	75	100
	III	23UMA4C07	CORE: ANALYTICAL GEOMETRY OF 2D AND 3D WITH GEOGEBRA	CC	4	4	3	25	75	100
	III	23UMA4C08	CORE: TRIGONOMETRY, VECTOR CALCULUS AND NUMBER THEORY WITH MAPLE APPLICATIONS	CC	4	4	3	25	75	100
	III	23UMA4A06	ALLIED : STATISTICAL QUALITY CONTROL ***[Employability & Industry 4.0]***	CSA	5	6	3	25	75	100
	IV	23UMA4SB2	SKILL BASED II : MATHEMATICAL MODELING ***[Innovation & Employability]***	SEC	3	2	3	25	75	100
	IV	22UBTA402/ 22UATA402/	BASIC TAMIL II / ADVANCED TAMIL II	AEC	2	2	2	25	25	50

22/4/24	22/4/24	23/04/24		Absent
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		21UHUR404	HUMAN RIGHTS	AEC		2	2	-	50	
V	III	23UMA5C09	CORE: ABSTRACT ALGEBRA	CC	5	5	3	25	75	100
	III	23UMA5C10	CORE: REAL ANALYSIS I	CC	5	5	3	25	75	100
	III	23UMA5C11	CORE: COMPLEX ANALYSIS I	CC	5	5	3	25	75	100
	III	23UMA5E01 / 23UMA5E02	OPERATIONS RESEARCH *[Entrepreneurship & Industry 4.0]/* ASTRONOMY I	DSE	5	4	3	25	75	100
	IV	23NMA5E01	APPLIED STATISTICAL SKILLS *[Skill Development]*	GE	4	4	3	25	75	100
	IV	24UMA5SB3	SKILL BASED III : DATA ANALYTICS WITH R PROGRAMMING-PRACTICALS *[Skill Development Entrepreneurship & Employability & Industry 4.0]*	SEC	3	2	3	40	60	100
	IV	23IDSBMA1	SKILL BASED : SIMPLE MATHEMATICS FOR COMPETITIVE EXAMINATIONS *[Employability & Skill Development]*	SEC	3	2	3	25	75	100
VI	III	23UMA6C12	CORE: LINEAR ALGEBRA	CC	6	5	3	25	75	100
	III	23UMA6C13	CORE: REAL ANALYSIS II	CC	6	5	3	25	75	100

22/4/24	22/4/24	22/04/24		Absent
Dr. D. Jayanthi	**Dr. N. Murugesan.**	**Dr. C. Janaki**	**Mr. T. Vibu**	**Ms. J. Magdalene**

	III	23UMA6C14	CORE: COMPLEX ANALYSIS II	CC	6	5	3	25	75	100
	III	23UMA6E03 / 23UMA6E04	OPTIMIZATION TECHNIQUES AND ITS APPLICATIONS *[Entrepreneurship & Industry 4.0]/* ASTRONOMY II	DSE	6	4	3	25	75	100
	IV	24UMA6SB4	SKILL BASED IV : NUMERICAL METHODS WITH C-PRACTICALS *[Skill Development Entrepreneurship & Industry 4.0]*	SEC	3	2	3	40	60	100
	IV	23IDSBMA1	SKILL BASED : SIMPLE MATHEMATICS FOR COMPETITIVE EXAMINATIONS *[Employability & Skill Development]*	SEC	3	2	3	25	75	100
	V	19UCYS605	CYBER SECURITY		2	2	2	-	50	50
			MOOC/SWAYAM COURSES			2				
			EXTENSION AND CO-CURRICULAR ACTIVITIES (NSS, NCC, SPORTS, NECTAR, RSP, YRC, AICUF, CHETNA WOMEN CELL)			1				**50**
			TOTAL		**180 +2 +2**	**140 +2 +2**				**3800+ 50**

IH- Instructional Hours, **CP**- Credit points,
CIA-Continuous Internal Assessment, **ESE**- End Semester Examination

22/4/24	22/4/24	23/04/24		Absent
Dr. D. Jayanthi	**Dr. N. Murugesan.**	**Dr. C. Janaki**	**Mr. T. Vibu**	**Ms. J. Magdalene**

PART WISE TOTAL

MATHEMATICS				
			CP	TOTAL
1	PART I	LANGUAGE COURSE	12	400
2	PART II	ENGLISH COURSE	12	400
3	PART III	CORE/ALLIED/PRACTICAL	95	2100
4	PART IV	BASIC TAMIL I & II ADVANCED TAMIL I & II INDIAN KNOWLEDGE SYSTEM & HUMAN RIGHTS	4	100
		WOMEN STUDIES	-	50
	PART IV	SKILL BASED (6 COURSES)	12	600
	PART IV	VALUE EDUCATION	2	50
5	PART IV	ENVIRONMENTAL STUDIES	2	50
	PART V	EXTENSION AND CO-CURRICULAR ACTIVITIES (NSS, NCC, SPORTS, NECTAR, RSP, YRC, AICUF, CHETNA WOMEN CELL)	1	50
	TOTAL		140	3800
		CYBER SECURITY	2	50
		MOOCS/ SWAYAM	2	
	GRAND TOTAL		140+2+2	3800+50

22/4/24		23/04/24		Absent
Dr. D. Jayanthi	Dr. N. Murugesan.	Dr. C. Janaki	Mr. T. Vibu	Ms. J. Magdalene

ABBREVIATIONS	NATURE OF COURSE
LAN	LANGUAGE
ENG	ENGLISH
CC	CORE
GEN	GENERIC (ALLIED)
AEC	ABILITY ENHANCEMENT COURSE
SEC	SKILL ENHANCEMENT COURSE
GE	GENERIC ELECTIVE (NME)
DSE	DISCIPLINE SPECIFIC ELECTIVE

VALUE ADDED COURSES

S.NO	NATURE OF COURSE	TITLE OF THE PAPER	INSTRUCTIONAL HOURS	INSTITUTION OFFERING THE COURSE
1	CERTIFICATE COURSE	Certificate Course in Astronomy	30	Aakam Industrial Training and Research Institute Coimbatore.
2		Job oriented Certificate Course in Banking & PSC Examinations	30	Sathish Explore Academy
3		Certificate Course in LATEX	30	Accent Techno Soft
4	DIPLOMA COURSE	Post Graduate Diploma in Operations Research	90	Department of Mathematics (Aided), Nirmala College for Women

23/4/24		Janaki 23/04/24		Absent
Dr. D. Jayanthi Assistant Professor(SG) , Department of Mathematics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore-43	**Dr. N. Murugesan** Assistant Professor(SS) , Department of Mathematics, Government Arts College, Coimbatore -18	**Dr. C. Janaki** Assistant Professor(SS) , Department of Mathematics, Government Arts College for Women, Coimbatore -18	**Mr. T. Vibu** Managing Partner, Rel Agencies, Coimbatore	**Ms. J. Magdalene** Project Manager, Robert Bosch, Keeranatham, Saravanampatti, Coimbatore-35

SEMESTER: I

COURSE CODE: 24UMA1C01

TITLE OF THE COURSE: CORE: CLASSICAL ALGEBRA WITH GEOGEBRA

[Entrepreneurship]

COURSE OBJECTIVES:

- To acquire knowledge about the convergence and divergence of a given series.
- To develop skills for solving algebraic equations.
- To understand and visualize the concepts of classical algebra through GEOGEBRA

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1	Identify the basic concept of Binomial, Exponential and Logarithmic theorems	**K2**
CO2	Discuss the basic knowledge of the convergent and divergent of the given series.	**K2**
CO3	Classifying the problem and finding its solution based on the theory of equatio	**K3**
CO4	Analyze the different methods to find the multiple roots of an equation.	**K3**
CO5	Compute the solutions of numerical equations.	**K3**

SYLLABUS

Credits: 4 **Instructional Hours: 75**

UNIT I: Binomial, Exponential and Logarithmic series theorems (K2) 15 hours

Binominal theorem -Positive integral index-Some important particular cases of binominal expansion-Application of the binominal theorem to the summation of the series-Exponential and logarithmic series: Exponential limit-exponential theorem-summation -Logarithmic series-modification of the logarithmic series-different form of logarithmic series.

Practicals for internal assessment:

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

1. Using geogebra draw geometrical figures and other objects.
2. Using geogebra construct sine wave

(Self- study: Series which can be summarized by Logarithmic series)

UNIT II: Convergency and divergency (K2) 15 Hours

Convergency and divergency of series: Definitions – Elementary results – Some general theorems concerning infinite series- Series of positive terms - Comparison tests– Cauchy's condensation test – De Alembert's ratio test - Cauchy's root test – Raabe's test.

Practicals for internal assessment:

1. Using geogebra export picture to the clipboard
2. Using geogebra resize and reflect and distorting the image

UNIT III: Theory of equations (K3) 15 Hours

Theory of Equations: Equation with real co-efficient, imaginary roots occur in pairs-equation with rational co-efficient, irrational root occur in pairs- Relations between roots and coefficient of equations -Symmetric function of the roots-sum of the powers of the roots of an equation.

(Self- study: Roots of an equation)

Practicals for internal assessment:

1. Using geogebra visualize the system of equations
2. Using geogebra construct a slope triangle

UNIT IV: Transformations of equations(K3) 15 Hours

Transformations of equations: Roots with signs changed- Roots multiplied by a given number- Reciprocal roots -Reciprocal equation: Standard form of reciprocal equations-Half the dimension- To increase or decrease the roots of the given equations by a given quantity-Form of the quotient and remainder when a polynomial is divided by binomial-removal of terms.

Practicals for internal assessment:

1. Using geogebra explore the properties of reflection
2. Using geogebra insert text into the graphics view

UNIT V: Solutions of Numerical equations (K3) 15 Hours

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

Descarte's rule of signs-Rolle's theorem -Multiple roots -Strum's theorem -Solutions of numerical equations-Integral roots -Limiting the number of trails- Newton's method of divisors- Horner's method.

Practicals for internal assessment:

1. Using geogebra combine spreadsheet view and graphic view
2. Using geogebra create a histogram

(Beyond The Curriculum: Cardon's method)

Note: End Semester Questions to be confined only to theory portions excluding practicals

TEXT BOOKS:

1. Manicavachagom Pillay T.K. and Natarajan T and K.S. Ganapathy, *Algebra*, Divya Subramanian for Ananda Book Depot, Chennai, (2017).

Unit 1: Chapter 3: Sec 1and Sec 6 (results only), Sec 10.

Chapter 4: Sec 1, Sec 2, Sec 3, Sec 5, Sec 6, Sec 7.

Unit 2 : Chapter 2: Sec8, Sec 9, Sec 10, Sec 11, Sec 12 (Results only),

Sec 13, Sec14, Sec 15, Sec16, Sec 17, Sec 18, Sec 19.

Unit 3: Chapter 6: Sec 9, Sec 10, Sec 11, Sec 12, Sec 13.

Unit 4: Chapter 6: Sec 15, Sec 16, Sec 17, Sec 18, Sec19.

Unit 5: Chapter 6: Sec 24, Sec 25, Sec 26, Sec 27, Sec 28, Sec 29, Sec 30.

2.Geogebra Manual – The Official Manual of Geogebra

Research.shu.ac.uk/geogebra /GIF – Guides/official Geogebramanual.pdf (2011)

REFERENCE BOOKS:

1.Kandasamy, P. and Thilagavathy, K. *Mathematics for B. Sc Branch I – Vol I*, S. Chand and company Ltd, New Delhi, (2004).

2. Bali, N.P. *Algebra*, Laxmi Publications, New Delhi, (2000).

3. A. Abdul Rasheed, *Allied Mathematics*, Vijay Nicole Imprints Private limited, Chennai, (2008).

4. Narayanan, S. HanumanthaRao, R. and Manicavachagam Pillai, T.K., Ancillary Mathematics Volume – I, SV Publications, (2007).

5. Vittal, P.R. and Malini, V., *Algebra and Trigonometry*, Margham Publication, Chennai, (2003).

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

6. Judith and MarkovHohenwarter, (2013), Introduction to Geogebra Version 4.4, http://stategeogebra.org/book/intro.en.pdf

BLENDED LEARNING

UNIT	TOPICS	LINKS
III	Theory of Equations	https://youtu.be/V4fCrkWJ8tc
IV	Descartes rule of signs	https://youtu.be/nTjnon4W8Sg
	Reciprocal Equations	https://youtu.be/dppJ_iHcZsQ
	Multiple roots	https://youtu.be/dppJ_iHcZsQ
V	Horner's Method	https://youtu.be/Z393AcN_Gz0

MAPPING OF CO'S WITH PO's AND PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO1	3	3	3	2	3	3	3	2	3	2	2	2	2	3
CO2	3	3	3	2	3	3	3	2	3	2	2	2	2	3
CO3	3	3	3	2	3	3	3	2	3	2	2	2	2	3
CO4	3	3	3	2	3	3	3	2	3	2	2	2	2	3
CO5	3	3	3	2	3	3	3	2	3	2	2	2	2	3

(Correlation: 3-High; 2-Medium ;1-Low)

ASSESSMENT TOOLS:

S. No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Assignment (Unit 1)	Once in a semester
5.	Assignment (Unit 2)	Once in a semester

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

6.	Quiz 1 (Unit 3)	Once in a semester
7.	Quiz 1 (Unit 4)	Once in a semester
8.	Other Component (Unit 5)	Once in a semester

Course designed by 1.Dr.Sr.A. Stanis Arul Mary, 2.Dr. K. Vaiyomathi	**Verified by HOD** Dr. K. Julia Rose Mary
Checked by CDC: Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

MEMBERS OF BOARD OF STUDIES

Dr. D. Jayanthi Assistant Professor(SG) , Department of Mathematics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore-43	**Dr. N. Murugesan** Assistant Professor(SS) , Department of Mathematics, Government Arts College, Coimbatore -18	**Dr. C. Janaki** Assistant Professor(SS) , Department of Mathematics, Government Arts College for Women, Coimbatore -18	**Mr. T. Vibu** Managing Partner, Rel Agencies, Coimbatore	**Ms. J. Magdalene** Project Manager, Robert Bosch, Keeranatham, Saravanampatti, Coimbatore-35

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

SEMESTER: II

COURSE CODE: 24UMA2C03

TITLE OF THE COURSE: CORE: DIFFERENTIAL EQUATIONS AND INTEGRAL TRANSFORMS WITH SCILAB

[Entrepreneurship & Industry 4.0]

COURSE OBJECTIVES:

- To demonstrate how differential equations can be used in solving many problems
- To solve the formulated differential equations with the given conditions and to interpret the solutions obtained.
- To gain knowledge of Scilab and use it in solving ordinary and partial differential equations.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1	Classify the differential equations with respect to their order and linearity.	**K2**
CO 2	Categorize the partial differential equation with suitable standard forms.	**K2**
CO 3	Define Laplace Transform and evaluate Laplace transform of derivatives, integrals and periodic functions.	**K3**
CO 4	Use the method of Laplace transform to solve differential equations with constant coefficients and also apply the concept to solve real life problems.	**K3**
CO5	Expand any periodic functions in terms of Fourier Series.	**K3**

SYLLABUS

Credits: 4 **Instructional Hours: 75**

UNIT I: Linear equations with constant coefficients (K2) **15 Hours**

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Equation of the first order but of higher degree: Equation solvable for $\frac{dy}{dx}$ -Equation solvable for y - Equation solvable for x - Particular cases- Equations that do not contain x explicitly- Linear equations with constant coefficients: Definition- The operator D- Complementary function of a linear equation with constant coefficients- Particular Integral.

Practicals for internal assessment: Solving ordinary differential equations using Scilab

UNIT II: Partial Differential Equations of the first order (K2) 15 Hours

Partial Differential Equations of the first order: Classification of integrals-Derivation of partial differential equations– Lagrange's method of solving the linear equation-Special methods-standard forms

(i)F (p, q) = 0 (ii) F(z, p ,q)=0

(iii) $f(x,p) = g(y,q)$ (iv) Clairaut's form: $z = px + qy + f(p,q)$

Practicals for internal assessment: Solving partial differential equations using Scilab

UNIT III: Laplace Transforms (K3)

15 Hours Laplace Transforms: Definition – General results of Laplace transforms of e^{at} , cos at, sin at, t^n where n is an integer- Laplace transforms of periodic functions -Some general theorems: First shifting theorem– Laplace transforms of $e^{at}\cos bt$, $e^{at}\sin bt$, $e^{at}\ t^n$ – Simple problems.

Practicals for internal assessment: Solving Laplace transforms of some functions using SciLab

***(Self- study: Problems in Laplace transforms*)**

UNIT IV: Inverse Laplace Transformation(K3) Ɓ Hours

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

Inverse laplace transformation: Definition – Application - Solution of differential equation with constant co-efficients using Laplace transformation- Solution of differential equation with variable co-efficients using Laplace transformation.

Practicals for internal assessment: Solving Laplace transforms of some functions using Scilab

UNIT V: Fourier Series (K3)

15 Hours

Fourier Series: Definition - Finding Fourier coefficients for a given periodic function with period 2π - Even and odd functions – Half range fourier series –Development in cosine series- Development in sine series - Change of interval.

Practicals for internal assessment: Calculating Fourier series using Scilab

(Beyond The Curriculum: Combination of series)

Note: End Semester Questions to be confined only to theory portions excluding practicals

TEXT BOOKS:

1. Narayanan S. and ManicavachagomPillay T. K, *Differential Equations and its Applications*, Viswanathan. S (printers & publishers) PVT., LTD, (2006).

Unit I: Chapter 4: Sec 1, Sec 2, Sec 3, Sec 4.

Chapter 5: Sec 1, Sec 2, Sec 3, Sec 4.

Unit II: Chapter 12: Sec 1, Sec 2, Sec 3, Sec 4, Sec 5 (5.1 to Sec 5.4).

Unit III: Chapter 9: Sec 1, Sec 2, Sec 3, Sec 4, Sec 5.

Unit IV: Chapter 9: Sec 6, Sec 7, Sec 8, Sec 9, Sec 10, Sec 11.

2. Narayanan.S and ManicavachagomPillay, *Calculus Vol III*, Viswanathan.S (Printers and Publishers) Pvt Ltd, Chennai, (2018).

Unit V: Chapter 6: Sec 1, Sec 2, Sec 3, Sec 4, Sec 5, Sec 6.

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3.Er. Hema Ramachandran & Dr. Achuthsankar S. Nair, *Scilab (A free Software to Matlab)* (1st edition), S Chand and company, (2015)

4. Lecture notes/Lab manual/Tutorials on Sci Lab

REFERENCE BOOKS:

1. Bali N.P, *Differential Equations*, Laxmi Publications, New Delhi, (2000).

2.Venkataraman M.K and Manorama Sridhar, *Differential Equations and Laplace Transforms*, The National Publishing company, (2004).

3.Sharma, J.N and Gupta.R.K. K, *Differential Equations*, Krishna PrakashanMandir, Meerut, (2000)

4. Narayanan.S, HanumanthaRao.R and Manicavachagom Pillay, *Ancillary Mathematics*, Vol III, Viswanathan.S (Printers and Publishers) Pvt Ltd, Chennai, (2015).

5.Vital P.R, *Differential Equations and Laplace Transforms*, (Third Revised Edition), Margham Publications, (2017).

6.JohnnyHeikell, *Scilab for real Dummies*, http://www.heikell.fi/downloads/scilab .pdf

BLENDED LEARNING

UNIT	TOPICS	LINKS
III	Laplace Transforms	https://www.youtube.com/watch?v=cMrYJICdcSs
IV	B Inverse Laplace transformation	https://www.youtube.com/watch?v=zczBU4fsEkY

MAPPING OF CO'S WITH PO's AND PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	3	3	3	3	3	3	2	3	3	2	2	2	3
CO2	3	3	3	3	3	3	3	2	3	2	2	2	2	3

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CO3	3	3	3	3	3	3	3	2	3	2	2	3	2	3
CO4	3	3	3	3	3	3	3	2	3	2	2	3	2	3
CO5	3	3	3	3	3	3	3	2	3	2	2	3	2	2

(Correlation: 3-High; 2-Medium ;1-Low**)**

ASSESSMENT TOOLS:

S. No	**Assessment methods**	**Frequency of Assessment**
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Assignment (Unit 1)	Once in a semester
5.	Assignment (Unit 2)	Once in a semester
6.	Quiz 1 (Unit 3)	Once in a semester
7.	Quiz 1 (Unit 4)	Once in a semester
8.	Other Component (Unit 5)	Once in a semester

Course designed by 1.Dr.Sr.A. Stanis Arul Mary 2.Dr. K. Vaiyomathi	**Verified by HOD** Dr. K. Julia Rose Mary
Checked by CDC: Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

MEMBERS OF BOARD OF STUDIES

Dr. D. Jayanthi Assistant Professor(SG) , Department of Mathematics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore-43	**Dr. N. Murugesan** Assistant Professor(SS) , Department of Mathematics, Government Arts College, Coimbatore -18	**Dr. C. Janaki** Assistant Professor(SS) , Department of Mathematics, Government Arts College for Women, Coimbatore -18	**Mr. T. Vibu** Managing Partner, Rel Agencies, Coimbatore	**Ms. J. Magdalene** Project Manager, Robert Bosch,Keeranatham, Saravanampatti, Coimbatore-35

SEMESTER II

COURSE CODE: 24UMA2C04

TITLE OF THE COURSE: CORE IV: DISCRETE MATHEMATICS

[Employability]

COURSE OBJECTIVES

- To understand the concepts of theory of inference, lattices and Boolean algebra
- To inculcate the knowledge to design the deterministic finite state and non-deterministic finite state automata.
- To recall relations and functions to extend the idea of graphs.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1	Understand the concept of mathematical logics and normal forms	**K2**
CO 2	Understand the theory of inference for the statement calculus and predicate calculus	**K2**
CO 3	Designing the concept of relations and ordering of a function	**K3**

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CO 4	Demonstrate some special lattices and extending the idea of Boolean algebra.	**K3**
CO 5	Applying structural designs using various patterns of graphs.	**K3**

SYLLABUS

Credits: 3 **Instructional Hours: 60**

UNIT I: MATHEMATICAL LOGIC AND NORMAL FORMS (K2) 12 hours

Mathematical Logic: Connectives: Negation – Conjunction – Disjunction - Statement Formulas and Truth Tables – Conditional and Biconditional- Well-Formed Formulas – Tautologies- Equivalence of Formulas- Duality Law – Tautological Implications. Normal Forms: Disjunctive Normal Forms – Conjunctive Normal Forms – Principal Disjunctive Normal Forms – Principal Conjunctive Normal Forms.

UNIT II: THE THEORY OF INFERENCE FOR THE STATEMENT CALCULUS (K2)

12 hours

The Theory of Inference for The Statement Calculus: Validity Using Truth Tables - Rules of Inference – Consistency of Premises and Indirect Method of Proof. The Predicate Calculus: Predicates – The Statement Function, Variables and Quantifiers – Predicate Formulas – Free and Bound Variables – The Universe of Discourse. Inference Theory of The Predicate Calculus: Valid Formulas and Equivalences – Some Valid Formulas Over Finite Universes – Special Valid Formulas Involving Quantifiers- Theory of Inference for The Predicate Calculus.

(Self Study: Formulas involving more than one quantifiers)

UNIT III: RELATIONS AND ORDERING (K3) 12 hours

Relations And Ordering: Relations – Properties of Binary Relations in A Set – Relation Matrix and The Graph of a Relation – Partition and Covering of a Set – Equivalence Relations – Composition of Binary Relations. Functions: Definition And Introduction – Composition of Functions – Inverse Functions.

UNIT IV: LATTICES AND BOOLEAN ALGEBRA (K3) 12 hours

Lattices And Boolean Algebra: Introduction – Poset - Lattices – Boolean Algebra – Simplification of Boolean Functions by the Map Method

(Self Study: Direct Product and homomorphism of Boolean Algebra)

UNIT V: GRAPH THEORY (K3) 12 hours

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Graph Theory: Introduction – Undirected Graph – Directed Graph – Trees – Matrix Representation of Graphs.

(Beyond The Curriculum: Some Graph Optimization Problems)

TEXT BOOKS:

1. Tremblay J.P and Manohar,R.P, (2007), Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill Publications, New Delhi.

Unit I : Chapter 1: Section: 1.2.1 to 1.2.4, 1.2.6 to 1.2.11, 1.3.1 to 1.3.4.

Unit II: Chapter 1: Section: 1.4.1 to 1.4.3, 1.5.1 to 1.5.5, 1.6.1 to 1.6.4

Unit III: Chapter 2: Section: 2.3.1 to 2.3.5, 2.3.7, 2.4.1 to 2.4.3.

2. Sundaresan V, Ganapathy Subramanian K.S and Ganesan K, (2002),Discrete Mathematics, A.R. Publications, Tamil Nadu.

Unit IV: Chapter 6: Section: 6.1 to 6.4

Unit V: Chapter 5: Section: 5.1 to 5.5

REFERENCE BOOKS:

1. Yadav S.K, (2016), Discrete Mathematics with Graph theory, Ane Books Pvt Ltd, New Delhi.

2. NarSinghDeo, (1979), Graph Theory for Computer Science & Engineers, PHI, India.

3. Sharma J.K, (2005), Discrete Mathematics, (2nd edition), MacMillan India Ltd.

4. Richard Johnsonbaugh, (1997), Discrete Mathematics (4th edition), Prentice Hall, New York

BLENDED LEARNING

UNIT	TOPICS	LINKS
III	Relations	https://youtu.be/FI6j5QZNVx0?si=uXgd1rxSv6zzsDjt
	Ordering	https://youtu.be/buXrxLfaF94?si=kex_gboS27NMM9O-

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IV	Properties of lattices	https://www.youtube.com/watch?v=c6ARWh6lVgc

MAPPING OF CO'S WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	3	2	3	2	3	3	2	2	3	3	2
CO2	2	3	3	3	2	3	2	3	3	2	2	2	2	2
CO3	3	3	2	3	3	3	2	2	2	3	2	3	3	2
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	2
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	2

(Correlation: 3-High ; 2-Medium ;1-Low**)**

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Online quiz (Unit III & IV)	Twice in a semester
7.	Group project (Unit V)	Once in a semester

Course designed by 1. Dr. K. Juilia Rose Mary 2. Dr. L. Mariapresenti	**Verified by HOD:** Dr. K. Juilia Rose Mary
Checked by CDC: Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

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Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

POST GRADUATE PROGRAMME-M.Sc MATHEMATICS
CHOICE BASED CREDIT SYSTEM (CBCS PATTERN)
(for the candidates admitted from the academic year 2023-2024 onwards)

Sem	Course Code	Title of the Course	Nature of Course	IH	CP	Exam Hrs	CIA	ESE	Total
I	23PMA1C01	ALGEBRA	CC	6	4	3	25	75	100
	23PMA1C02	REAL ANALYSIS	CC	6	4	3	25	75	100
	23PMA1C03	ORDINARY DIFFERENTIAL EQUATIONS *[Skill Development]*	CC	6	4	3	25	75	100
	23PMA1C04	NUMERICAL ANALYSIS WITH MATLAB *[Skill Development]*	CC	6	4	3	25	75	100
	23PMA1E01 / 23PMA1E02	PYTHON PROGRAMMING *[Employability & Industry 4.0]*/ ANALYSIS OF ALGORITHMS	DSE	6	4	3	25	75	100
II	23PMA2C05	COMPLEX ANALYSIS	CC	5	4	3	25	75	100
	23PMA2C06	PARTIAL DIFFERENTIAL EQUATIONS *[Skill Development]*	CC	5	4	3	25	75	100
	23PMA2C07	CONTROL THEORY *[Employability]*	CC	5	4	3	25	75	100
	23PMA2C08	GRAPH THEORY *[Employability]*	CC	5	4	3	25	75	100
	23PMA2C09	FORMAL LANGUAGES AND AUTOMATA	CC	5	4	3	25	75	100
	23PMA2E01 / 23PMA2E02	OPTIMIZATION TECHNIQUES *(Entrepreneurship & Industry 4.0)*/ STOCHASTIC PROCESSES	DSE	5	4	3	25	75	100
		SUMMER INTERNSHIP	-	-	2	-	-	-	-

06/06/23	6/6/23	6/6/23		6/6/23
Dr. D. Jayanthi	**Dr. N. Murugesan.**	**Dr. C. Janaki**	**Mr. T. Vibu**	**Ms. J. Magdalene**

III	23PMA3C10	TOPOLOGY	CC	5	4	3	25	75	100
	23PMA3C11	MECHANICS *[Employability]*	CC	5	4	3	25	75	100
	23PMA3C12	PROBABILITY THEORY & MATHEMATICAL STATISTICS *[Employability]*	CC	5	4	3	25	75	100
	23PMA3C13	MATHEMATICAL METHODS	CC	5	4	3	25	75	100
	23PMA3C14	MATHEMATICAL ANALYSIS *[Innovation]*	CC	6	5	3	25	75	100
	23PMA3E01 / 23PMA3E02	FINANCIAL MATHEMATICS *[Skill Development]*/ MATHEMATICAL SOCIAL SCIENCES	DSE	4	4	3	25	75	100
IV	23PMA4C15	FUNCTIONAL ANALYSIS	CC	6	4	3	25	75	100
	23PMA4C16	FLUID DYNAMICS *(Entrepreneurship & Industry 4.0)*	CC	6	4	3	25	75	100
	23PMA4C17	NUMBER THEORY & CRYPTOGRAPHY *(Entrepreneurship)*	CC	6	4	3	25	75	100
	23PMA4E01 / 23PMA4E02	FUZZY MATHEMATICS *(Entrepreneurship & Industry 4.0)* / DIFFERENTIAL GEOMETRY	DSE	6	4	3	25	75	100
	23PMA4PV	PROJECT		6	5		25	75	100
		TOTAL		**120**	**90**		**550**	**1650**	**2200**
	GEN: 20PDIS404	DIGITAL SECURITY		2	2	2HRS	-	50	50
	GEN:	MOOC			2	-	-	-	-
		GRAND TOTAL		**120 +2**	**90 +2 +2**				**2200 +50**

IH- Instructional Hours, **CP**- Credit points,
CIA-Continuous Internal Assessment, **ESE**- End Semester Examination

06/06/23	6/6/23	6/6/23		6/6/23
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SEMESTER: III

COURSE CORE: 23PMA3C10

TITLE OF THE COURSE: CORE -TOPOLOGY

COURSE OBJECTIVES:

- To study the basic concepts of closures, continuity and connectedness of spaces.
- To enable the students to gain mathematical maturity and to make them competent in writing proofs.
- To motivate the students to take up research in the area of Analysis, Geometry and Fuzzy theory.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1	define topological spaces, basis, Order topology, Product topology, closed sets ,limit points and theorems based on it	**K2**
CO2	be familiar with the continuous functions and various methods for imposing topologies on sets	**K2**
CO3	acquire knowledge about connectedness and its properties	**K3**
CO4	understand the concept of Compact spaces and compact subspaces of the real line	**K4**
CO5	explain countability axioms,separation axioms and normal spaces and theorems based on it	**K4**

SYLLABUS

Credits: 4 **Instructional Hours:75**

UNIT I: TOPOLOGICAL SPACES (K2) **15 Hours**

Topological Spaces - Basis for a Topology : Basis-Standard topology - Lower limit topology - K-topology - subbasis for a topology – The Order Topology –Product Topology on $X \times Y$ – Subspace topology - closed Sets and LimitPoints: closure and interior of a set - Limit points- Hausdorff spaces.

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UNIT II: CONTINUOUS FUNCTIONS (K2) **15 Hours**

Continuous Functions: Continuity of a function – Homeomorphism - Rules for constructing continuous function - Pasting lemma - Maps into Products – The Product Topology: Comparison of box and product topologies -The MetricTopology:Euclidean metric - Square metric - uniform metric - Sequence lemmaUniform Limit theorem.

(Self Study: Examples on Metrizable Spaces)

UNIT III: CONNECTEDNESS(K3) **15 Hours**

Connected spaces – Connected subspaces of the real line - Intermediate Value theorem - Components and Local Connectedness.

(Self Study: Examples on Connected Spaces)

UNIT IV: COMPACTNESS (K4) **15 Hours**

Compactness: Compact Spaces – The tube Lemma-Compact subspaces of the real line: Extreme Value Theorem -The Lebesgue number lemma - Uniform continuity theorem - Limit Point compactness – Local Compactness - The Tychonoff theorem – The stone – Cech Compactification.

UNIT V: COUNTABILITY AND SEPARATION AXIOMS(K4) **15 Hours**

Countability and Separation Axioms: The Countability axioms -The first Countability axioms -The second Countability axioms – The Separation Axioms – Normal spaces – The Urysohn's Lemma – The Urysohnmetrization theorem –The Tietze extension theorem.

[Beyond the Curriculum – Imbedding of Manifolds]

TEXT BOOK:

1. James R.Munkers, (2000),Topology, (Second edition), Prentice Hall of India Pvt, Ltd. New Delhi.

UNIT I Chapter 2 Sections 12 – 17
UNIT II Chapter 2 Sections 18 – 21
UNIT III Chapter 3 Sections 23 – 25
UNIT IV Chapter 3 Sections 26 – 29
Chapter 5 Sections 37 & 38
UNIT V Chapter 4 Sections 30 – 35

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REFERENCE BOOKS:

1. Dugundji.J, Allyn and Bacon, (1966),Topology, Reprinted in India by Prentice Hall of India Pvt. Ltd.
2. George F. Simmons, (1963), Introduction to topology and Modern Analysis, Mcgraw Hill Book Company.
3. Joshi.K.D, (1989),General topology, Gian Publication House, New Delhi.
4. Chandrasekhara Rao.K, (2009 Reprint 2017), Topology, Narosa Publishing House.

BLENDED LEARNING

UNIT	TOPICS	LINKS
IV	Limit point Compactness and Local Compactness	https://youtu.be/H6QY7VMUlTM
V	Urysohn Metrization theorem:	https://youtu.be/FyYmppkacu0
	Urysohn lemma:	https://youtu.be/M4K8Lm5v4_U
	Tietze Extension theorem	:https://youtu.be/v3yE5E9yLwQ

MAPPING OF CO's WITH PO's and PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	3	3	3	3	3	3	2	2	2	2	2	2	3	3	3
CO2	3	3	3	3	3	3	2	2	2	2	2	2	3	3	3
CO3	3	3	3	3	3	3	2	2	2	2	2	2	3	3	3
CO4	3	3	3	3	3	3	2	2	2	2	2	2	3	3	3
CO5	3	3	3	3	3	3	2	2	2	2	2	2	3	3	3

Correlation: 3-High 2-Medium 1-Low

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Group Discussion (Unit V)	Once in a semester

Course designed by Dr. M. Trinita Pricilla	**Verified by HOD** Dr. K. Julia Rose.Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

SEMESTER: III

COURSE CODE: 23PMA3C11

TITLE OF THE COURSE: CORE -MECHANICS

[Employability]

COURSE OBJECTIVES:

- To create an awareness of the beauty and excitement of Mechanics as a fundamental aspect of man's knowledge.
- To become acquainted with mathematical technologies and procedures which are useful in other fields of Physics.
- To understand and appreciate the working of objects - motion of rockets etc.

COURSE OUTCOMES

At the end of the course the students will be able to

CO1	Describe about Constraints and get a simplified attempt at an axiomatic formulation of the basic concepts of Mechanics.	**K2**
CO2	Understand variational principles and Lagranges equations.	**K2**
CO3	Explain Hamiltons Equations of Motion and its interpretations.	**K3**
CO4	Summarize the equations of Canonical transformations and discuss integral invariants.	**K3**
CO5	Investigate Hamilton Jacobi Theory and discuss its study in detail.	**K4**

SYLLABUS

Credits: 4 **Instructional Hours: 75**

UNIT I Survey of elementary principles:(K2) **15 Hours**

Constraints-Generalized co-ordinates - Holonomic and non-holonomic systems - Scleronomic and Rheonomic systems - D'Alembert's Principle and Lagrange's equations – Velocity dependent potentials and the dissipation function - Some applications of the Lagrange

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formulation.

(Self Study- Holonomic and non-holonomic systems)

UNIT II Variation principles and Lagrange's equations:(K2) 15 Hours

Hamilton's principle-Some techniques of calculus of variations- Derivation Lagrange's equations from Hamilton's principle-Extension of Hamilton's principle to non-holonomic systems-Conservation theorems and symmetry properties.

UNIT III Hamilton Equations of motion (K3) 15 Hours

Legendre Transformations and the Hamilton Equations of motion - Canonical equation of Hamilton - Cyclic coordinates and conservation theorems - Routh's procedure Derivation of Hamilton's equation from a variational principle -The principle of Least Action. conversion of Lagrange's into Hamilton and vice versa

UNIT IV Canonical transformations (K3) 15 Hours

The equations of Canonical transformations - Examples of Canonical transformations - Poisson brackets and other canonical invariants -

(Self Study- Integral invariants of Poincare Lagrange brackets)

UNIT V Hamilton Jacobi Theory (K4) 15 Hours

Hamilton Jacobi Equations for Hamilton's principal function-Harmonic oscillator problem - Hamilton-Jacobi equation for Hamilton's characteristic function - Separation of variables in the Hamilton - Jacobi equation.

(Beyond the Curriculum: Ignorable coordinates and Kepler Problem)

TEXTBOOK:

1. H.Goldstein, (2001), Classical Mechanics (Second Edition), Narosa Publishing House, New Delhi.
   - UNIT I Chapter 1: 1.3 to 1.6
   - UNIT II Chapter 2: 2.1 to 2.4, 2.6
   - UNIT III Chapter 8: 8.1 to 8.3, 8.5, 8.6
   - UNIT IV Chapter 9: 9.1, 9.2, 9.4
   - UNIT V Chapter 10: 10.1 to 10.4.

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

REFERENCE BOOKS:

1.A.S.Ramsey, (1972), Dynamics part II, The English Language Book Society and Cambridge University Press.

2.F.Gantmacher, (1975), Lectures in Analytic Mechanics, MIR Publishers, Moscow.

3.I.M.Gelfand and S.V. Fomin, (2000), Calculus of Variations, Prentice Hall.

4. S.L.Loney, (1979), An Elementary Treatise on Statics, Kalyani Publishers, New Delhi.

BLENDED LEARNING

UNIT	**TOPICS**	**LINKS**
III	Lagrangian to Hamiltonian	-https://youtu.be/F-SlKwVfmEo
IV	Canonical Transformations	https://youtu.be/OLgYGv-EYIQ
	Poisson bracket	https://youtu.be/M13xA6VxhgM -https://youtu.be/YwRs8AbTzQk
	Lagrangian Brackets	https://youtu.be/lOzlAqXEzlI
V	Hamilton Dynamics	-https://youtu.be/J1otrzmNBVQ https://youtu.be/wI6tj57VXcI -https://youtu.be/lMeVRvZJDuQ
	Hamilton-Jacobi equation	-https://youtu.be/l2OCE-Zd0dk -https://youtu.be/UTSwHLXNvsc
	Generating functions	https://youtu.be/yotdDcEJ8aw https://youtu.be/K2ffByObIxk https://youtu.be/aUrZ3OwCIzU
	Hamilton's characteristic function and harmonic oscillator solved using Hamilton Jacobi theory	https://youtu.be/hvE6gxD2wYs

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MAPPING OF CO's WITH PO's and PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	3	3	3	3	3	3	2	2	3	2	3	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	2	3	2	3	3	3
CO3	3	3	3	2	3	3	2	2	3	3	3	2	3	3	3
CO4	3	3	3	2	3	3	2	2	3	3	3	2	3	3	3
CO5	3	3	3	2	3	3	2	2	3	3	3	2	3	3	3

Correlation: 3-High 2-Medium 1-Low

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Real time Problem solving (Unit V)	Once in a semester

Course designed by Dr. F. Nirmala Irudayam	**Verified by HOD** Dr. Dr. K. Julia Rose.Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

SEMESTER: III

COURSE CODE: 23PMA3C12

TITLE OF THE COURSE: CORE - PROBABILITY THEORY AND MATHEMATICAL STATISTICS

[Employability]

COURSE OBJECTIVES:

- To understand the concepts of Random Variable, Distribution function and its expected values.
- To estimate the moments, Probability generating function of Distribution using characteristic functions.
- To estimate the different types of estimates of Distribution.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1	Differentiate the types of Random Variables and its Distribution.	**K2**
CO2	Estimate the moments, Semi Invariance and Probability generating function of different distributions.	**K2**
CO3	Differentiate the types of Distribution and Evaluating moments.	**K3**
CO4	Select a particular significant test for a given problem.	**K3**
CO5	Estimate the different types of estimates.	**K4**

SYLLABUS

Credits: 4 **Instructional Hours: 75**

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UNIT I: Random Variables and its Distribution (K2) **15 hours**

Sample space and Events – Probabilities defined on events – Conditional Probabilities – Independent Events – Baye's formula - Random Variables – Discrete Random Variables – The Bernoulli Random Variable – The Binomial Random Variable – The Geometric Random Variable - The Poisson Random Variable - Continuous Random Variables – The Uniform Random Variable - The Exponential Random Variable - Normal Random Variables Expectation of a random variable.

(*Self Study –*Sample space and events, Conditional Probabilities)

UNIT II: **Jointly Distributed Random Variables (K2)** **15 hours**

Jointly distributed random variables – Independent random variables – Covariance and Variance – Properties of Covariance – Joint Probability distributions of functions of Random Variables - Moment Generating Functions upto Example 2.46

UNIT III: The Multivariate Normal Distribution (K3) **15 hours**

The Poisson Paradigm Example 2.47 - The multivariate normal distribution Example 2.48 The Joint Distribution of sample mean and sample variance from a normal population upto Proposition 2.5 - Limit Theorems Chebyshev's Inequality – Strong law of Large Numbers – Central Limit Theorem – Normal Approximation to Binomial – Stochastic Processes.

UNIT IV: Significance Tests(K3) **15 hours**

Sample moments and their functions – the notion of a sample – the notion of a Statistic – The distribution of the arithmetic mean of independent normally distributed random variables – the χ^2 distributions – the distributions of Statistic (X, S) – Student's t distributions – Fisher's Z distribution – Significance test – Concept of a statistical test – Parametric test for small samples – parametric tests for large samples – the χ^2test

(Self Study- Independence tests by contingency tables)

UNIT V: Theory of Estimation (K4) **15 hours**

The Theory of Estimation – preliminary notions – consistent estimates – unbiased estimates – the sufficiency of an estimate – the efficiency of an estimate – Asymptotically most efficient estimates – methods of finding estimates – confidence intervals – Theory of hypothesis testing – Preliminary remarks – the power functions and OC functions

(Beyond the Curriculum: Neymann's factorisation criterion for sufficient estimator)

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TEXT BOOKS

1. Introduction to Probability Models, 10th Edition, Author: Sheldon M.Ross, Elsevier, Academic Press is an imprint of Elsevier, 30 Corporate Drive, Suite 400, Burlington, MA 01803, USA, 2010

   UNIT I : Sections: 1.2 to 1.6 & 2.1 to 2.4 Pages: 1 to 15 & 21 to 44

   UNIT II : Sections: 2.5 to Example 2.46 Pages: 44 to 68

   UNIT III: Sections: Example 2.47 to Proposition 2.5 & 2.8 to 2.9

   Pages: 68 to 74 & 77 to 86

2. Probability Theory and Mathematical Statistics, 3rd Edition, Author: MAREK FISZ, Robert E. Krieger Publishing Company, Malabar, Florida, Reprint 1980

   UNIT IV: Sections: 9.1 to 9.7 & 12.1 to 12.4 Pages: 335 to 357 & 425 to 445

   UNIT V: Sections: 13.1 to 13.8 Pages:461 to 494

REFERENCE BOOKS:

1. S.P.Gupta, **(**2014), Statistical Methods, Edition 43, Sultan Chand and Sons.
2. S.C Gupta & V.K Kapoor, (2015), Fundamentals of Mathematical Statistics (4th edition), Published by Sultan Chand Sons, New Delhi.
3. Dr.Parimal Mukhopadhyay, (2015), Mathematical Statistics, New Central Book Agency,Calcutta.
4. V.K.Rohatgi, **(**2015**),** An Introduction to Probability theory and Mathematical Statistics , Wiley Eastern Ltd,,Delhi.
5. T Veerarajan, (2017), Fundamentals of Mathematical Statistics, Yes Dee Publishing Pvt. Ltd, Ambattur Industrial Estate, Chennai

BLENDED LEARNING

UNIT	**TOPICS**	**LINKS**
I	Random Variables and Distributions:	https://youtu.be/UftY0e2ilM4
	Continuous random Variable:	https://youtu.be/VsUJwyK9wlo
III	Stochastic Processes:	https://youtu.be/TuTmC8aOQJE

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MAPPING OF CO's WITH PO's and PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	3	2	2	3	2	3	3	2	2	3	2	2	3	3	3
CO2	3	2	2	3	2	3	3	2	2	3	2	2	3	3	3
CO3	3	2	2	3	2	3	3	2	2	3	2	2	3	3	3
CO4	3	2	2	3	2	3	3	2	2	3	2	2	3	3	3
CO5	3	2	2	3	2	3	3	2	2	3	2	2	3	3	3

Correlation: 3-High 2-Medium 1-Low

ASSESSMENT TOOLS:

S.No	**Assessment methods**	**Frequency of Assessment**
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Field Survey (Unit V)	Once in a semester

Course designed by Dr. A. Arokia Lancy	**Verified by HOD** Dr. K. Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

SEMESTER: III

COURSE CODE :24PMA3C13

TITLE OF THE COURSE: CORE13 -MATHEMATICAL METHODS

COURSE OBJECTIVES:

- To solve the integral equations which arise in the field of Science and Engineering in a simpler way.
- To solve the differential and integral equations in the field of integral transforms.
- To find the solution for initial value and boundary value problems

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1	Resolve Fourier cosine and sine transform	K2
CO2	Solving Parseval's Theorem for cosine and sine transforms and Diffusion Equation	K2
CO3	Construct Hankel transforms and implement Parseval's relation.	K3
CO4	Compile integral equations using approximate method and analyze the Volterra equation	K4
CO5	Demonstrate initial value and boundary value problems using Abel's Integral equation and Euler's equation and functional of the integral transform	K4

SYLLABUS

Credits: 4 **Instructional hours: 75**

UNIT I Integral transform (K2) **15 hours**

Integral transform: Fourier cosine and sine transforms - Fourier transform of derivatives – The calculation of the Fourier transforms of some simple functions -

[Self-Study: Examples of Fourier Sine transforms]

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UNIT II Integral transform (K2) **15 hours**

The Convolution integral –Parseval's Theorem for cosine and sine transforms - Solution of PDE by means of Fourier transform - The Linear Diffusion Equation on a semi - infinite line - The two dimensional diffusion equation.

UNIT III Hankel transforms(K3) **15 hours**

Hankel transforms: Elementary Properties of Hankel Transforms -The Hankel inversion theorem – Hankel transforms of derivatives of functions (proof is deleted) –The Parseval's relation for Hankel transforms - Relations between Fourier and Hankel transforms - The use of Hankel Transforms in the solution of PDE.

UNIT IV Integral equations with Separable Kernels (K3) **15 hours**

Integral equations: Reduction to a system of algebraic equations-Examples-Fredholm alternatives- Examples – An approximate method - **Method of successive approximations** – Volterra integral equation - Examples.

UNIT V Application to ordinary differential equations(K4) **15 hours**

Application to ordinary differential equations – Initial value problems-Boundary value problems-Examples. **The Calculus of Variations:** Variation and its properties - Euler's equation - Functionals of the form - Functional dependent on higher order derivatives

(Beyond the Curriculum: Singular integral equations - Abel Integral equation- Examples)

TEXT BOOKS:

1.Ian.N.Sneedo, (1972), The use of integral equations first edition, TATA McGrawHill Publishing company limited, New Delhi.

UNIT I Chapter 2: 2.4 - 2.7,
UNIT II Chapter 2: 2.9 - 2.10, 2.16 – 2 (a),(b),(c)
UNIT III Chapter 5: 5.2 - 5.4, 5.6 - 5.7,

2.Ram.P.Kanwal, Linear integral equations theory and technique, Second edition, ,Birkhauser Publishers

UNIT IV Chapter 2: 2.1 - 2.5, Chapter 3: 3.3 - 3.4.
UNIT V Chapter 5: 5.1 - 5.3,

3. Elsgolts.L,(1970), Differential equations and calculus and variations MIR Publishers, Moscow, Russia

UNIT V Chapter 6: 6.1 - 6.4.

REFERENCE BOOKS:

1. Tricomi, F.G, (1985), Integral equation Dover Publications.

2. Parashar B.P, (2008), Differential and Integral equation II edition, CBS Publications &Distributions PVT Ltd.

3. Gelfand I.M, (2003), Calculus of variation University Press of Pacific.

4. Bolza, (1960), Lectures on the calculus of variations, Oskar published by Chelsea, Newyork.

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BLENDED LEARNING

UNIT	TOPICS	LINKS
IV	Introduction to Boundary Value Problem	https://youtu.be/AnyGw-gOY0U
V	Calculus of Variation	https://youtu.be/6HeQc7CSkZs
	Eulers Equation	https://youtu.be/oTRq9uIBOmY

MAPPING OF CO's WITH PO's and PSO's

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CO1	3	2	2	2	3	2	3	2	2	2	3	3	3	3	3
CO2	3	2	2	2	2	2	2	2	2	2	3	3	3	3	3
CO3	3	3	2	2	2	2	2	3	3	2	2	3	3	3	3
CO4	3	2	2	2	3	3	2	3	2	2	3	3	2	3	3
CO5	3	3	2	2	3	2	3	2	3	2	3	3	2	3	3

Correlation: 3-High 2-Medium 1-Low

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Real time Problem solving (Unit V)	Once in a semester

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Course designed by Dr.K.Julia Rose Mary	**Verified by HOD** Dr. U.Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

MEMBERS OF BOARD OF STUDIES

Dr. D. Jayanthi Assistant Professor(SG) , Department of Mathematics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore-43	**Dr. N. Murugesan** Assistant Professor(SS) Department of Mathematics, Government ArtsCollege, Coimbatore - 18,	**Dr. C. Janaki** Assistant Professor(SS) , Department of Mathematics, Government Arts College for Women, Coimbatore -18	**Mr. T. Vibu** Managing Partner, Rel Agencies, Coimbatore	**Ms. J. Magdalene** Project Manager, Robert Bosch,Keeranatham, Saravanampatti, Coimbatore-35

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SEMESTER: III

COURSE CODE: 23PMA3C14

TITLE OF THE COURSE: CORE – MATHEMATICAL ANALYSIS

[Innovation]

COURSE OBJECTIVES:

- To develop logical reasoning in connectedness, compactness in metric spaces
- To give a vivid picture of vector spaces and to have a matrix representation of linear transformations
- To understand the advance level of Analysis and Calculus

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1	Understand elementary real analysis concepts of sequences and series	**K2**
CO2	Understand vector spaces in detail with its applications	**K2**
CO3	Apply theoretical proofs of complex analysis to solve problems	**K3**
CO4	Apply the variational methods for boundary value problems	**K3**
CO5	Analyse the difference between Volterra and Fredholm Equations	**K4**

SYLLABUS

Credits: 5 **Instructional Hours: 90**

UNIT – I Real Analysis (K2) **18 Hours**

Analysis: Elementary set theory, finite, countable and uncountable sets, Archimedean property, supremum, infimum. ,limsup, liminf.,Continuity, uniform continuity, differentiability, mean

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value theorem. Sequences and series of functions, uniform convergence. Improper Integrals. Monotonic functions, types of discontinuity, functions of bounded variation, Metric spaces, compactness, connectedness. Normed Linear Spaces.

[Self Study:Metric Spaces,Normed linear spaces, function of bounded variation.]

UNIT – II Linear Algebra (K2) 18 Hours

Linear Algebra: Vector spaces: subspaces, linear dependence, linear independence, basis, Change of basis, dimension, Transformation: linear transformations, linear operator, non singular, invertible. Matrices: Algebra of matrices, rank and determinant of matrices, linear, eigenvalues and eigenvectors, Diagonalizable matrix, spectrum, Cayley-Hamilton theorem, Matrix representation of linear transformations. Canonical form: Jordan forms. Characteristic polynomial: minimal polynomial.

(Beyond the Curriculum: Quadratic forms, reduction, and classification of quadratic forms)

UNIT – III Complex Analysis (K3) 18 Hours

Complex Analysis: Properties of Complex numbers, analytic functions, C-R equations, Singularity, Cauchy Residue Theorem, Complex Integral, Liouville's Theorem, Bi linear transformation, Radius of Convergence, Laurents series, Taylor's series , Fundamental Theorem of Algebra, Cauchy's Integral formula, Open mapping theorem, Schwarz's lemma.

[Self Study: Casorati Weierstrass, Wierstrass Theorem, meromorphic functions, Identity theorem, Power series]

UNIT – IV Calculus of Variations (K3) 18 Hours

Calculus of Variations: Variation of a functional, Euler-Lagrange equation, Necessary and sufficient conditions for extrema. Variational methods for boundary value problems in ordinary and partial differential equations, Isometric problem.

UNIT – V Linear integral equations(K4) 18 Hours

Linear integral equation of the first and second kind of Fredholm and Volterra type, Solutions with separable kernels. Characteristic numbers and eigenfunctions, resolvent kernel, Wronskian. Fredholm integral equation

Note: 60 MCQ's should be given for the end semester examination

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TEXT BOOK :

1. "Mathematical Analysis", S. C. Malik, Savita Arora, New Age International, 1992
2. "A First Course in Mathematical Analysis" ,D. Somasundaram,Narosa Publishers , 1996
3. "Introduction To Real Analysis" Robert G. Bartle Donald R , Fourth Edition, John Wiley & Sons, 2011
4. "Complex Variables- Theory and Applications " , HS Kasana - The second edition, Prentice Hall India Pvt, 2005
5. "Foundations of complex analysis" , S. Ponnusamy, The second edition ,Oxford UK Alpha Science International , 2005
6. "Linear Algebra", Murray R. Spiegel, Seymour Lipschutz, John J. Schiller, Dennis Spellman, Shishir Gupta , Mcgraw Hill Education
7. "Matrices" ,A. R. Vasishtha, A. K. Vasishtha , Krishna Prakashan Media, 1991
8. "Differential Equations" , Shepley L. Ross , John Wiley and Sons , 1985
9. "Integral Equation & Boundary Value Problem" ,M.D. Raisinghania , Narosa Book Publishers , Third Edition , 2007.
10. "Advanced Engineering Mathematics" , R.K Jain , S.R.K Iyengar , Taylor & Francis, 2002

BLENDED LEARNING

UNIT	TOPICS	LINKS
II	Vector spaces:	https://youtu.be/4A3b8zORlg4
	Canonical form: Jordan forms-	ttps://youtu.be/GVixvieNnyc
V	Kernels	https://youtu.be/f1YeniD2wPE
	Fredholm Equation	https://youtu.be/rCWzF1yvZlQ

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MAPPING OF CO's WITH PO's and PSO's

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CO1	2	2	3	2	2	2	3	3	1	3	3	3	3	3	3
CO2	3	3	3	2	2	2	3	3	1	3	3	1	3	3	3
CO3	3	2	3	2	2	3	3	3	1	2	3	2	2	3	3
CO4	3	3	3	2	2	2	3	3	1	3	3	1	3	2	3
CO5	3	3	3	3	2	2	3	3	1	2	3	2	3	3	3

Correlation: 3-High 2-Medium 1-Low

ASSESSMENT TOOLS:

S.No	**Assessment methods**	**Frequency of Assessment**
1.	End Semester Examination	Once in a semester (ONLINE) : 60 MCQ's
2.	CIA I	Once in a semester(ONLINE)
3.	CIA II	Once in a semester(ONLINE)
4.	Model Examination	Once in a semester(ONLINE)
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Online Mock test for NET/SET (Unit V)	Once in a semester

Course designed by Sr.Stephy Stephen	**Verified by HOD** Dr.K. Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

SEMESTER III

COURSE CODE: 23PMA3E01

TITLE OF THE COURSE: ELECTIVE-FINANCIAL MATHEMATICS

Syllabus

OBJECTIVES:

- To lay theoretical foundation with potential applications to financial problems
- To provide efficient introduction to theoretical skills that are genuinely used in financial institutions

At the end of the course the students will be able to

Co1	Explain solving Probability and Normal Random variables	**K2**
Co2	Discuss interest rates and present value analysis with interpretations.	**K2**
Co3	Solve multiperiod Binomial model.	**K3**
Co4	Construct additional results on options.	**K3**
Co5	Analyze optimization model.	**K4**

SYLLABUS

Credits: 4 **Instructional Hours: 60**

Unit 1: (K2) **12 Hours**

Probability and Events - Conditional Probability - Random Variables and Expected Values - Covariance and Correlation - Continuous Random Variables - Normal Random Variables - Properties of Normal Random Variables - Central Limit *Theorem*

Self-Study: Probability and Events

Unit 2: (K2) **12 Hours**

Interest Rates - Present Value Analysis - Rate of Return - Continuously Varying Interest Rates - Options pricing - pricing Via Arbitrage.

Self Study:Problems in Interest ratio

Unit 3: (K3) **12 Hours**

The Arbitrage Theorem - Multiperiod Binomial Model – Proof of theArbitrage Theorem - The Black Scholes Formula - Properties of Black Scholes Option Cost.

Multiperiod Binomial Model :https://youtu.be/h9gT0q91XBA

The Black Scholes Formula : https://www.youtube.com/watch?v=VIHldsSmASU

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Unit 4: (K3) **12 Hours**

Call Options on Dividend Paying Securities - Pricing American Put Options - Estimating the Volatility Parameter - Limitations of Arbitrage Pricing - Valuing Investments by Expected utility - The Portfolio Selection Problem

Unit 5: (K4) **12 Hours**

Deterministic Optimization Models - Probabilistic Optimization Models - Investment Allocation Model - Barrier Options - Asian and Look back Options - Monte Carlo Simulation

Monte Carlo Simulation: https://youtu.be/OgO1gpXSUzU

Asian and Look back Options - https://www.youtube.com/watch?v=3wCyVgQe4fc

https://www.youtube.com/watch?v=uNdlxAuLjL8

Barrier Options: https://www.youtube.com/watch?v=YJOEd9DJ5J8

TEXT BOOK:

1. Sheldon M.Ross, An Introduction To Mathematical Finance, Cambridge press – 1999.

REFERENCES:

1. Martin. Boxter and Andrew Rennie, Financial Calculus: An Introduction to Derivative Pricing, Cambridge University press, 1996.
2. Alison Etheridge, A course in Financial Calculus, Cambridge University press, 2002.
3. Hull, Options, Futures and other Derivatives and Finance, Prentice hall, 6th edition.
4. Roman, Introduction to the Mathematics of Finance, Springer verlag, 2004
5. Gerber, Life Insurance Mathematics, Springer, 3rd edition. 6. Booth and Philip, Modern Actuarial Theory and Practice, Chapman and Hall.

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Mapping of CO's with PO's/ PSO's:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3
CO 1	H	H	H	H	H	H	M	M	H	H	H	M	H	L	M
CO 2	H	H	H	M	H	H	M	M	H	M	H	M	H	L	M
CO 3	H	H	H	M	H	H	H	M	H	H	H	M	H	L	M
CO 4	H	H	M	H	H	H	H	H	H	H	H	H	H	L	M
CO 5	H	H	H	M	H	H	M	M	H	H	H	H	H	L	M

Correlation : H-High, M-Medium, L-Low

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Assignment	Once in a semester
5.	Online Quiz	Once in a semester
6.	Seminar	Once in a semester
7.	Power Point Presentation	Once in a semester

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Course designed by Dr. A. Francina Shalini	**Verified by HOD** Dr.K. Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

SEMESTER: III

COURSE CODE: 23PMA3E02

TITLE OF THE COURSE: ELECTIVE-MATHEMATICAL SOCIAL SCIENCES

SYLLABUS

OBJECTIVES:

- To educate the students with a sample of available tools in Mathematics to study and analyse the social issues
- To give an experience in experimenting with the techniques.

COURSE OUTCOMES:

At the end of the course the students will have the ability to

CO1	Investigate and formulate hypothesis in social research	**K2**
CO2	Convert real world problems into graphs to arrive at the solution	**K2**
CO3	Establish standard measures using sampling	**K3**
CO4	Solve LPP and EOQ problems	**K3**
CO5	Evaluate real time problems in fuzzy environment	**K4**

SYLLABUS

Credits: 4 **Instructional Hours: 60**

UNIT 1: INTRODUCTION TO SOCIAL SCIENCES(K2) **12 Hours**

Some fundamental concepts in social sciences- Research, survey, investigation and experiment- Hypothesis in social research questionnaire-experimental design in social research. Examples from case studies.

Self Study:Examples from case studies.

UNIT 2: GRAPH THEORETIC TOOLS(K2) **12 Hours**

Conversion of issues to graphs- weighted graphs-popular models-Examples from case studies- Techniques used in Numerical Methods and examples from case studies.

Self Study:Weighted graphs

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UNIT 3: STATISTICAL TOOLS(K3) **12Hours**

Sampling and types of sampling- standard measures in statistics- examples from case studies.

Sampling Techniques: https://www.youtube.com/watch?v=bQ5_PPRPjG4

https://youtu.be/qNqrHO3woyE

UNIT 4: OR TOOLS (K3) **12 Hours**

Formulating the Linear Programming Problem- Simplex method- Transportation problem- North West Corner Rule- Least Cost Method- Mathematical representation of assignment problem- Optima solution to Assignment problem- Necessity for maintaining inventory- EOQ problems with deterministic and probabilistic demand- networks- graphs- spanning tree problems- shortest route problem- maximal flow problem- examples from case studies

EOQ problems with deterministic demand:
https://www.youtube.com/watch?v=8iAwz25wCkQ

maximal flow problem: https://www.youtube.com/watch?v=J0wzih3_5Wo

UNIT 5: FUZZY TOOLS (K4) **12 Hours**

Fuzzy -neural network models- examples from case studies

TEXT BOOKS:

1. Mojumdar.P.K, Research methods in Social sciences, Viva books Pvt ltd, 2005.
   Chapters: 2.1-2.3 , 3, 4.5 , 8.1, 8.2 8.8 17.4-17.7, 8.11
2. Bart Kosko, Neural networks and fuzzy systems, Prentice Hall of India, New Delhi, 2003.
   Chapters: 3,4 and 8.
3. Bondy and Murthy, Graph theory with applications.
   Chapters: 14,15.
4. Kandasamy and Thilagavathy, Numerical Methods.
5. Kanti Swarup, Operations research.

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REFERENCE BOOKS:

1. Fundamentals of Mathematical Statistics, Gupta and Kapoor
2. Operations research, Hamdy A Taha
3. Research Methodology, CR Kothari
4. Research Methodology, Gopal Lal Jain
5. Statistical Methods, J.N.Kapoor
6. Fuzzy sets and fuzzy logic, George J.Klir and Bo yuan
7. Theory of fuzzy sebsets, A. Kauffmann
8. Fundamentals of Neural networks, Laurene Fausett
9. Fuzzy sets and systems, Didier Dubois and Henri Prade.

Mapping of CO's with PO's /PSO's

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO 8**	**PO 9**	**PO1 0**	**PO 1 1**	**PO1 2**	**PS O 1**	**PSO2**	**PSO 3**
CO1	L	L	H	H	H	H	L	L	H	M	H	L	M	M	M
CO2	L	L	H	H	H	H	L	L	H	M	H	L	M	M	M
CO3	L	L	H	H	H	H	L	L	H	M	H	L	M	M	M
CO4	L	L	H	H	H	H	L	L	H	M	H	L	M	M	M
CO5	L	L	H	H	H	H	L	L	H	M	H	L	M	M	M

Correlation : H-High, M-Medium, L-Low

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ASSESSMENT TOOLS:

S.No	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a semester
2	CIA I	Once in a semester
3	CIA II	Once in a semester
4	Assignment	Once in a semester
5	Online Quiz	Once in a semester

Course designed by Dr. A. Francina Shalini	**Verified by HOD** Dr.K. Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

SEMESTER: IV

COURSE CODE: 23PMA4C15

TITLE OF THE COURSE: CORE - FUNCTIONAL ANALYSIS

COURSE OBJECTIVES:

- To have a basic knowledge about Banach spaces with examples
- To study different types of operators
- To understand the fundamentals of functional analysis and the concepts associated with the dual of a linear space.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1	Define Banach spaces, continuous linear transformation and illustrate the examples and theorems on it	**K2**
CO2	Develop the aspects of Hilbert spaces, orthogonal complements and orthonormal sets and their properties are derived	**K3**
CO3	Be familiar with the types of operators and projections	**K3**
CO4	Acquire knowledge about matrices and spectrum of an operator	**K4**
CO5	Be exposed to the basic concepts of Banach Algebra and derive the formula for spectral radius	**K4**

SYLLABUS

Credits: 4 **Instructional Hours:90**

UNIT I: BANACH SPACES (K2) **18 hours**

Banach spaces - The definition and some examples - Continuous Linear Transformation - The Hahn - Banach Theorem - The Natural Imbedding of N in N** - The Open Mapping Theorem.

UNIT II: CONJUGATE OPERATORS(K3) **18 hours**

The conjugate of an operator - Hilbert spaces – the definitions and some simple Properties - orthogonal complements - orthonormal sets.

(Self Study: Properties of Hilbert Spaces)

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UNIT III: TYPES OF OPERATORS(K3) **18 hours**

The conjugate space h* - the adjoint of an operator – self adjoint

Operators - normal and unitary operators - projections

(Self Study: Normal and Unitary Operators)

UNIT IV: MATRICES(K4) **18 hours**

Matrices - Determinants and the spectrum of an operator - the spectral theorem

UNIT V: BANACH ALGEBRA(K4) **18 hours**

The definition and some examples of banach algebras - regular and singular Elements - topological divisors of zero - the spectrum - the formula for the spectral radius.

[Beyond Curriculum – Radical and semi simplicity]

TEXT BOOK:

1. Simmons.G.F, (1963), Introduction to Topology and Modern Analysis, McGraw-Hill Book Company, London.

UNIT I	Sections 46 - 50
UNIT II	Sections 51 - 54
UNIT III	Sections 55 - 59
UNIT IV	Sections 60 - 63
UNIT V	Sections 64 – 68

REFERENCE BOOKS:

1. Lustermik L.A. and Sobolev V.J, (1974), Elements of Functional Analysis, Hindustan publishing corporation, New Delhi.
2. Taylor A.E, John Wiley and Sons, (1958), Introduction to Functional Analysis, New York.
3. Somasundaram.D,(2006), First Course in Functional Analysis, Narosa Publication House, Delhi.

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BLENDED LEARNING

UNIT	TOPICS	LINKS
I	Hahn-banach theorem:	https://youtu.be/1kw707GKBy8
	Open mapping theorem:	https://youtu.be/-s0nYqFvB6k
II	Hilbert spaces:	https://youtu.be/s1HeH7JJfGE
	Projection theorem and orthonormal set	https://youtu.be/0ccqsS9aTgg

MAPPING OF CO's WITH PO's and PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	3	3	3	3	3	3	2	2	2	2	2	2	3	3	3
CO2	3	3	3	3	3	3	2	2	2	2	2	2	3	3	3
CO3	3	3	3	3	3	3	2	2	2	2	2	2	3	3	3
CO4	3	3	3	3	3	3	2	2	2	2	2	2	3	3	3
CO5	3	3	3	3	3	3	2	2	2	2	2	2	3	3	3

Correlation: 3-High 2-Medium 1-Low

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Term Paper Presentation (Unit V)	Once in a semester

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Course designed by Dr. M. Trinita Pricilla	**Verified by HOD** Dr. K. Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

SEMESTER: IV

COURSE CODE: 23PMA4C16

TITLE OF THE COURSE: CORE - FLUID DYNAMICS

[Entrepreneurship & Industry 4.0]

COURSE OBJECTIVES:

- To devise and introduce fundamental aspects of fluid flow behaviour.
- To understand a great range of phenomena consisting of considerable complexity.
- To predict the reactions in many areas of practical importance which involve fluids.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1	describe and derive various measures of fluids, equation of continuity and boundary conditions.	**K2**
CO2	compute Euler' s momentum theorem, Bernouli's theorem, energy equation for inviscid fluid, Kelvin's theorem and Helmholtz Equation	**K2**
CO3	define two-dimensional motion & it functions, basic singularities, conformal transformation and Lift forces	**K3**
CO4	compute Navier –Strokes equations, steady flow through an arbitrary cylinder under various motions	**K4**
CO5	analysis the behavior of Laminar boundary layer in incompressible flow.	**K4**

SYLLABUS

Credits: 4 **Instructional Hours: 90**

UNIT I BERNOULLI'S EQUATION (K2) **18 Hours**

Introductory Notions - Velocity – Streamlines and path lines - Stream tubes and Filaments - Fluid Body Density – pressure - Differentiation following the fluid - Equation of continuity - Boundary Condition - kinematical and physical - Rate of change of linear Momentum - equation of motions.

[Self Study:Velocity]

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UNIT II Euler's momentum theorem (K2) **18 Hours**

Euler's momentum theorem - Conservative forces - Bernoulli's theorem - in Steady motion - Energy Equation for inviscid fluid – Circulation - Kelvin's theorem - Vortex motion - Helmholtz Equation**.**

UNIT III Two - dimensional motion(K3) **18 Hours**

Two - dimensional motion - Two dimensional functions - Complex potential basic singularities – Source – Sink – Vortex – Doublet- Circle theorem - flow past a Circular cylinder with Circulation - Conformal transformation - Blasius - lift force.

UNIT IV Dynamics of Real Fluids(K4) **18 Hours**

Viscous flow - Navier-Stokes Equations - Vorticity and Circulation in a viscous Fluid - Steady flow through an arbitrary cylinder under pressure-Steady Couette flow between cylinders in relative motion

(Self Study– Steady flow between parallel planes)

UNIT V Laminar Boundary Layer in incompressible flow: (K4) **18 Hours**

Laminar Boundary Layer in incompressible flow: Boundary Layer concept – Boundary Layer Equations – Displacement Thickness, Momentum Thickness – Kinetic energy Thickness – integral equation of boundary layer – Flow parallel to Semi-infinite flat plate – Blasius equation and its solution in series.

(Beyond Curriculum: How near to the stagnation point of a cylinder)

TEXT BOOKS:

1. Milne Thomson L.M., (1996), Theoretical Hydro Dynamics, Dovev Publications, New York.
   UNITS I & II: Chapter I 1.0-1.3
   Chapter III 3.10 – 3.53 (omit3.32, 3.44)
2. Curle N, Davies H. J, (1968), Modern fluid dynamics –VOL I, D.Van Nostrand Company Ltd., London.
   UNITS III & IV: Chapter 3: 3.1-3.7.5(omit 3.4 full and 3.5, 3.5.3)
   Chapter 5: 5.1-5.5.5
   Chapter 6: 6.1-6.3.1(omit 6.2.2)

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REFERENCE BOOKS:

1. Shanthi Swarup, (1990), Fluid Dynamics, (4th Edition), Krishna Prakasam Mandir, Meerut.
2. Rathy R. K, (1976), An Introduction to Fluid Dynamics, Oxford and IBH Publishing Company, New Delhi.
3. Kaufmann Walter, (1977), Fluid Mechanics, McGraw Hill Publishing Company Ltd., New Delhi.
4. Raisinghania M. D, (2003), Fluid Dynamics, (4th Edition), S Chand & Company, New Delhi.

BLENDED LEARNING

UNIT	TOPICS	LINKS
III	Lift Force:	https://www.youtube.com/watch?v=NKw1gPU-JNY
IV	Navier-Stokes Equations:	https://youtu.be/ERBVFcutl3M
V	Displacement Thickness, Momentum Thickness :	https://www.youtube.com/watch?v=h_vk0ZYMBVc

MAPPING OF CO's WITH PO's and PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	3	3	3	3	3	3	2	2	3	2	3	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	2	3	2	3	3	3
CO3	3	3	3	2	3	3	2	2	3	3	3	2	3	3	3
CO4	3	3	3	2	3	3	2	2	3	3	3	2	3	3	3
CO5	3	3	3	2	3	3	2	2	3	3	3	2	3	3	3

Correlation: 3-High 2-Medium 1-Low

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ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Real time Problem solving (Unit V)	Once in a semester

Course designed by Dr. K. Mohana	**Verified by HOD** Dr. K. Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER IV

COURSE CODE: 23PMA4C17

TITLE OF THE COURSE: CORE - NUMBER THEORY AND CRYPTOGRAPHY *[Entrepreneurship]*				
Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu**	**Ms. J. Magdalene**

OBJECTIVES:

1. To introduce the basic concepts of number theory.
2. To introduce the students to arithmetic topics, both ancient and very modern, which

have been at the center of interest in applications, especially in cryptography.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1	Explain some topics in elementary number theory	**K2**
CO2	Identify Finite Fields and Quadratic Residues	**K3**
CO3	Experiment with cryptography and public key Cryptography	**K3**
CO4	Apply Primality and Factoring	**K3**
CO5	Classify Elliptic Curves	**K4**

SYLLABUS

Credits: 4 **Instructional Hours: 90**

Unit I: Some Topics in Elementary Number Theory: **(K2)** **18 Hours**

Time estimates for doing arithmetic – Divisibility and the Euclidean algorithm – Congruences – Some applications to factoring .

[Self Study:Some applications to factoring]

Unit II: Finite Fields and Quadratic Residues: **(K3)** **18 Hours**

Finite fields – Existence of multiplicative generators of finite fields – Existence and uniqueness of finite fields with prime power number of elements – Explicit construction - Quadratic residues and reciprocity.

[Self Study:Finite Fields]

Unit III: Cryptography and Public Key Cryptography: **(K3** **18 Hours**

Some simple cryptosystems – Enciphering matrices - The idea of public key cryptography – RSA – Discrete log – Knapsack.

Unit IV: Primality and Factoring: **(K3)** . **18 Hours**

Pseudo primes – The rho method – Fermat factorization and factor bases – The continued

fraction method.

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Unit V: Elliptic Curves: **(K4)** **18 Hours**

Introduction – Basic facts – Elliptic curve cryptosystems – Elliptic curve primality test.

[Beyond the Curriculum: Applications of Elliptic Curves]

Text Book :

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1. Neal Koblitz, A course in number theory and cryptography, 2nd Edition, Springer Verlag, 1994.

Unit I: Chapter I: Sections: 1 – 4.

Unit II: Chapter II: Sections: 1 – 2.Unit

III: Chapter III: Sections: 1 – 2

Chapter IV: Sections: 1 – 4

Unit IV: Chapter V: Sections: 1 -4.

Unit V: Chapter VI: Sections: 1 -3.

Reference Books:

1. An Introduction to Number Theory and Cryptography, James, S. Kreft, Lawrence .C., Washington, Chapman &hall / CRC, 2nd edition, e – Book, 2013.
2. Herstein, I.N., Topics in Algebra, 2nd Edition, Wiley, 1975.
3. Introduction to Number Theory, Anthony Vazzana, Martin Erickson, David Garth, Chapman and Hall / CRC, 2nd edition, e – Book, 2007.
4. Tom M. Apostal, Introduction to Analytic Number Theory, Springer International Student Edition, 1989.
5. William Sallings, Cryptography and Network Security, 4th Edition, Prentice Hall, 2006.

BLENDED LEARNING

UNIT	TOPICS	LINKS
I	Euclidean algorithm	https://youtu.be/Af-DBwOjCD8 https://youtu.be/aOcZuHEeoaw
II	Quadratic residues	:https://youtu.be/0wJWvWh5TNM
V	Elliptic curve cryptosystems:	https://youtu.be/dCvB-mhkT0w

MAPPING OF CO's WITH PO's and PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	2	2	2	2	2	3	3	3	2	3	3	3	3
CO2	3	2	2	2	2	2	2	2	3	3	2	2	3	3	3
CO3	3	2	2	2	2	3	2	2	3	2	3	2	2	3	3
CO4	3	3	3	2	2	2	2	2	3	3	2	2	2	3	3
CO5	3	3	2	3	2	2	3	3	3	2	1	2	3	3	3

Correlation: 3-High 2-Medium 1-Low

Dr. D. Jayanthi Dr. N. Murugesan. Dr. C. Janaki Mr. T. Vibu Ms. J. Magdalene

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Real time Problem solving (Unit V)	Once in a semester

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Course designed by Dr.K. Mohana	**Verified by HOD** Dr. Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: IV

COURSE CODE: 23PMA4E01

TITLE OF THE COURSE: ELECTIVE - FUZZY MATHEMATICS

COURSE OBJECTIVES:

- To provide a strong foundation in understanding the basic concepts of Fuzzy sets and its arithmetic operations on intervals and on Fuzzy numbers
- To acquire a deeper understanding of the theory.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1	Differentiate between randomness and fuzziness, prospective of fuzzy variables, give own examples of different types of fuzzy sets.	**K2**
CO2	Formalize new operations on fuzzy sets based on t-norms and t-conorms.	**K3**
CO3	Establish fuzzy sets based on the given fuzzy numbers	**K3**
CO4	Define the domain, range and different types of functions on fuzzy sets.	**K3**
CO5	Evaluate real time problems in fuzzy environment	**K4**

SYLLABUS

Credits:4 **Instructional Hours: 90**

UNIT I Fuzzy sets (K2) **18 Hours**

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Fuzzy sets – basic types – basic concepts – ⟨cuts – additional properties of –⟨ cuts – extension principle of fuzzy sets

UNIT II Fuzzy Operations (K3) 18 Hours

Operation on fuzzy sets – types of operations – fuzzy complements – t norms- fuzzy unions – combinations of operations

(*Self Study : Combinations of operations*)

UNIT III Fuzzy arithmetic (K3) 18 Hours

Fuzzy arithmetic - fuzzy numbers-arithmetic operations on intervals - arithmetic operations on fuzzy numbers

UNIT IV Fuzzy relations (K3) 18 Hours

Fuzzy relations – binary relations – fuzzy equivalence relations - fuzzy compatibility relations - fuzzy ordering relations - fuzzy morphisms.

Fuzzy relations: https://youtu.be/3KnFQVj_k4I

Fuzzy morphism, :https://youtu.be/SsFU9TCDuSQ)

UNIT V Fuzzy relation equations (K4) 18 Hours

Fuzzy relation equations – general discussion – problem partitioning – solution method – fuzzy relation equations based on Sup – I compositions – fuzzy relations equation based on inf-$\rceil_i$ – compositions.

For fuzzy relation problems https://youtu.be/8_bbUT_V-3M)

For fuzzy relation equation https://youtu.be/-zJnGtgusG4)

(*Self Study : Fuzzy relations equation based on inf-$\rceil_i$ – compositions*)

TEXT BOOK

1. George.J. Klir / Bo Yuan, (2004), Fuzzy sets and Fuzzy logic Theory and Applications , Prentice Hall of India, New Delhi,

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UNIT I Sec 1.3, 1.4 and 2.1, 2.3
UNIT II Sec 3.1 - 3.5
UNIT III Sec 4.1, 4.3, 4.4
UNIT IV Sec 5.3, 5.5 - 5.8
UNIT V Sec 6.1 - 6.5

REFERENCE BOOKS:

1. Ganesh.M, (2015), Introduction to Fuzzy sets and Fuzzy Logic, (Seventh Edition),PHI Learning Private Limited, New Delhi.
2. Nanda.S and Das.N.R, (2014), Fuzzy Mathematical Concepts, (Second Edition), Narosa Publishing House Private Limited, New Delhi.
3. Hooda.D.S and Vivek Raich,(2015), Fuzzy Set Theory and Fuzzy Controller mathematical concepts, (First Edition), Narosha Publishing House Private Limited, New Delhi.
4. John Harris,(2010), An Introduction to Fuzzy Logic Applications, (First Edition), Springer Private Limited.

Mapping of CO's with PO's/ PSO's:

	PO 1	**PO 2**	**PO 3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO 8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	M	M	M	M	M	M	M	H	L	H	M	H	H	M	L
CO2	H	M	L	M	M	M	M	M	L	H	M	L	H	H	M
CO3	H	M	L	M	M	H	M	M	L	M	H	L	M	M	M
CO4	H	H	H	M	M	M	M	M	L	H	M	L	M	L	M
CO5	H	H	M	H	M	M	H	H	L	M	L	L	H	M	M

Correlation:H – High, M-Medium , L-Low

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Assignment	Once in a semester
5.	Online Quiz	Once in a semester
6.	Seminar	Once in a semester
7.	Power Point Presentation	Once in a semester

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

Course designed by Dr. Julia Rose Mary	**Verified by HOD** Dr. Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER IV

COURSE CODE: 23PMA4E02

TITLE OF THE COURSE: ELECTIVE – DIFFERENTIAL GEOMETRY

COURSE OBJECTIVES:

- To teach some applications of abstract algebra and analysis to geometrical problems and facts.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1	Interpret the analytical representation of various curves	**K2**
CO2	Explain the evolute and involute of different curves	**K2**
CO3	Construct the tangent and normal for all the curves using the theory of surfaces	**K3**
CO4	Analyze the concept of geodesics	**K4**
CO5	Classify the surface theory	**K4**

SYLLABUS

Credits: 4 **Instructional Hours: 90**

UNIT I CURVES (K2) **18 hours**

Curves – Analytical representation – Arc length, tangent – Osculating plane – Curvature – Formula of Frenet. Curves – Analytical representation – Arc length, tangent-

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Self Study: Arc length, tangent

Arc length :https://youtu.be/PK7HZiFG_VI

Formula for Frenet. -https://youtu.be/RL6VbMTJNYk

UNIT II NATURAL EQUATIONS(K2) 18 hours

Contact – Natural equations – General solution of the natural equations – Helics – Evolutes and Involutes.

Self Study:Evolutes

UNIT III THEORY OF SURFACES(K3) 18 hours

Elementary theory of Surfaces – Analytic representation – First Fundamental form – Normal, Tangent plane – Developable Surfaces.

UNIT IV GEODESICS(K4) 18 hours

Second Fundamental form – Meusnier Theorem – Euler's Theorem – Dupin's Indicatrix – Some surfaces – Geodesics – Some simple problems.

Geodesics – Some simple problems-

https://youtu.be/f8ACx2iN6fk

Meusnier Theorem -https://youtu.be/jIsn2M-A-t8

UNIT V SURFACE THEORY(K4) 18 hours

Equations of Gauss and Weingarten – Some applications of Gauss and theCoddazi equations – The Fundamental Theorem of Surface Theory.

TEXT BOOKS:

1. Dirk J. Struik, 'Lectures on Classical Differential Geometry', Second Edition, Addison Wesley Publishing Company, London, (1961).
   Chapters 1.1 to 1.11, 2.1 to 2.8 and 3.1 to 3.6

Dr. D. Jayanthi	**Dr. N. Murugesan.**	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

REFERENCES:

1. Willmore, 'An Introduction to Differential Geometry', Oxford University Press, London,(1972).
2. Thorpe, 'Elementary Topics in Differential Geometry', Second Edition, Springer Verlag, NewYork, (1985).
3. Mittal, Agarwal, 'Differential Geometry', Thirtieth Edition, Krishna Prakashan, Meerut,(2003).
4. Somasundaram, 'Differential Geometry', Narosa, Chennai, Reprint (2019)

Mapping of CO's and PO's/PSO's :

	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO 8**	**PO 9**	**P10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	H	M	H	M	M	H	L	M	L	L	H	H	H	M	H
CO2	H	M	H	M	H	H	M	M	L	L	H	H	H	M	H
CO3	H	M	H	M	H	H	M	M	L	L	H	H	H	M	H
CO4	H	M	H	H	H	H	M	M	L	L	H	H	H	M	H
CO5	H	L	H	H	H	H	H	H	L	H	H	H	H	M	H

Correlation: H-High M-Medium L-Low

ASSESSMENT TOOLS:

S.No	**Assessment methods**	**Frequency of Assessment**
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Assignment	Once in a semester
5.	Online Quiz	Once in a semester
6.	Seminar	Once in a semester
7.	Power Point Presentation	Once in a semester

Course designed by Dr. A.ArokiaLancy	**Verified by HOD** Dr. Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

SEMESTER IV

TITLE OF THE COURSE: GEN- DIGITAL SECURITY

COURSE CODE: 20PDIS404

Credits: 2 **Instructional Hours: 30**

UNIT–I: **Cyber Security** **5 Hours**

Introduction to Cyber Security- Attacks- security goals – Vulnerabilities – Methods of defense controls – Authentication – Malwares.

UNIT –II: Information security **6 Hours**

Components of an Information System – Program Security: Secure Programs - File Production Mechanisms – Database Security: Concepts of Database- Sensitive Data - Inference– Administrating Security: Security Planning – Protecting Programs and Data

UNIT- III: Network Security **7 Hours**

What is Network Security? : Types of Attacks - Networks concepts: Types of Transmission Media- Protocols – Types of Computer Networks- Network Security Controls – Firewalls: Software and Hardware Firewalls- Antivirus – Content Filtering- Web Security: Understanding the Risks - Security Awareness- Securing most Common Social Networking Sites- Encryption Techniques.

UNIT – IV: Cyber Crime and Terrorism **6 Hours**

Introduction to Cyber Crime –Where does the Cyber Crime Come From?- Types of Cyber Crime: Identity Theft- Psychological Tricks -Social Media Related Attacks- Digital Banking Frauds - Attacks through Mobile Application - Virus Attack on Personal Computer – Other Types of Attacks - General Tips to keep you safe – Cyber Terrorism and Security Measures.

UNIT –V: Cyber Law and Case Studies **6 Hours**

Overview of Cyber Law- Cyber Law in E-Commerce- Digital Signatures and Certificates- Information Technology Acts – Case Studies: Business Frauds- Bank Frauds – Facebook Frauds.

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

POST GRADUATE PROGRAMME-M.Sc MATHEMATICS
LEARNING OUTCOME BASED CURRICULUM FRAMEWORK under CBCS PATTERN
SYLLABUS & SCHEME OF EXAMINATION
(for the candidates admitted from the academic year 2024-2025 onwards)

Sem	Course Code	Title of the Course	Nature of Course	IH	CP	Exam Hrs	CIA	ESE	Total
I	23PMA1C01	ALGEBRA	CC	6	4	3	25	75	100
	23PMA1C02	REAL ANALYSIS	CC	6	4	3	25	75	100
	23PMA1C03	ORDINARY DIFFERENTIAL EQUATIONS ***[Skill Development]***	CC	6	4	3	25	75	100
	23PMA1C04	NUMERICAL ANALYSIS WITH MATLAB ***[Skill Development]***	CC	6	4	3	25	75	100
	24PMA1E01 / 24PMA1E02	PYTHON PROGRAMMING ***[Skill Development Employability & Industry 4.0]/*** ANALYSIS OF ALGORITHMS	DSE	3	2	3	10	40	50
	24PMA1EP1	PYTHON PROGRAMMING PRACTICALS ***[Skill Development Employability & Industry 4.0]/***	DSE	3	2	3	20	30	50
II	23PMA2C05	COMPLEX ANALYSIS	CC	5	4	3	25	75	100
	23PMA2C06	PARTIAL DIFFERENTIAL EQUATIONS ***[Skill Development***	CC	5	4	3	25	75	100

23/04/24	23/4/24	23/04/24		Absent
Dr. D. Jayanthi	**Dr. N. Murugesan.**	**Dr. C. Janaki**	**Mr. T. Vibu**	**Ms. J. Magdalene**

	23PMA2C07	CONTROL THEORY *[Employability]*	CC	5	4	3	25	75	100
	23PMA2C08	GRAPH THEORY *[Employability]*	CC	5	4	3	25	75	100
	23PMA2C09	FORMAL LANGUAGES AND AUTOMATA	CC	5	4	3	25	75	100
	23PMA2E01 / 23PMA2E02	OPTIMIZATION TECHNIQUES *(Entrepreneurship & Industry 4.0)*/ STOCHASTIC PROCESSES	DSE	5	4	3	25	75	100
		SUMMER INTERNSHIP	-	-	2	-	-	-	-
III	23PMA3C10	TOPOLOGY	CC	5	4	3	25	75	100
	23PMA3C11	MECHANICS *[Employability]*	CC	5	4	3	25	75	100
	23PMA3C12	PROBABILITY THEORY & MATHEMATICAL STATISTICS *[Employability]*	CC	5	4	3	25	75	100
	24PMA3C13	MATHEMATICAL METHODS	CC	5	4	3	25	75	100
	23PMA3C14	MATHEMATICAL ANALYSIS *[Innovation]*	CC	6	5	3	25	75	100
	23PMA3E01 / 23PMA3E02	FINANCIAL MATHEMATICS *[Skill Development]*/ MATHEMATICAL SOCIAL SCIENCES	DSE	4	4	3	25	75	100
IV	23PMA4C15	FUNCTIONAL ANALYSIS	CC	6	4	3	25	75	100
	23PMA4C16	FLUID DYNAMICS *(Entrepreneurship & Industry 4.0)*	CC	6	4	3	25	75	100
	23PMA4C17	NUMBER THEORY & CRYPTOGRAPHY *(Entrepreneurship)*	CC	6	4	3	25	75	100

23/4/24		23/04/24		
Dr. D. Jayanthi	**Dr. N. Murugesan.**	**Dr. C. Janaki**	**Mr. T. Vibu**	**Ms. J. Magdalene**

	23PMA4E01 / 23PMA4E02	FUZZY MATHEMATICS *(Entrepreneurship & Industry 4.0)* / DIFFERENTIAL GEOMETRY	DSE	6	4	3	25	75	100
	23PMA4PV	PROJECT		6	5		25	75	100
		TOTAL		**120**	**90**		**550**	**1650**	**2200**
	GEN: 20PDIS404	DIGITAL SECURITY		2	2	2HRS	-	50	50
	GEN:	MOOC			2	-	-	-	-
		GRAND TOTAL		**120 +2**	**90 +2 +2 +2**				**2200 +50**

IH- Instructional Hours, **CP**- Credit points,
CIA-Continuous Internal Assessment, **ESE**- End Semester Examination

23/4/24		22/04/24		Absent
Dr.D.Jayanthi Asst,Professor(SG) Department of Mathematics, Avinashilingam Institute For Home Science and Hr. Edn, Coimbatore	Dr.N.Murugesan Asst.Professor(SG) Department of Mathematics, Govt.Arts College Coimbatore	Dr.C.Janaki Asst.Professor Department of Mathematics, Govt.Arts College For Women. Coimbatore	Mr.Vibu.T Mangaing Partner REL Agencies, Coimbatore	Ms.Magadalene, Project Manager, Robert Bosch, Keeranatham, Saravanampatti, Coimbatore

SEMESTER I

COURSE CODE: 24PMA1E01

TITLE OF THE COURSE: ELECTIVE 1-PYTHON PROGRAMMING

[Skill Development, Employability, Industry 4.0]

COURSE OBJECTIVES:

- To provide a comprehensive study of the Python programming language
- To master in writing the Python scripts
- To identify problems that requires programmed solution

COURSE OUTCOMES:

At the end of the course, the students will be able to

CO 1	Define the Identifiers, Keywords and Variables	**K2**
CO 2	Discuss the operators and control flow statements	**K2**
CO 3	Writing Python Scripts by acquiring knowledge on functions	**K3**
CO 4	Apply String and Lists in programmes	**K4**
CO 5	Analyze and design Dictionary methods using tuples	**K4**

Credits: 2 **Instructional Hours: 60**

SYLLABUS

Unit I : INTRODUCTION TO PYTHON (K2) **12 hours**

Introduction- Python overview- Getting started with Python- Comments Python- Identifiers – Reserved Keywords – Variables – Standard Data types

Unit II : OPERATORS AND CONTROL FLOW STATEMENTS (K2) **12 hours**

Operators – Statement and Expression – String operations – Boolean expressions - Control statements – Iteration While statement - Input from key board Operators in Python.

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

Unit III: FUNCTIONS (K3) 12 hours

Introduction - Built in functions – Composition of functions - user defined functions -Parameters and arguments - Function calls -The Return statement - Python Recursive function – The Anonymous functions – Writing Python scripts.

(Self study- Built in functions)

Unit IV: STRINGS AND LISTS (K4) 12 hours

Strings – Compound data type – Len function – String slices – Strings are immutable – String Traversal – Escape characters - string formatting operators – string formatting functions Lists. Value access of elements - Lists are mutable – Traversing list – Deleting elements from list - Built in list operators – Built in list methods

(Self study-Len function)

Unit V: TUPLES AND DICTIONARIES (K4) 12 hours

Tuples - Creating tuples - Accessing values in tuples - Tuples are immutable – Tuple Assignment, Tuples Return values - Variable length argument tuple - Basic tuple operation – Built in tuple function. Dictionaries – Creating Dictionary – Accessing values in Dictionary - Updating Dictionary – Deleting elements from Dictionary – Properties of Dictionary – Key operations in Dictionary – Built in Dictionary methods

TEXT BOOK:

Balagurusamy. E. *Introduction to Computing and Problem-Solving using Python* , McGraw Hill Education,(India) Private limited, New Delhi,(2016)

Unit I : Chapter 3: section 3.1 – 3.8

Unit II : Chapter 3: Section 3.9 – 3.15

Unit III : Chapter 4: 4.1 – 4.10

Unit IV : Chapter 5

Unit V : Chapter 6

REFERENCE BOOKS:

1. Wesley J. Chun, *Core Python Applications Programming*, 3rd Edition, Pearson Education, (2016)
2. Charles Dierbach, *Introduction to Computer Science using Python*, Wiley Publishers,(2015)
3. Jeeva Jose and P. SojanLal, *Introduction to Computing and Problem Solving with PYTHON*, Khanna Publishers, New Delhi, (2016).
4. Mark Lutz, *Learning Python*, 5th edition, Orelly Publication, (2013)

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

BLENDED LEARNING

UNIT I - INTRODUCTION TO PYTHON	
Topic	**Links**
Getting started with Python- Comments Python- Identifier Reserved Keywords – Variables – Standard Data types	1.**https://youtu.be/_uQrJ0TkZlc** 2.**https://www.tutorialspoint.com/python/python_overview.htm** 3.**https://youtu.be/wLJh4Gmgb9o** **4.https://youtu.be/yHFcNNh-SsA**
Boolean expressions, Control statements. Iteration While statement – Input from key board Operator Python	**1.https://youtu.be/v5MR5JnKcZI** **2.https://youtu.be/Pm9FOpOwhlA** **3.https://fsharpforfunandprofit.com/posts/expressions-vs-statements/**

Mapping of CO's with PO'S and PSO's :

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	2	1	2	3	2	1	2	3	3	3	2	2	2
CO2	2	2	1	3	2	2	3	3	2	3	2	2	2
CO3	3	2	2	3	2	2	3	3	3	3	2	2	3
CO4	2	1	2	3	2	2	3	3	3	3	2	2	3
CO5	2	2	2	3	1	2	3	3	3	3	2	2	3

(**Correlation: H-High, M-Medium, L-Low)**

ASSESSMENT TOOLS:

Dr. D. Jayanthi	**Dr. N. Murugesan.**	**Dr. C. Janaki**	**Mr. T. Vibu .**	**Ms. J. Magdalene**

S.NO	INTERNAL MARKS	EXTERNAL MARKS
1.	CIA I – 2 marks CIA II – 2 marks Assignment I – 1 mark Assignment II – 1 mark Online Quiz I – 1 mark Online Quiz II – 1 mark Other Component – 2 marks **Total Marks: 10**	Section: B 5 x 3 =15 Section: C 5 x 5 = 25 **Total Marks: 40**

Course designed by 1. Dr. M.Trinita Pricilla	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.A.Jansi Rani	Principal

MEMBERS OF BOARD OF STUDIES

Dr. D. Jayanthi Assistant Professor(SG) , Department of Mathematics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore-43	**Dr. N. Murugesan** Assistant Professor(SS) , Department of Mathematics, Government Arts College, Coimbatore -18	**Dr. C. Janaki** Assistant Professor(SS) , Department of Mathematics, Government Arts College for Women, Coimbatore -18	**Mr. T. Vibu** Managing Partner, Rel Agencies, Coimbatore	**Ms. J. Magdalene** Project Manager, Robert Bosch, Keeranatham, Saravanampatti, Coimbatore-35

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

SEMESTER: I

COURSE CODE: 23PMA1C01

TITLE OF THE COURSE: CORE : ALGEBRA

COURSE OBJECTIVES:

- To lay the foundation for further study of higher Mathematics
- To impart in the students the basic skill to use mathematical language in a formal reasoning framework.

COURSE OUTCOMES

At the end of the course the students will be able to

CO1	Recall the idea of Group theory and list out the number of subgroups based on counting principle	K2
CO2	Retrive the notion of Euclidean ring and extend to polynomials	K2
CO3	IIlustrate extension field based on Fields and compute roots of the polynomial.	K3
CO4	Apply the concept of automorphism to construct Galois field	K4
CO5	Analyse the various forms of Linear Transformation using Matrices	K4

SYLLABUS

Credits: 4 **Instructional Hours: 90**

UNIT I Group Theory (K2) **18 Hours**

Group Theory: Conjugacy – Normalizer – Cauchy's Theorem - Another counting principle - Sylow's Theorem [https://youtu.be/Wk36dZ4NRtM] - first Part of Sylow's theorem - Second part of Sylow's Theorem - Third Part of Sylow's theorem - Direct Product

[Beyond the Curriculum –Finite Abelian Groups]

UNIT II Ring Theory (K2) **18 Hours**

Ring Theory: Euclidean rings-particular Euclidean ring – Fermat Theorem-Polynomial rings – The Division algorithm-Polynomials over rational field-Gauss Lemma- Einstein's Criterion.

(Self study-Ring Theory:Euclidean Rings)

UNIT III Fields (K3) **18 Hours**

Fields: Extension fields-Roots of polynomials- Remainder Theorem-More about Roots

UNIT IV Fields and Galois Theory (K4) **18 Hours**

Fields: Elements of Galois Theory - Elementary Symmetric Functions-Theorems on Symmetric Polynomials -Finite Fields

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

UNIT V Linear Transformation (K4) **18 Hours**

Linear Transformation: Canonical forms: Triangular form-Trace and Transpose-Jacobson's lemma-Hermitian, unitary and normal Transformations.

(Self study-Linear Transformations)

TEXT BOOK:

I. N. Herstein (1999) Topics in Algebra (2nd Edition), Johnwiley and Sons, Pvt Ltd-Singapore

UNIT I	Chapter 2 - Sections 2.11 to 2.12
UNIT II	Chapter 3 - Section 3.7 to 3.9
UNIT III	Chapter 5 - Sections 5.1 and 5.3
UNIT IV	Chapter 5 - Sections 5.6, Chapter 7 - Section 7.1
UNIT V	Chapter 6 - Sections 6.4, 6.8 and 6.10.

REFERENCE BOOKS:

1. J.B. Fraliegh (1988), A first course in Abstract Algebra, Narosa Publishing House, New Delhi.
2. Stephen H.Friedberg, Arnold J.Insel, Lawrence E.Spence (2009), Linear Algebra, PHI learning Pvt ltd. New Delhi.
3. Waerden,Van Der. B. L (1991) Algebra.Vol. II , Springer International.
4. Sahai,Vivek & Bist Vikas (2008), Algebra, Ed 3, Narosa Publishing House, New Delhi.
5. Thomas. W Hungerford (1974), Algebra Texts in Mathematics, Springer international.

BLENDED LEARNING

UNIT	TOPICS	LINKS
I	Sylow's first theorem-Sylow p-subgroup	https://youtu.be/vTWC6LKBBA0
	Second proof of Sylow's theorem	https://youtu.be/u0GuMqnMGQI
	Second part of Sylow's theorem	https://youtu.be/cCRgIP1HPkg
	Third part of Sylow's theorem	https://youtu.be/RJk3uXvCXjk
IV	Elements of galois theory	https://youtu.be/BhRPUqD5miM
	Theorems on Symmetric Polynomials	https://youtu.be/oIbl6aQAQso

MAPPING OF CO's WITH PO's and PSO's

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	3	2	3	2	2	3	1	2	1	1	3	3	3	3	3
CO2	3	2	3	2	3	3	2	2	1	1	3	3	3	3	3
CO3	3	2	3	2	3	3	2	2	1	1	3	3	3	3	3
CO4	3	2	3	3	3	3	2	2	1	1	3	3	3	3	3
CO5	3	1	3	3	3	3	3	3	2	3	3	3	3	3	3

Correlation: 3-High 2-Medium 1-Low

ASSESSMENT TOOLS:

S.No	**Assessment methods**	**Frequency of Assessment**
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Term paper presentation (Unit V)	Once in a semester

Course designed by Dr.Francina Shalini	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: I
COURSE CODE: 23PMA1C02
TITLE OF THE COURSE: CORE - REAL ANALYSIS

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

COURSE OBJECTIVES:

- To present the concepts and techniques of analysis in a way that will provide knowledge in mastering the fundamentals of the theory.
- To provide a solid foundation in the theory of Riemaan - Steiltjes integral.
- To create an idea about Measure Theory and its Integration.

COURSE OUTCOMES

At the end of the course the students will be able to

CO1	Define R-S Integral and state its properties of Integration & differentiation	K2
CO2	Demonstrate sequences and series of functions with Uniform convergence of integration and differentiation.	K3
CO3	Apply functions of several variables into Inverse and Implicit function theorems	K3
CO4	Express Lebesgue Measure into their functions	K3
CO5	Extend Lebesgue Integral with convergence based on Lebesgue Measure.	K4

SYLLABUS

Credits: 4 **Instructional Hours: 90**

UNIT I: R-S Integral (K2) **18 Hours**

R-S Integral: Definition and Existence of the Integral - Properties of the Integral Integration and Differentiation - Integration of Vector - Valued Functions

(Self Study -Rectifiable Curves)

UNIT II Sequences and Series of Functions (K3) **18 Hours**

Sequences and Series of Functions: Discussion of main Problem – Uniform Convergence - Uniform Convergence and Continuity - Uniform Convergence and Integration - Uniform Convergence and Differentiation - Equicontinuous Families of Functions - The Stone - Weierstrass Theorem.

UNIT III Functions of several variables (K3) **18 Hours**

Functions of several variables: Linear Transformation – The Contraction Principle – The Inverse Function Theorem – The Implicit Function Theorem - Derivatives of Higher Order – Differentiation of Integrals.

[Beyond the Curriculum –Rank Theorem, Determinants]

UNIT IV Lebesgue Measure (K3) **18 Hours**

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

Lebesgue Measure: Outer measure - Measurable sets and Lebesgue measure - Measurable functions - Littlewood's Theorem.

UNIT V Lebesgue Integral (K4) 18 Hours

Lebesgue Integral: The Lebesgue integral of bounded functions over a set of finite measure - integral of non-negative functions - General Lebesgue Integral

(Self study -Convergence in measure)

TEXT BOOKS:

1. Rudin W, (1976), Principles of mathematical Analysis (2nd Edition), McGraw Hill, New York. (UNIT I to III: Chapters 6,7 and 9 (omit 9.30-9.37))

2. Roydon H. L, (1988), Real Analysis, (3rd Edition), Macmillan, New York.
(UNIT IV to V: Chapters 3 and 4).

REFERENCE BOOKS:

1. Bartle R.G, (1976), Elements of Real Analysis, (2nd Edition), John Willy and sons, New York.

2. Rudin , (2006), Real and Complex Analysis, (3rd Edition), Mc Graw Hill, India.

3. Rangachari M. S, (1996), Real Analysis, New Century Book House :Academic Staff College, University of Madras.

4. Goldberg, Richard R, (1964), Methods of real analysis, Oxford & IBH Publishing Co Pvt Ltd.

BLENDED LEARNING

UNIT	TOPICS	LINKS
II	Sequences and Series of Functions	https://youtu.be/bWTmUWWZnhQ
	Equicontinuous Families of Functions	https://youtu.be/sslQQHAchMY
IV	Introduction to Measure Theory	https://youtu.be/nsMUPVceFUk
	Lebesgue Measure	https://youtu.be/M7pi0UulwhA
	Littlewood's Function	https://youtu.be/MeSXfoqvZ1c

MAPPING OF CO's WITH PO's and PSO's

Dr. D. Jayanthi	**Dr. N. Murugesan.**	**Dr. C. Janaki**	**Mr. T. Vibu .**	**Ms. J. Magdalene**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	3	3	3	3	3	3	2	2	3	2	3	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	2	3	2	3	3	3
CO3	3	3	3	2	3	3	2	2	3	3	3	2	3	3	3
CO4	3	3	3	2	3	3	2	2	3	3	3	2	3	3	3
CO5	3	3	3	2	3	3	2	2	3	3	3	2	3	3	3

Correlation: 3-High 2-Medium 1-Low

ASSESSMENT TOOLS:

S.No	**Assessment methods**	**Frequency of Assessment**
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Term Paper Presentation (Unit V)	Once in a semester

Course designed by Dr. A. Arokia Lancy	**Verified by HOD** Dr..K.Julia Rose.Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: I

COURSE CODE: 23PMA1C03

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

TITLE OF THE COURSE: CORE - ORDINARY DIFFERENTIAL EQUATIONS

[Skill Development]

COURSE OBJECTIVES:

- To solve the differential equations which arise in the field of Science and Engineering in a simpler way.
- To compare the linear and non-linear oscillations

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1	Explain Legendre equation and Legendre polynomials using the second order differential equations	K2
CO2	Demonstrate the existence and uniqueness theorem for the system of Linear Differential Equations	K3
CO3	Compute linear systems and periodic coefficients based on a system of first order equations.	K3
CO4	Examine the successive approximation based on Picard's theorem	K4
CO5	Appraise elementary linear oscillations and non-linear oscillation using Sturm's comparison theorem	K4

SYLLABUS

Credits:4 **Instructional Hours: 90**

UNIT I Solution in power series (K2) **18 hours**

Second order linear equations with ordinary points - Legendre equation and Legendre polynomials - second order equations with regular singular points-Bessel Functions

(***Self study: Properties of Bessel's functions – Bessel's equation)***

UNIT II System of linear differential equations (K3)

18 Hours

Systems of first order equations - existence and uniqueness theorem – nth order equation - fundamental matrix – theorems based on fundamental matrix.

[Beyond the curriculum: Problems in Fundamental Matrix]

UNIT III Non-homogeneous linear systems (K3) **18 Hours**

Non-homogeneous linear systems - Linear systems with constant coefficient -linear systems with periodic coefficients.

UNIT IV Existence and uniqueness solutions (K4) **18 Hours**

Successive approximation - - Non-uniqueness of solution - Continuation and dependence on initial conditions - Existence of solutions in the large - Existence and uniqueness of solutions of systems.

UNIT V Oscillations of second order equations (K4)

18 Hours

Fundamental results - Sturm's comparison theorem - Elementary linear Oscillations.

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Comparison theorem of Hille-Winter-oscillations of $x'' + a(t)x = 0$

(Self study: Elementary nonlinear oscillation)

TEXT BOOK:

Deo S.G. and Raghavendra.V, (2002)**,** Ordinary differential equations and stability theory Publisher Academic Press, New York

UNIT I	Chapter – 3	Sections 3.2 - 3.5
UNIT II	Chapter - 4	Sections 4.2 - 4.4
UNIT III	Chapter - 4	Sections 4.5 - 4.7
UNIT IV	Chapter – 5	Sections 5.3 - 5.8
UNIT V	Chapter – 6	Sections 6.1 - 6.6

REFERENCE BOOKS:

1. Coddington.E.A and Levinsion.N, (1995), Theory of Ordinary Differential Equations , McGraw Hill Publishing Company, New York

2. SomaSundaram.D, (2013), Ordinary Differential Equations a First Course, Narosa Publishing Ltd, Delhi.

3. A. Chakarbarti, (2006), Elements of Ordinary Differential Equations and Special functions, New Age International Ltd, Delhi.

4. Lothar Collatz, (1986), Differential Equations, an Introduction with Applications, Wiley publisher.

BLENDED LEARNING

UNIT	TOPICS	LINKS
I	Legendre equation	*https://youtu.be/3e5BUrtUKZc*
IV	Picard's theorem	https://www.youtube.com/watch?v=oTN7hGoSPMw
V	Sturm's comparison theorem	https://www.youtube.com/watch?v=4gXY8uLgGOs

MAPPING OF CO's WITH PO's and PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	3	3	2	2	1	2	3	3	3	3	3	3	3	3	3
CO2	3	2	2	2	2	2	3	3	3	3	2	3	3	3	3
CO3	3	3	2	1	2	1	3	3	3	2	3	3	3	3	2
CO4	3	1	2	2	2	2	3	3	3	2	2	2	3	2	2
CO5	2	3	2	2	2	2	3	2	3	3	3	3	3	3	3

Correlation: 3-High 2-Medium 1-Low

ASSESSMENT TOOLS:

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu .**	**Ms. J. Magdalene**

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Real time Problem solving (Unit V)	Once in a semester

Course designed by Dr. K. Mohana	**Verified by HOD** Dr. K.Julia Rose.Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: I

COURSE CODE: 23PMA1C04

TITLE OF THE COURSE: CORE - NUMERICAL ANALYSIS WITH MATLAB

[Skill Development]

COURSE OBJECTIVES:

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

- To solve the differential equations which arise in the fields of Science and Engineering by simple Numerical methods.
- To develop appropriate numerical methods to solve a differential equation.
- To introduce the Mathematical software MATLAB for high-performance numerical computations and visualization.
- To use MATLAB to solve numerical problems

COURSE OUTCOMES

At the end of the course the students will be able to

CO1	Identify the numerical methods to solve nonlinear equations and apply appropriate techniques for numerical differentiation and integration.	K2
CO2	Understand and solve a solution of the system of equations by different metho	K3
CO3	Solve an ordinary differential equation by appropriate numerical method	K3
CO4	Analyze the implications of approximations and to solve the numerical soluti of partial differential equations.	K4
CO5	Investigate the boundary value problem and Eigenvalue problems.	K4

SYLLABUS

Credits: 4 **Instructional Hours: 90**

UNIT I Solving Nonlinear Equations: (K2) **18 hours**

Newton's Method –- Bairstow's Method for Quadratic factors - Numerical Differentiation and Integration – Derivatives from Difference tables – Higher order derivatives – Divided difference - Central difference formula – Trapezoidal rule – Simpson's rule .

(Self Study: Trapezoidal Rule)

MATLAB: Newton-Raphson Method, Numerical Integration, Trapezoidal and Simpson's Rule,Solution of Differential Equations.

UNIT II Solution of system of equations: (K3) **18 hours**

Gauss elimination method – Gauss-Jordan method – LU decomposition method - Matrix inversion method - Methods of iteration – Gauss Jacobi method and Gauss Seidal iteration. MATLAB: Gauss Elimination and Gauss Jordan, Gauss Jacobi and Gauss Seidal iteration.

(Self study:Gauss elimination method – Gauss-Jordan method)

UNIT III Solution of Ordinary Differential Equations: (K3) **18 hours**

TheTaylor Series method - Taylor Series method of First order Equations - The Euler method and Its Modifications - Modified and Improved Euler methods - Runge-Kutta methods. Multistep methods: Milne's method – The Adams- Moulton Method.

MATLAB: Euler's Method - Taylor Series Method - Runge-Kutta Methods -

Predictor-Corrector Methods.

UNIT IV Numerical solution of Partial differential equations (K4) 18 hours

(Solution of Elliptic, Parabolic and Hyperbolic Partial Differential Equations): Difference quotients - Elliptic equations: Laplace's equation – Liebmann's iteration process - Poisson Equations, Parabolic equations: Bender Schmidt method. Crank Nicholson Method– Hyperbolic equations.

UNIT V Boundary Value Problems and Characteristic Value Problems (K4) 18 hours

Solution through a set of equations - Derivative Boundary conditions - Characteristic Value Problems - The power Method: Eigenvalues of a matrix by Power method

(Beyond the Curriculum: The Shooting Method)

https://www.youtube.com/watch?v=_JeAp7SGGKM*MATLAB is used only for Practical not for Theory.

TEXTBOOKS

1. Curtis F Gerald and Patrick O. Wheatly, (1998), Applied Numerical Analysis, (5th edition), Pearson.

UNIT I 1.4, 1.8, 4.2 ,4.3,4.6,4.7

UNIT II 2.3, 2.4, 2.5, 2.7, 2.10

UNIT III 5.2, 5.3, 5.4, 5.5, 5.6, 5.7

UNIT V 6.2, 6.3, 6.6, 6.7

2. MK Venkataraman, (1999), Numerical Methods in Science and Engineering,

Fifth edition. The National Publishing Company, Madras.

UNIT IV Chapter XII Sections 1 to 9

3. John H. Mathews and Kurds D. Fink, Numerical Methods using MATLAB,Third Edition, Prentice Hall, Upper Saddle River, NJ, 1999.

Reference Books:

1. Chapra S.C. and Canale R.P. (2006) Numerical Methods for Engineers, 5th Ed., McGraw Hill

2. Brian R Hunt, Ronald L Lipsman, Jonathan M Rosenberg, A Guide to MATLAB for Beginners and Experienced Users, Cambridge University Press, 2003.

3. C. Woodford and C. Phillips, Numerical Methods with Worked Examples, Matlab Edition, Springer, Netherlands, 2012. 38

4. Raj Kumar Bansal, Ashok Kumar Goel, Manoj Kumar Sharma, MATLAB and its Applications in Engineering, Butterworth-Heinemann; 3 edition, e– book, 2013.

5. Rudra Pratap, Getting started with MATLAB 7, Oxford University Press, 2008.

6. Steven T. Karris, "Numerical Analysis Using Matlab and Excel", Third Edition, Orchard Publication, 2007.

BLENDED LEARNING

UNIT	TOPICS	LINKS
IV	Parabolic equations: Bender schmidt method.	https://www.youtube.com/watch?v=m_1ohMonnOU https://www.youtube.com/watch?v=wxW_R32ziwI
IV	Derivative Boundary Conditions	https://www .youtube.com/watch?v=_JeAp7SGGKM

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MAPPING OF CO's WITH PO's and PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	3	3	2	2	2	2	3	2	3	3	2	3	3	3	3
CO2	3	3	2	2	2	2	3	2	3	3	2	3	3	3	3
CO3	3	3	2	2	2	2	3	2	3	3	2	3	3	3	3
CO4	3	3	2	2	2	2	3	2	3	3	2	3	3	3	3
CO5	3	3	2	2	2	2	3	3	3	3	2	3	3	3	3

Correlation: 3-High 2-Medium 1-Low

ASSESSMENT TOOLS:

S.No	**Assessment methods**	**Frequency of Assessment**
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Term Paper Presentation (Unit V)	Once in a semester

Course designed by Dr. A. Sahaya Sudha	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

SEMESTER I

COURSE CODE: 23PMA1E01

TITLE OF THE COURSE: ELECTIVE 1-PYTHON PROGRAMMING

SYLLABUS

OBJECTIVES:

- To provide a comprehensive study of the Python programming language
- To master in writing the Python scripts
- To identify problems that requires programmed solution

At the end of the course, the students will be able to

Co1	Define the Identifiers, Keywords and Variables	K2 Understanding
Co2	Discuss the operators and control flow statements	K2 Understanding
Co3	Writing Python Scripts by acquiring knowledge on functions	K3 Applying
Co4	Apply String and Lists in programmes	K4 Analyzing
Co5	Analyze and design Dictionary methods using	K4

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	tuples	Analyzing

Credits: 4 **Instructional Hours: 90**

Unit I :Introduction to Python (K2) 18 hours

Introduction- Python overview- Getting started with Python- Comments Python- Identifiers – Reserved Keywords – Variables – Standard Data types

1. **https://youtu.be/_uQrJ0TkZlc**
2. **https://www.tutorialspoint.com/python/python_overview.htm**
3. **https://youtu.be/wLJh4Gmgb9o**
4. **https://youtu.be/yHFcNNh-SsA**

Unit II : Operators and Control flow statements (K2) 18 hours

Operators – Statement and Expression – String operations – Boolean expressions - Control statements – Iteration While statement - Input from key board Operators in Python

1.**https://youtu.be/v5MR5JnKcZI**
2.**https://youtu.be/Pm9FOpOwhlA**
3.**https://fsharpforfunandprofit.com/posts/expressions-vs-statements/**

Unit III: Functions (K3) 18 hours

Introduction - Built in functions – Composition of functions - user defined functions - Parameters and arguments - Function calls -The Return statement - Python Recursive function - The Anonymous functions – Writing Python scripts.

(Self study- Built in functions)

Unit IV: Strings and Lists (K4) 18 hours

Strings – Compound data type – Len function – String slices – Strings are immutable – String Traversal – Escape characters - string formatting operators – string formatting functionsLists – Value access of elements - Lists are mutable – Traversing list – Deleting elements from list - Built in list operators – Built in list methods

(Self study-Len function)

Unit V: Tuples and Dictionaries (K4) 18 hours

Tuples - Creating tuples - Accessing values in tuples - Tuples are immutable – Tuple Assignment – Tuples Return values - Variable length argument tuple - Basic tuple operation – Built in tuple function.

Dictionaries – Creating Dictionary – Accessing values in Dictionary - Updating Dictionary – Deleting elements from Dictionary – Properties of Dictionary – Key operations in Dictionary – Built in Dictionary methods

Mapping of CO's with PO's/PSO's :

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PSO 1**	**PSO 2**	**PSO3**
CO1	2	1	2	3	2	1	2	3	3	3	2	2	2
CO2	2	2	1	3	2	2	3	3	2	3	2	2	2

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CO3	3	2	2	3	2	2	3	3	3	3	2	2	3
CO4	2	1	2	3	2	2	3	3	3	3	2	2	3
CO5	2	2	2	3	1	2	3	3	3	3	2	2	3

Correlation: H-High, M-Medium, L-Low

ASSESSMENT TOOLS:

S.NO	ASSESSMENT METHODS	FREQUENCY OF ASSESSMENT
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Assignment	Once in a semester
5.	Online Quiz	Once in a semester
6.	Seminar	Once in a semester
7.	Power Point Presentation	Once in a semester

TEXT BOOK:

Introduction to Computing and Problem-Solving using Python by E. Balagurusamy, McGraw Hill Education (India) Private limited, New Delhi (2016)

Unit I : Chapter 3: section 3.1 – 3.8
Unit II: Chapter 3: Section 3.9 – 3.15
Unit III : Chapter 4: 4.1 – 4.10
Unit IV : Chapter 5
Unit V: Chapter 6

REFERENCE BOOKS:

1. Wesley J. Chun, "Core Python Applications Programming", 3rd Edition, PearsonEducation, 2016
2. Charles Dierbach, "Introduction to Computer Science using Python", Wiley, 2015
3. Jeeva Jose &P.SojanLal, "Introduction to Computing and Problem Solving with PYTHON", Khanna Publishers, New Delhi, 2016
4. Mark Lutz, "Learning Python", 5th edition, Orelly Publication, 2013, ISBN 978-1449355739

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu .**	**Ms. J. Magdalene**

Course designed by Dr. K.Julia Rose Mary	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER I
COURSE CODE: 23PMA1E02
TITLE OF THE COURSE: ELECTIVE 2- ANALYSIS OF ALGORITHMS
SYLLABUS

OBJECTIVES:

- To introduce the knowledge of analysis of algorithms.
- To find the algorithms of complexity order.
- To evaluate linked lists and trees
- To understand the searching and sorting methods.

At the end of the course the students will have the able to:

Co 1	Learn the different specifications of algorithms	K2 Understanding
Co 2	Identify data structures and queues	K3 Applying
Co 3	Distinguish linked lists and trees	K3 Applying
Co 4	Evaluate search and sort in graphs	K4 Analyzing
Co 5	Evaluate and interpolate different algebraic problems	K4 Analyzing

Credits: 4 **Instructional Hours: 90**

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Unit-I Algorithms (K2) 18 hours

Introduction-Algorithm-Algorithmspecification:PseudocodeConventions, Recursive algorithms - Performance analysis: Space Complexity, Time Complexity,AsymptoticNotation,PracticalComplexities.

Algorithmspecification:PseudocodeConventions:https://youtu.be/QCdIclk8kts

Performance analysis:https://youtu.be/sn1ugY-jzQE

Unit-II Data structures and Queues (K3) 18 hours

Arrays – ordered lists- Representation of Arrays-Stack and Queues – Fundamentals-Evaluation of Expressions.

Self Study: Arrays

Unit-III Linked lists and trees (K3) 18 hours

Linked Lists - Singly Linked Lists- Linked Stacks and Queues-More on LinkedLists-SimplealgorithmsofDoublyLinkedLists(insertionanddeletion only).Trees- Binary Trees-Binary Tree Representations- Binary Tree Traversal.

Self Study: Trees

Binary Tree Traversal :https://youtu.be/gm8DUJJhmY4

Linked Lists:https://youtu.be/WwfhLC16bis

Unit-IV Search and Sort (K4) 18 hours

Divideandconquer-Generalmethod-Binarysearch-Findingthemaximum andminimuminasetofitems-Mergesort-Quicksort-Selectionsort.Basic Traversal and Search Techniques for graphs: Breadth First Search - Depth FirstSearch

Unit-V Interpolations (K4) 18 hours

Backtracking - The 8-Queens problem - Algebraic problems - The general method-Evaluationandinterpolation-Horner'srule-Lagrangeinterpolation

Newtonian interpolation

MAPPING OF CO's WITH PO's/PSO's:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	3	2	1	3	3	3	1	3	2	1
CO2	3	3	3	3	3	2	1	3	3	3	1	3	2	1
CO3	3	3	3	3	3	2	1	3	3	3	1	3	2	1
CO4	3	3	3	3	3	2	1	3	3	3	1	3	2	1
CO5	3	3	3	3	3	2	1	3	3	3	1	3	2	1

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Correlation: L-Low, M-Medium, H-High

ASSESSMENT TOOLS

S.NO	ASSESSMENT TOOLS	FREQUENCY OF ASSESSMENT
1.	End semester examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Assignment	Once in a semester
5.	Online quiz	Once in a semester

Textbooks:

1. Ellis Horowitz, Sartaj Sahniand Sanguthevar Rajasekaran, Fundamentals of Computer algorithms, Galgotia Publications Pvt. Ltd., 2004.

   Units: I Sections:1.1, 1.2, 1.3.1 to1.3.4
   Units: IV Sections:3.1 to 3.5, 6.2
   Units: V Sections:7.1, 7.2, 9.1, 9.2

2. Ellis Horowitz, SartajSahni, Fundamentals of Data Structures, Galgotia BookSource, 1981.

   Units:II Sections: 2.2, 2.4, 3.1, 3.3
   Units:III Sections:4.1, 4.2, 4.5, 4.8, 5.2, 5.3, 5.4

References

1. A.V. Aho, J.E.Hopcroft, J.D. Ullman, The Design and Analysis of Computer Algorithms,Addison-WesleyPubl.Comp.,1974.
2. Seymour E.Goodman and S.T. Hedetniemi, Introduction to the design and analysis of algorithms, McGraw Hill International Edition, 2002.

Course designed by Dr. K.Julia Rose Mary	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

SEMESTER II

COURSE CODE: 23PMA2C05

TITLE OF THE COURSE: CORE - COMPLEX ANALYSIS

COURSE OBJECTIVES:

- To know the basic concepts of limits and continuity of analytic functions
- To evaluate complex integration and to study important related theorems

COURSE OUTCOMES

At the end of the course the students will be able to

CO1	Retrieve the idea of analytical functions and linear transformations using complex numbers	K2
CO2	Discuss Cauchy's theorem for various contours and to associate for higher derivatives	K2
CO3	Analyze on the types of singularities, calculus of residues and to have a thorough study of harmonic functions.	K3
CO4	Appraise on various forms of series and product development	K4
CO5	Outline the importance of Riemann mapping and boundary behavior.	K4

SYLLABUS

Credits: 4 **Instructional Hours: 75**

UNIT I Analytic functions (K2) **15 Hours**

Introduction to the concept of analytic function – Polynomials – Rational function – Elementary theory of power series: Power series – Abel's limit theorem – Conformality, Arcs and closed curves analytic functions in regions – Conformal Mapping – Linear transformation – The linear group – The Cross ratio – Symmetry.

(Self Study: Cross ratio)

UNIT II Complex Integration:(K2) **15 Hours**

Complex integration: Line integrals - Rectifiable arcs - Line integrals as functions of arcs - Cauchy's theorem for a rectangle - Cauchy's theorem in a disk - Cauchy's integral formula - The index of a point with respect to a closed curve - The integral formula-higher derivatives**.**

UNIT III Calculus of Residues(K3) **15 Hours**

Removable Singularities - Taylor's theorem - Zeros & Poles - The local mapping – The maximum principle – Chains and cycles - The Calculus of residues: The residue theorem - The argument principle - Evaluation of definite integrals - Harmonic Functions: The definitions & basic properties - Mean value property - Poisson's Formula.

[Self Study: Zeros]

UNIT IV Series & Product Developments:(K4) **15 Hours**

Series & Product Developments: Weierstrass Theorem - The Taylor's series – Laurent Series

- Partial fractions & Factorization - Partial Fractions - Infinite Products - Canonical Products.

UNIT V The Gamma function(K4) 15 Hours

The Gamma function - The Riemann Mapping Theorem – Statement and Proof - Boundary behavior – use of the reflection principle – Analysis arcs.

(Beyond the curriculum:Stirling's Formula)

TEXT BOOK:

1.L.V.Ahlfors, (1979), Complex Analysis, Mc Graw hill, New York,

	UNIT I Chapter – 2	**Sections 1.3 – 1.4, 2.4 – 2.5**
	Chapter – 3	Sections 2.1 – 2.3, 3.1 – 3.3
UNIT II	Chapter - 4	Sections 1.1 – 1.5, 2.1 - 2.3
UNIT III	Chapter – 4	Sections 3.3 – 3.4, 4.1
		Sections 5.1 5.3, 6.1 – 6.3
UNIT IV	Chapter – 5	Sections 1.1 – 1.3, 2.1 – 2.3
UNIT V	Chapter – 5	Sections 2.4
	Chapter – 6	Sections 1.1 – 1.4

REFERENCE BOOKS:

1. V.Karunakaran, (2005), Complex analysis(1st Edition),Narosa Publishing home, New Delhi.
2. S.Ponnusamy,(2005), Foundation of Complex Analysis(2rd Edition), Narosa Publishing home, New Delhi.
3. Zill,Dennis G &Shanahan,Patrick,D,(2016), Complex Analysis (Ed-3), Jones & Bartlett India Pvt. Ltd.
4. Dube,K.K,(2009), Fundamentals Of Complex Analysis Theory and Applications, I.K International Publishing House Pvt.Ltd.
5. Biswal, PurnaChandra,(2015),Complex analysis, PHI Learning Pvt Ltd.

BLENDED LEARNING

UNIT	**TOPICS**	**LINKS**
I	CONFORMAL MAPPING	HTTPS://YOUTU.BE/48AERHS9WL0
IV	Weierstrass theorm	https://youtu.be/NXvvWBgH5wo
	Laurent Series For Complex Number	https://youtu.be/gUmIrJRXDSs
	The Taylor's series	https://youtu.be/xls_5Ly7VA4-
	Laurent Series	https://youtu.be/bB8naRlKYPI
	power series	https://youtu.be/BsDGcJN_1TU-

MAPPING OF CO's WITH PO's and PSO's

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	3	2	3	2	2	3	1	2	2	2	3	3	3	3	3
CO2	3	2	3	2	3	3	2	2	2	2	3	3	3	3	3
CO3	3	2	3	2	3	3	2	2	2	2	3	3	3	3	3
CO4	3	2	3	3	3	3	2	2	2	2	3	3	3	3	3
CO5	3	1	3	3	3	3	3	3	2	3	3	3	3	3	3

Correlation: 3-High 2-Medium 1-Low

ASSESSMENT TOOLS:

S.No	**Assessment methods**	**Frequency of Assessment**
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Group Discussion (Unit V)	Once in a semester

Course designed by Dr. F. Nirmala Irudayam	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

SEMESTER: II

COURSE CODE: 23PMA2C06

TITLE OF THE COURSE: CORE - PARTIAL DIFFERENTIAL EQUATIONS

[Skill Development]

COURSE OBJECTIVES:

- To provide the reader with an easier and systematic way of solving partial differential equations.
- To demonstrate the ability to understand and use basic models to describe and analyze initial and boundary value problems.

COURSE OUTCOMES

At the end of the course the students will be able to

CO1	Explain solving First Order Partial Differential Equations using different methods	K2
CO2	Discuss Second Order Partial Differential Equations with interpretations.	K2
CO3	Solving Linear hyperbolic equations using method of integral transforms.	K3
CO4	Apply Laplace Equations for Boundary Value Problems	K3
CO5	Appraise wave equations and Diffusion equations using separation of variables	K4

SYLLABUS

Credits: 4 **Instructional Hours: 75**

UNIT I First Order partial differential equation(K2)
15 hours

Non linear partial differential equations of the first order - Cauchy's method of Characteristics - Compatible systems of first order equations - Charpit's method - Special types of first order equations - Jacobi's method.

UNIT II Second Order partial differential equation(K2) 15 hours

Partial differential equations of the second order - The origin of second order Equations - Linear Partial differential equations with constant coefficients - Equations with variable coefficients - Characteristic curves of second order Equations - Characteristics of equations in three variables.

UNIT III Hyperbolic Differential Equation(K3) 15 hours

The solution of Linear Hyperbolic Equations - Separation of variables - The method of integral transforms.

[Beyond the Curriculum :Non Linear equations of the Second Order]

UNIT IV Laplace Equations(K3) 15 hours

Laplace's equations -The occurrence of Laplace's equations in Physics - Elementary

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Solutions of Laplace's equations - Families of equipotential surfaces - Boundary value problems

(Self Study: Separation of Variables)

UNIT V Wave Equations (K4)

15 hours

The wave equation -The occurrence of wave equation in Physics – Elementary solutions of one-dimensional wave equation - The Diffusion Equation: Elementary solutions of Diffusion Equation.

[Self Study -Separation of variables.]

TEXTBOOK:

Ian.N.Sneddon, (1989), Treatment as in Elements of Partial Differential Equations, McGraw-Hill Book Company.

UNIT I Chapter 2 Sections 7,8,9,10,11 and 13.

UNIT II Chapter 3 Sections 1, 4, 5, 6 and 7.

UNIT III Chapter 3 Sections 8 to 10.

UNIT IV Chapter 4 Sections 1 to 5.

UNIT V Chapter 5 Sections 1, 2 and Chapter 6: Sections 3, 4

REFERENCE BOOKS:

1. Amaranath.T, (2003), Partial Differential Equation, Ed.2,,Narosa Publishing House, Delhi.
2. Veerarajan T, (2004), Partial Differential Equation and integral transforms, Tata McGraw-Hill Publishing Co Ltd.
3. T.Amaranath, (2003), An Elementary Course in Partial Differential Equations, Second Edition, Narosa Publishing House Pvt Ltd, Delhi.
4. Gupta P.P, (2003), Partial Differential Equations, Pragati Prakashan House -Meerut.

BLENDED LEARNING

UNIT	TOPICS	LINKS
I	Non linear partial differential equations of the first order-	https://youtu.be/DLQi4mL_ifE
	Compatible systems of first order equations	https://youtu.be/YbBvZe035Aa
	Cauchy's method of Characteristics	https://youtu.be/FVI7N6lAEY0-
V	Diffusion equation and its introduction-	https://youtu.be/npWWesmdlxk -
	One dimensional wave equation	https://youtu.be/WgCUXYWTqPs -

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MAPPING OF CO's WITH PO's and PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	3	3	3	3	3	3	2	2	3	2	3	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	2	3	2	3	3	3
CO3	3	3	3	2	3	3	2	2	3	3	3	2	3	3	3
CO4	3	3	3	2	3	3	2	2	3	3	3	2	3	3	3
CO5	3	3	3	2	3	3	2	2	3	3	3	2	3	3	3

Correlation: 3-High 2-Medium 1-Low

ASSESSMENT TOOLS:

S.No	**Assessment methods**	**Frequency of Assessment**
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Real time Problem solving (Unit V)	Once in a semester

Course designed by Dr. A. Francina Shalini	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: II

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

COURSE CODE: 23PMA2C07

TITLE OF THE COURSE: CORE – CONTROL THEORY

[Employability]

COURSE OBJECTIVES:

- To solve the complexity of modern systems of control on computers, microprocessors or any electronic devices.
- To exhibit a wide variety of modern techniques that go beyond associated with traditional applied mathematics to a larger spectrum.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1	Understand the fundamental limits of control in differential equation and observability.	K2
CO2	Discuss various properties of controllability including Linear and Nonlinear systems.	K2
CO3	Carry out the synthesis of Linear and Nonlinear stability of the system and analyze the control system stability.	K3
CO4	Design stabilization via feedback control systems based on Bass Method	K4
CO5	Formulate An optimal control problem and analyze Linear and Non linear optimal control system.	K4

SYLLABUS

Credits: 4 **Instructional Hours: 75**

UNIT I:Differential Equations and observability (K2) **15 Hours**

Differential Equations and observability: Basic results of differential equations – Fixed point method - Banach Fixed point theorem- Brouwer Fixed Point Theorem - Linear system – observability Grammian – constant coefficient systems – reconstruction Kernel-Non linear systems.

UNIT II: Controllability (K2) **15 Hours**

Controllability: Linear Systems) – Controllability Grammian – adjoint systems – constant coefficient systems – Steering function – Non linear systems-completely controllable-Growth condition.

(Beyond Curriculum: Controllability with Prescribed control)

UNIT III: Stability (K3) **15 Hours**

Stability: Linear Systems – uniform stability – asymptotic stability – of linear systems – linear time varying systems – Perturbed Linear Systems – Gronwall's Inequality – Non Linear Systems.

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UNIT IV: Stabilizability(K4) **15 Hours**

Stabilization via Linear Feedback Control– Bass method – The Controllable Subspace – Stabilization with Restricted Feedback.

(*Self study: Stabilization with Restricted Feedback*)

UNIT V: Optimal control (K4) **15 Hours**

Optimal control: Linear Time Varying Systems with quadratic performance criteria – Matrix Ricatti equation– Linear Time Invariant Systems – Non Linear Systems.

***(Self study:Linear Time Invariant Systems*)**

TEXT BOOK:

Balachandranand.Dauer,J.P, (1999), Elements of Control Theory, Narosa Publishing House, New Delhi,

UNIT I Chapter 1 Sections 1.2, 1.3

Chapter 2 Sections 2.1, 2.2

UNIT II Chapter 3 Sections 3.1, 3.2

UNIT III Chapter 4 Section 4.1, 4.2, 4.3

UNIT IV Chapter 5 Sections 5.1, 5.2, 5.3

UNIT V Chapter 6 Sections 6.1, 6.2, 6.3

REFERENCE BOOKS:

1.R.Conti,(1976), Linear Differential Equations and Control Theory, Academic Press, London.

2.H.Hormes and J.O.Lasalle, (1969), Functional analysis and Time Optional Control, Academic Press

3.L.R.Leigh,(1980), Functional analysis and Linear Control, Academic Press

4. E.B.Lee and L.Markus, (1967), Foundations of Optimal Control Theory, John Wiley, New York

BLENDED LEARNING

UNIT	TOPICS	LINKS
I	Existence using Fixed point theorem	https://www.youtube.com/watch?v=ngbBa15-pX8
II	Controllability and Observability	(https://www.youtube.com/watch?v=S4_rIjCC70w&t=1388s)
IV	Stabilizability	(https://www.youtube.com/watch?v=rq1rXIdpIJw)
V	The Riccati Equation	(https://www.youtube.com/watch?v=3heIoKDhN3E)

MAPPING OF CO's WITH PO's and PSO's

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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	2	3	2	2	2	2	3	3	3	2	3	2	2	3	3
CO2	2	3	2	2	2	2	3	3	3	2	3	2	2	3	3
CO3	2	3	2	2	2	2	3	3	3	2	3	2	2	3	3
CO4	2	3	2	2	2	2	3	3	3	2	3	2	2	3	3
CO5	2	3	2	2	2	2	3	3	3	2	3	2	2	3	3

Correlation: 3-High 2-Medium 1-Low

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Group Discussion (Unit V)	Once in a semester

Course designed by Dr. A. Sahaya Sudha	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: II

COURSE CODE: 23PMA2C08

TITLE OF THE COURSE: CORE - GRAPH THEORY

[Employability]

COURSE OBJECTIVES:

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

- **To learn the concept of graph theory and understand its applications to other branches of Mathematics.**
- **To gain knowledge about different types of graphs, their properties, relationships etc… and to implement them into real world problems.**
- **To understand new proofs of theorems of Brooks, Chvatal, Tutte and Vizing.**

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1	To remember the definitions and properties of graphs, sub graphs and trees. To remember Cayley's formula.	K2
CO2	To understand the concept of connectivity, Euler tour and Hamilton cycles with their characteristics.	K2
CO3	To understand the concept of Matching and Covering and to apply the results to real world problems.	K3
CO4	To analyze independent set, chromatic number, chromatic polynomials and girth graphs.	K3
CO5	To understand planar graphs, dual graphs, four colour conjecture and directed graphs.	K4

SYLLABUS

Credits: 4 **Instructional Hours: 75**

UNIT I Graphs, Subgraphs and Trees (K2) **15 hours**

Graphs and simple graphs –Graph Isomorphism – Incidence and Adjacency matrices – Subgraphs – Vertex degree – Paths and Cycles.Trees – Cut edges and bonds – Cut vertices – Cayley's formula.

(Self study: Graphs and simple graphs)

UNIT II Connectivity, Euler Tours and Hamilton Cycles(K2) **15 hours**

Connectivity – Edge connectivity - Blocks – Internally disjoint paths – Whitney's theorem – Subdivision of edges - Menger's theorem - Euler Tours – Dirac theorem - Hamilton Cycles – Necessary condition for a graph to be Hamiltonian – Closure of a graph – degree majorised graph – Chvatal theorem.

UNIT III Matching and Edge Colorings(K3) **15 hours**

Matchings – Berge theorem - Matchings and Coverings in Bipartite graphs – Hall's theorem – Marriage theorem - Perfect Matchings – Tutte's theorem – multiplicity of a graph - Edge colorings – Edge Chromatic number – Vizing's theorem.

(Self study: Edge Chromatic number)

UNIT IV Independent Sets, Cliques and Vertex Colorings(K3) **15 hours**

Independent sets – Independence and covering number – edge covering – Erdos theorem - Ramsey's theorem – Vertex colourings – Critical graphs - Chromatic number – Dirac theorem - Brook's theorem – Hajos conjecture – Chromatic polynomials – Girth and Chromatic number.

UNIT V Planar Graphs and Directed graphs(K4) **15 hours**

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Plane and Planar graphs – Dual graphs – Euler's formula – Bridges – Kuratowski'stheorem, (Proof omitted) – The five colour theorem and the four colour Conjecture– Non hamilton planar graphs.Directed graphs – Directed paths – Directed cycles.

(Beyond the Curriculum: Networks)

TEXT BOOK:

J.A.Bondy and U.S.R.Murty, (1982), Graph Theory with Applications, North Holland, New York, Amsterdam, Oxford.

UNIT I Section: 1.1 to 1.7 & 2.1 to 2.4

UNIT II Section: 3.1 to 3.2 & 4.1 to 4.2

UNIT III Section: 5.1 to 5.3 & 6.1 to 6.2

UNIT IV Section: 7.1 to 7.3 & 8.1 to 8.5

UNIT V Section: 9.1 to 9.7 & 10.1 to 10.3

REFERENCE BOOKS:

1. Narsingh Deo, (2000), Graph Theory with Applications to Engineering and Computer Science, 19th Printing, Prentice Hall of India Private Ltd, New Delhi.

2. Frank Harary ,(1988), Graph Theory, Narosa Publishing House, New Delhi.

3. Parthasarathy K.R, (1994), Basic Graph Theory, Tata McGraw – Hill Publishing Co. Ltd,New Delhi.

4. Choudum S.A, (1987), A first course in Graph Theory, Macmillan Publishers

5. R.Balakrishnan, RJ Wilson, G.Sethuraman, (2004), Graph Theory and its Applications, Narosa Publishing House, New Delhi,

BLENDED LEARNING

UNIT	TOPICS	LINKS
IV	Ramsey Theory:	https://www.youtube.com/watch?v=-CxDfy7AsV8 https://www.youtube.com/watch?v=7p76yYMth5A https://www.youtube.com/watch?v=nZDaJenIH88
V	Planar Graphs	https://youtu.be/yklF3JDMxGk
	Coloring of planar graphs:	https://www.youtube.com/watch?v=kubJIJMOS8I

MAPPING OF CO's WITH PO's and PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	2	2	2	3	3	3	2	3	3	2	2	3	2	3	3
CO2	2	2	2	3	3	3	2	3	3	2	2	3	2	3	3
CO3	2	2	2	3	3	3	2	3	3	2	2	3	2	3	3
CO4	2	2	2	3	3	3	2	3	3	2	2	3	2	3	3
CO5	2	2	2	3	3	3	2	3	3	2	2	3	2	3	3

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu .**	**Ms. J. Magdalene**

Correlation: 3-High 2-Medium 1-Low

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Real time Problem solving (Unit V)	Once in a semester

Course designed by Dr. Sr. Stanis Arul Mary	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER II

COURSE CODE: 23PMA2C09

TITLE OF THE COURSE: CORE - FORMAL LANGUAGES AND AUTOMATA

COURSE OBJECTIVES:

- To introduce the concept nuances of Automata and Grammar and enable the students to understand the applications of these techniques in computer science.
- To provide an insight to theoretical computer science.
- To get across to the students the notion of effective computability, using mathematical models

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1	Define the notion of Finite Automata and Non-deterministic finite automata	K2
CO2	Discuss the properties of Regular sets	K2
CO3	Finding the normal forms by acquiring knowledge on grammars	K3
CO4	Apply the concept of grammars and normal forms to design pushdown automata	K4
CO5	Analyse and design the construction and techniques of the Turing machine model	K4

SYLLABUS

Credits: 4 **Instructional Hours: 75**

Unit I: (K2) **15 Hours**

Finite Automata

An Informal picture of Finite Automata -Deterministic Finite Automata – Non-Deterministic Finite automata - Finite automata with Epsilon -Transitions.

Unit II: (K2) **15 Hours**

Regular Expressions and Languages, Properties of Regular languages

Regular Expressions- Finite Automata and regular expressions- Proving languages not to be regular

(***Self Study: Closure properties of Regular languages)***

Unit III: (K3) **15 Hours**

Context-Free Grammars and Languages, Pushdown Automata

Context-Free Grammars -Parse trees -Definition of the Pushdown Automaton -The language of a PDA

(Self Study: Examples in context free grammer)

Unit IV: (K4) **15 Hours**

Pushdown Automata, Properties of Context free Languages

Equivalence of PDA's and CFG's – Deterministic Pushdown Automata- Normal forms for Context-free grammars -The Pumping lemma for Context -free languages.

[Beyond the Curriculum – Closure Properties of Context-free languages]

Unit V: (K4) **15 Hours**

Introduction to Turing Machines

Problems that Computers cannot solve-The Turing Machine-Programming techniques for Turing Machines

TEXT BOOK:

1. John E.Hopcroft, Rajeev Motwani and Jeffrey D.Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Publishing House, 3rd Edition.

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Unit I : Chapters: 2.1 – 2.3, 2.5.
Unit II : Chapters: 3.1-3.2, 4.1.
Unit III : Chapters: 5.1 – 5.2, 6.1 – 6.2.
Unit IV : Chapters:6.3 - 6.4, 7.1 – 7.2.
Unit V : Chapters: 8.1 – 8.3.

REFERENCE BOOKS:

1. Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation, Second Edition, Prentice Hall, 1997.
2. A.V. Aho, Monica S. Lam, R. Sethi, J.D. Ullman, Compilers: Principles, Techniques and Tools, Second Edition, Addison-Wesley, 2007
3. A.V. Aho and Jeffrey D. Ullman, Principles of Compiler Design, Narosa Publishing House, Chennai, 2002.

BLENDED LEARNING

UNIT	TOPICS	LINKS
I	Deterministic Finite Automata-	-https://youtu.be/t_zRuXaGneQ -
	Finite Automata	https://youtu.be/iVZDqRQiPMo
	Non -Deterministic Finite Automata	https://youtu.be/ehy0jGIYRtE
III	Regular Grammer-	https://youtu.be/WgEsPTAL55Q
	Derivation from grammer-	https://youtu.be/ejXgLRSIxsA
	Context free grammer -	https://youtu.be/5_tfVe7ED3g
IV	Pushdown Automata	https://youtu.be/JtRyd7Svlew https://youtu.be/4ejIAmp_Atw

MAPPING OF CO's WITH PO's and PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	2	2	2	3	2	2	3	3	3	3	3	2	2	3	3
CO2	2	2	2	3	2	2	3	3	3	3	3	2	2	3	3
CO3	2	2	2	3	2	2	3	3	3	3	3	2	2	3	3
CO4	2	2	2	3	2	2	3	3	3	3	3	2	2	3	3
CO5	2	2	2	3	2	2	3	3	3	3	3	2	2	3	3

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

Correlation: 3-High 2-Medium 1-Low

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model Examination	Once in a semester
5.	Assignment (Unit I & II)	Twice in a semester
6.	Seminar (Unit III & IV)	Twice in a semester
7.	Group Discussion (Unit V)	Once in a semester

Course designed by Dr. F. Nirmala Irudayam	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: II

COURSE CODE: 23PMA2E01

TITLE OF THE COURSE: ELECTIVE – OPTIMIZATION TECHNIQUES

SYLLABUS

OBJECTIVES:

- To develop logical reasoning in sequencing in a network to find the shortest route
- To give practical training in converting a managerial decision making problem to a linear programming problem.

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- To understand the advance queuing models which predicts the performance of service in various systems.

At the end of the course the students will be able to

Co 1	Determine the shortest route and minimum cost flow in a network by different algorithms	K2
Co 2	Find the optimum feasible solution by revised simplex method, bounded variable algorithm and parametric programming	K3
Co 3	Provide inventory management tools and techniques for deterministic and probabilistic inventory models of different situations	K3
Co 4	Analyze the procedure of queuing of daily life	K4
Co 5	Define mathematical queuing models for better service	K4

Credits: 4 **Instructional Hours: 75**

UNIT I:Network Models (K2) **15 hours**

Network Models: Network definitions – Minimal Spanning Tree Algorithm – Shortest Route Problem – Maximal Flow Model.

(*Self Study : Finding the shortest route problem*)

UNIT II: Advanced Linear Programming Problems (K3) **15 hours**

Advanced Linear programming: Simplex Method Fundamentals – Revised Simplex Method – Bounded Variables Algorithm.

UNIT III: Inventory Models(K3) **15 hours**

Deterministic Inventory Models: General Inventory Model – Static Economic Order Quantity Models – Dynamic Economic Order Quantity Models - Probabilistic Inventory Models: Continuous Review Models – Single Period Models – Multi Period Models.

(*Self Study : Multi Period Models*)

Deterministic Inventory Models - **https://youtu.be/uA-cR8nBP6E**

Economic Order Quantity Models - **https://youtu.be/fFR1nYhF_iw**

UNIT IV Markovian queuing (K4) **15 hours**

Advanced Markovian queuing models: Bulk input ($M/M^X/1$) - Bulk service $M/M^Y/1$ – Erlangian models ($M/E_k/1$, $E_k/M/1$, $E_j/E_k/1$).

UNIT VServer Queues(K4) **15 hours**

Models with General Arrival or Service patterns: Single server queues with Poisson input and General service (M/G/1).

QueueingModels - **https://youtu.be/xGkpXk-AnWU**

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Single server queues -**https://youtu.be/2aPlzhsEsIw**.

Mapping of CO's with PO's/ PSO's:

	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po8	Po 9	Po1 0	Po1 1	Po1 2	Pso 1	Pso 2	Pso3
CO1	2	2	3	2	2	2	2	3	2	3	2	3	3	2	3
CO2	3	3	2	2	2	2	2	2	2	3	2	2	3	3	2
CO3	3	2	2	2	2	3	2	2	2	2	3	2	2	2	2
CO4	3	3	3	2	2	2	2	2	2	3	2	2	3	2	3
CO5	3	3	2	3	2	2	3	3	2	2	2	2	3	2	2

Correlation : 3-High, 2-Medium, 1-Low

ASSESSMENT TOOLS:

S.No	Assessment methods	Frequency of Assessment
1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Assignment	Once in a semester
5.	Online Quiz	Once in a semester
6.	Seminar	Once in a semester
7.	Power Point Presentation	Once in a semester

TEXT BOOKS:

1. **Hamdy A. Taha, (2002), Operations Research an introduction, Eighth Edition**
   UNIT I Chapter 6 Sections 6.1 – 6.4
   UNIT II Chapter 7 Sections 7.1 – 7.3
   UNIT III Chapter 11 Sections 11.1 – 11.3 and
   Chapter 14 Sections 14.1 – 14.3
2. **Donald Gross and Carl M.Harris, (2014), Fundamental of Queuing Theory, Fourth Edition, Wiley Series Pvt Ltd, Singapore**
   UNIT IV Chapter 3 Sections 3.1 – 3.3
   UNIT V Chapter 5 Sections 5.1(5.1.1 to 5.1.7)

REFERENCE BOOKS:

1. F.S.Hiller&Lieberman.J, Introduction to Operations Research (Seventh Edition), Tata – Mcgraw Hill Publishing Company, New Delhi.
2. C.Beightler D Philips and B.Wilde, (1979),Foundations of Optimization, Second Edition, Prentice Hall Pvt.Ltd., NewYork.
3. Gupta C.B, (2008), Optimization Techniques in Operations Research, I.K International publishing.

Course designed by Dr. A.Arokia Lancy	**Verified by HOD** Dr. K.Julia Rose Mary

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

SEMESTER: II
COURSE CODE : 23PMA2E02
TITLE OF THE COURSE : ELECTIVE –STOCHASTIC PROCESSES
SYLLABUS

OBJECTIVES:

- To study the stochastic models, transition probabilities and its classifications
- To enable the students to identify a standard stochastic process
- To understand the real life queueing problems
- To motivate the students to take up research in the area of many fields including biology, music and health care etc

At the end of the course the students will be able to

Co1	define the stochastic models and to solve the random walk associated with real life probabilistic situation	K2
Co2	Be familiar with the transition probabilities and its classifications.	K2
Co3	learn the well known models like birth-death and queueing to reorient their knowledge of stochastic analysis.	K3
Co4	Acquire knowledge on Renewal discrete time, Renewal continuous time , Renewal equations and theorems on it	K4

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Co5	understand the real life queueing problems by comparing the conventional queueing models.	K4

Credits: 4 **Instructional Hours: 75**

UNIT I :Elements of Stochastic processes and Markov chains(K2) 15 **Hours**

Stochastic processes - Specification of Stochastic processes –Stationary processes - Markov chain - Transition probabilities - Random walk Stationary processes - Markov chain : Transition probabilities:

https://youtu.be/IUb6n1Nqcik

https://youtu.be/33k8R87XB2Y

UNIT II:

Higher transition probabilities and classification of states (K2) 15 Hours

Higher transition probabilities - Classification of states - Transient and recurrent states.

UNIT III: Markov process with discrete state space (K3) 15 Hours

Poisson process - Generalizations of Poisson process - Pure birth process -Yule-Furry process - Birth-Immigration process.

Pure birth Process - https://youtu.be/OtTTVZRX9tE

Self Study: Examples in Poisson Process

UNIT IV: Renewal processes (K4) 15 Hours

Renewal process in discrete time - Renewal process in continuous time -Renewal equation - Renewal theorems.

UNIT V: Stochastic processes in queueing(K4) 15 Hours

Queueing processes - Steady state behaviour of M/M/1 queueing model -Non-Markovian queueing models - Queues with Poisson input (M/G/1)

Self Study:Examples of Queues

Mapping of CO's with Po's /PSO's:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	2	2	3	3	3	3	3	2	3	-	3
CO2	3	3	3	3	2	2	3	3	3	3	3	2	3	-	3
CO3	3	3	3	3	2	2	3	3	3	3	3	2	3	-	3
CO4	3	3	3	3	2	2	3	3	3	3	3	2	3	-	3
CO5	3	3	3	3	2	2	3	3	3	3	3	2	3	-	3

Correlation:3 - High , 2-Medium 1-Low

ASSESSMENT TOOLS:

S.No	**Assessment methods**	**Frequency of Assessment**
PP1.	End Semester Examination	Once in a semester
2.	CIA I	Once in a semester

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3.	CIA II	Once in a semester
4.	Assignment	Once in a semester
5.	Online Quiz	Once in a semester
6.	Seminar	Once in a semester
7.	Power Point Presentation	Once in a semester

TEXT BOOK:

1. J. Medhi, Stochastic Processes, New Age International Publishers,Second Edition, New Delhi, 1994.

UNIT I	Chapter 2	Sections 2.1, 2.2, 2.3
	Chapter 3	Section 3.1
UNIT II	Chapter 3	Sections 3.1 and 3.4
UNIT III	Chapter 4	Sections 4.1, 4.3 (omit 4.3.5 - 4.3.7)
UNIT IV	Chapter 6	Sections 6.1.1 - 6.1.3, 6.2 (omit example 2(b)), 6.3, 6.5(omit 6.5.2))
UNIT V	Chapter 10	Sections 10.1 (omit 10.1.4), 10.2 (omit 10.2.3.1), 10.7 (omit examples 7(a), 7(b) and Sections 10.7.3, 10.7.4)

REFERENCE BOOKS:

1. U. Narayan Bhat, Elements of Applied Stochastic Processes, Second Edition, John Wiley & Sons, New York, 1972.
2. N.V. Prabhu, Stochastic Processes, Macmillan, New York

Course designed by Dr. M. Trinita Pricilla	**Verified by HOD** Dr. K.Julia Rose Mary
Checked by CDC Dr.S.Jaculin Arockia Selvi	**Approved by** Principal

Dr. D. Jayanthi	**Dr. N. Murugesan**.	**Dr. C. Janaki**	**Mr. T. Vibu** .	**Ms. J. Magdalene**

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