VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
[AUTONOMOUS]
ELAYAMPALAYAM, TIRUCHENGODE-637205.
DEPARTMENT OF MATHEMATICS
M. Sc.–MATHEMATICS (TANSCHE)
COURSE PATTERN AND SCHEME OF EXAMINATIONS UNDER OBE
For the Candidates admitted from the year 2023-2024
ACADEMIC YEAR – 2023-24

SEM	SUBJECTCODE	COURSE	SUBJECTTITLE	Hours/ Week	CREDIT	INT.MARK	EXT. MARK	TOT. MARK
I	23 P1MAC01	Core Course-I	Algebraic Structures	6	4	25	75	100
	23 P1MAC02	Core Course-II	Real Analysis - I	6	4	25	75	100
	23 P1MAC03	Core Course-III	Ordinary Differential Equations	5	4	25	75	100
	23P1MADE01	Discipline Specific Elective Course-I	Number Theory and Cryptography	4	3	25	75	100
	23P1MADE02	Discipline Specific Elective Course-II	Mathematical Programming	4	3	25	75	100
	23P1MAS01	Skill Enhancement Course - I	Differential Equations Using SCI Lab	3	2	25	75	100
	23P1MAAC01	Ability Enhancement Compulsory Course - I	Aptitude Skills	2	2	25	75	100
TOTAL				**30**	**22**	**175**	**525**	**700**

SEM	SUBJECTCODE	COURSE	SUBJECTTITLE	Hours/ Week	CREDIT	INT.MARK	EXT. MARK	TOT. MARK
II	23 P2MAC04	Core Course-IV	Advanced Algebra	6	4	25	75	100
	23 P2MAC05	Core Course-V	Real Analysis - II	6	4	25	75	100
	23 P2MAC06	Core Course-VI	Partial Differential Equations	5	4	25	75	100
	23P2MADE03	Discipline Specific Elective Course-III	Mathematical Methods	4	3	25	75	100
	23P2MADE04	Discipline Specific Elective Course-IV	Discrete Mathematics	4	3	25	75	100
	23P2MAS02	Skill Enhancement Course - II	Mathematical Documentation Using Latex	3	2	25	75	100
	23P2MAAC02	Ability Enhancement Compulsory Course - II	Logical Skills	2	2	25	75	100
	Internship Training during summer vacation.(Credits shall be awarded in III Semester marksheet)			-	-	-	-	-
TOTAL				**30**	**22**	**175**	**525**	**700**

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">ALGEBRAIC STRUCTURES</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">CORE I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23P1MAC01</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td>1</td><td colspan="2">--</td><td colspan="2">5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="8">UG level Modern Algebra</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="8">To introduce the concepts and to develop working knowledge on class equation, solvability of groups, finite abelian groups, linear transformations, real quadratic forms</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="8">UNIT-I : Counting Principle - Class equation for finite groups and its applications - Sylow's theorems (For theorem 2.12.1, First proof only).
Chapter 2: Sections 2.11 and 2.12 (Omit Lemma 2.12.5)</td></tr>
<tr><td colspan="8">UNIT-II : Solvable groups - Direct products - Finite abelian groups- Modules
Chapter 5 : Section 5.7 (Lemma 5.7.1, Lemma 5.7.2, Theorem 5.7.1)
Chapter 2: Section 2.13 and 2.14 (Theorem 2.14.1 only)
Chapter 4: Section 4.5</td></tr>
<tr><td colspan="8">UNIT-III : Linear Transformations: Canonical forms –Triangular form - Nilpotent transformations.
Chapter 6: Sections 6.4, 6.5</td></tr>
<tr><td colspan="8">UNIT-IV : Jordan form - rational canonical form.
Chapter 6 : Sections 6.6 and 6.7</td></tr>
<tr><td colspan="8">UNIT-V: Trace and transpose - Hermitian, unitary, normal transformations, real quadratic form.
Chapter 6 : Sections 6.8, 6.10 and 6.11 (Omit 6.9)</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="8">Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="8">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="8">I.N. Herstein. Topics in Algebra (II Edition) Wiley Eastern Limited, New Delhi, 1975.</td></tr>
</table>

Reference Books	1. M.Artin, *Algebra*, Prentice Hall of India, 1991. 2. P.B.Bhattacharya, S.K.Jain, and S.R.Nagpaul, *Basic Abstract Algebra* (II Edition) Cambridge University Press, 1997. (Indian Edition) 3. I.S.Luther and I.B.S.Passi, *Algebra*, Vol. I –Groups(1996); Vol. II Rings, Narosa Publishing House , New Delhi, 1999 4. D.S.Malik, J.N. Mordeson and M.K.Sen, *Fundamental of Abstract Algebra*, McGraw Hill (International Edition), New York. 1997. 5. N.Jacobson, *Basic Algebra*, Vol. I & II W.H.Freeman (1980); also published by Hindustan Publishing Company, New Delhi.
Website and e-Learning Source	http://mathforum.org, http://ocw.mit.edu/ocwweb/Mathematics, http://www.opensource.org, www.algebra.com

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Recall basic counting principle, define class equations to solve problems, explain Sylow's theorem and apply the theorem to find number of Sylow subgroups

CLO 2: Define Solvable groups, define direct products, examine the properties of finite abelian groups, defin modules

CLO 3: Define similar Transformations, define invariant subspace, explore the properties of triangular matrix to find the index of nilpotence to decompose a space into invariant subspaces, to find invariants of linea transformation, to explore the properties of nilpotent transformation relating nilpotence with invariants.

CLO 4: Define Jordan, canonical form, Jordan blocks, define rational canonical form, define companio matrix of polynomial, find the elementary devices of transformation, apply the concepts to find characteristi polynomial of linear transformation.

CLO 5: Define trace, define transpose of a matrix, explain the properties of trace and transpose, to find trace to find transpose of matrix, to prove Jacobson lemma using the triangular form, define symmetric matrix, skev symmetric matrix, adjoint, to define Hermitian, unitary, normal transformations and to verify whether th transformation in Hermitian, unitary and normal

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

<table>
<tr><td>Title of the Course</td><td colspan="6">REAL ANALYSIS I</td></tr>
<tr><td>Paper Number</td><td colspan="6">CORE II</td></tr>
<tr><td>Category Core</td><td>Year I
Semester I</td><td>Credits</td><td>4</td><td>Course Code</td><td colspan="2">23P1MAC02</td></tr>
<tr><td>Instructional Hours per week</td><td>Lecture
4</td><td>Tutorial
1</td><td>Lab Practice
--</td><td colspan="3">Total
5</td></tr>
<tr><td>Pre-requisite</td><td colspan="6">UG level real analysis concepts</td></tr>
<tr><td>Objectives of the Course</td><td colspan="6">To work comfortably with functions of bounded variation, Riemann-Stieltjes Integration, convergence of infinite series, infinite product and uniform convergence and its interplay between various limiting operations.</td></tr>
<tr><td>Course Outline</td><td colspan="6">UNIT-I : Functions of bounded variation - Introduction - 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 two increasing functions - Continuous functions of bounded variation.
Chapter – 6 : Sections 6.1 to 6.8
Infinite Series : Absolute and conditional convergence - Dirichlet's test and Abel's test - Rearrangement of series - Riemann's theorem on conditionally convergent series.
Chapter 8 : Sections 8.8, 8.15, 8.17, 8.18</td></tr>
<tr><td></td><td colspan="6">UNIT-II : The Riemann - Stieltjes Integral - Introduction - Notation - The definition of the Riemann - Stieltjes integral - Linear Properties - Integration by parts- Change of variable in a Riemann - Stieltjes integral - Reduction to a Riemann Integral – Euler’s summation formula - Monotonically increasing integrators, Upper and lower integrals - Additive and linearity properties of upper, lower integrals - Riemann's condition - Comparison theorems.
Chapter - 7 : Sections 7.1 to 7.14</td></tr>
<tr><td></td><td colspan="6">UNIT-III : The Riemann-Stieltjes Integral - Integrators of bounded variation-Sufficient conditions for the existence of Riemann-Stieltjes integrals-Necessary conditions for the existence of RS integrals- Mean value theorems -integrals as a function of the interval – Second fundamental theorem of integral calculus-Change of variable -Second Mean Value Theorem for Riemann integral- Riemann-Stieltjes integrals depending on a parameter- Differentiation under integral sign-Lebesgue criteriaon for existence of Riemann integrals. Chapter - 7 : 7.15 to 7.26</td></tr>
</table>

	UNIT-IV : Infinite Series and infinite Products - Double sequences - Double series - Rearrangement theorem for double series - A sufficient condition for equality of iterated series - Multiplication of series – Cesaro summability - Infinite products. **Chapter - 8 Sec, 8.20, 8.21 to 8.26** **Power series** - Multiplication of power series - The Taylor's series generated by a function - Bernstein's theorem - Abel's limit theorem - Tauber's theorem **Chapter 9 : Sections 9.14 9.15, 9.19, 9.20, 9.22, 9.23**
	UNIT-V: Sequences of Functions – Pointwise convergence of sequences of functions - Examples of sequences of real - valued functions - Uniform convergence and continuity - Cauchy condition for uniform convergence - Uniform convergence of infinite series of functions - Riemann - Stieltjes integration – Non-uniform Convergence and Term-by-term Integration - Uniform convergence and differentiation - Sufficient condition for uniform convergence of a series - Mean convergence. **Chapter -9 Sec 9.1 to 9.6, 9.8,9.9,9.10,9.11, 9.13**
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	Tom M.Apostol : *Mathematical Analysis*, 2nd Edition, Addison-Wesley Publishing Company Inc. New York, 1974.
Reference Books	1. Bartle, R.G. *Real Analysis*, John Wiley and Sons Inc., 1976. 2. Rudin,W. *Principles of Mathematical Analysis*, 3rd Edition. McGraw Hill Company, New York, 1976. 3. Malik,S.C. and Savita Arora. *Mathematical Anslysis*, Wiley Eastern Limited.New Delhi, 1991. 4. Sanjay Arora and Bansi Lal, *Introduction to Real Analysis*, Satya Prakashan, New Delhi, 1991. 5. Gelbaum, B.R. and J. Olmsted, *Counter Examples in Analysis*, Holden day, San Francisco, 1964. 6. A.L.Gupta and N.R.Gupta, *Principles of Real Analysis*, Pearson Education, (Indian print) 2003.
Website and e-Learning Source	http://mathforum.org, http://ocw.mit.edu/ocwweb/Mathematics, http://www.opensource.org, www.mathpages.com

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO1: Analyze and evaluate functions of bounded variation and Rectifiable Curves.
CLO2: Describe the concept of Riemann-Stieltjes integral and its properties.
CLO3: Demonstrate the concept of step function, upper function, Lebesgue function and their integrals.
CLO4: Construct various mathematical proofs using the properties of Lebesgue integrals and establish the Lev monotone convergence theorem.
CLO5: Formulate the concept and properties of inner products, norms and measurable functions.

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

<table>
<tr><td>Title of the Course</td><td colspan="6">ORDINARY DIFFERENTIAL EQUATIONS</td></tr>
<tr><td>Paper Number</td><td colspan="6">CORE III</td></tr>
<tr><td>Category Core</td><td>Year I
Semester I</td><td>Credits</td><td>4</td><td>Course Code</td><td colspan="2">23P1MAC03</td></tr>
<tr><td>Instructional Hours per week</td><td>Lecture
4</td><td>Tutorial
1</td><td>Lab Practice
--</td><td colspan="3">Total
5</td></tr>
<tr><td>Pre-requisite</td><td colspan="6">UG level Calculus and Differential Equations</td></tr>
<tr><td>Objectives of the Course</td><td colspan="6">To develop strong background on finding solutions to linear differential equations with constant and variable coefficients and also with singular points, to study existence and uniqueness of the solutions of first order differential equations</td></tr>
<tr><td>Course Outline</td><td colspan="6">UNIT-I : Linear equations with constant coefficients
Second order homogeneous equations-Initial value problems-Linear dependence and independence-Wronskian and a formula for Wronskian-Non-homogeneous equation of order two.
Chapter 2: Sections 1 to 6</td></tr>
<tr><td></td><td colspan="6">UNIT-II : Linear equations with constant coefficients
Homogeneous and non-homogeneous equation of order n –Initial value problems- Annihilator method to solve non-homogeneous equation-Algebra of constant coefficient operators.
Chapter 2 : Sections 7 to 12.</td></tr>
<tr><td></td><td colspan="6">UNIT-III : Linear equation with variable coefficients
Initial value problems -Existence and uniqueness theorems – Solutions to solve a non-homogeneous equation – Wronskian and linear dependence – reduction of the order of a homogeneous equation – homogeneous equation with analytic coefficients-The Legendre equation.
Chapter : 3 Sections 1 to 8 (Omit section 9)</td></tr>
<tr><td></td><td colspan="6">UNIT-IV :Linear equation with regular singular points
Euler equation – Second order equations with regular singular points – Exceptional cases – Bessel Function.
Chapter 4 : Sections 1 to 4 and 6 to 8 (Omit sections 5 and 9)</td></tr>
<tr><td></td><td colspan="6">UNIT-V : Existence and uniqueness of solutions to first order equations: Equation with variable separated – Exact equation – method of successive approximations – the Lipschitz condition – convergence of the successive approximations and the existence theorem.
Chapter 5 : Sections 1 to 6 (Omit Sections 7 to 9)</td></tr>
</table>

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	E.A.Coddington, *A introduction to ordinary differential equations* (3rd Printing) Prentice-Hall of India Ltd., New Delhi, 1987.
Reference Books	1. Williams E. Boyce and Richard C. DI Prima, *Elementary differential equations and boundary value problems*, John Wiley and sons, New York, 1967. 2. George F Simmons, *Differential equations with applications and historical notes*, Tata McGraw Hill, New Delhi, 1974. 3. N.N. Lebedev, *Special functions and their applications*, Prentice Hall of India, New Delhi, 1965. 4. W.T. Reid. *Ordinary Differential Equations*, John Wiley and Sons, New York, 1971 5. M.D.Raisinghania, *Advanced Differential Equations*, S.Chand & Company Ltd. New Delhi 2001 6. B.Rai, D.P.Choudary and H.I. Freedman, *A Course in Ordinary Differential Equations*, Narosa Publishing House, New Delhi, 2002.
Website and e-Learning Source	http://mathforum.org, http://ocw.mit.edu/ocwweb/Mathematics, http://www.opensource.org, www.mathpages.com

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO1: Establish the qualitative behavior of solutions of systems of differential equations .

CLO2: Recognize the physical phenomena modeled by differential equations and dynamical systems.

CLO3: Analyze solutions using appropriate methods and give examples.

CLO4: Formulate Green's function for boundary value problems.

CLO5: Understand and use various theoretical ideas and results that underlie the mathematics in this course.

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

<table>
<tr><td>Title of the Course</td><td colspan="7">NUMBER THEORY AND CRYPTOGRAPHY</td></tr>
<tr><td>Paper Number</td><td colspan="7">Elective I(Generic / Discipline Specific)(One from Group A)</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23P1MADE01</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td colspan="2">4</td><td>1</td><td colspan="2">--</td><td colspan="2">5</td></tr>
<tr><td>Pre-requisite</td><td colspan="7">UG level Number Theroy.</td></tr>
<tr><td>Objectives of the Course</td><td colspan="7">1. To introduce students to some of the basic ideas of number theory, and to use this as a context in which to discuss the development of mathematics through examples, conjectures, theorems, proofs and applications.
2. Illustrate different methods of proof in the context of elementary number theory, and will apply some basic techniques of number theory to cryptography.
3. To explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms.
4. To introduce classical encryption techniques and concepts of modular arithmetic and number
theory.</td></tr>
<tr><td rowspan="5">Course Outline</td><td colspan="7">UNIT I : Divisibility and Euclidean algorithm – Congruence, Euler’s Theorem, Wilson’s Theorem,
Chinese Remainder Theorem, Primitive roots - Applications to Factoring.
Chapter 1, Sections 1.1-1.4</td></tr>
<tr><td colspan="7">UNIT II: Finite Fields – Quadratic Residues – Quadratic Reciprocity – The Jacobi symbol.
Chapter 2, Sections 2.1-2.2</td></tr>
<tr><td colspan="7">UNIT III: Cryptosystems – Enciphering Matrices – Public Key Cryptography – Concepts of Public Key Cryptography – Modular Arithmetic – RSA.
Chapters 3&4, Sections 3.1-3.2, 4.1-4.2</td></tr>
<tr><td colspan="7">UNIT IV: Pseudo primes and Strong Pseudo primes – The rho method – Fermat factorization and factor bases and Algorithm – The Continued fraction method and Algorithm.
Chapter 5, Sections 5.1-5.4</td></tr>
<tr><td colspan="7">UNIT V: Elliptic Curves – Basic Facts, Elliptic curves Cryptosystems. Chapter 6, Sections 6.1-6.2</td></tr>
</table>

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	"A Course in Number Theory and Cryptography" by Neal Koblitz, , Springer – Verlag, New York, 1987.
Reference Books	"An Introduction to Theory of Numbers" by Ivan Nivan and HerbertsZucherman, Third Edition, 1972, Wiley Eastern Limited, New Delhi
	"Introduction to Analytic Number Theory" by Tom Apostol, Narosa Publications, New Delhi
	"Elementary Number Theory" by David M. Burton, Wm. C. Brown Publishers, Dubuque, Lowa, 1989.
	"Cryptography and Network Security Principles and Practice" by William Stallings, Prentice Hall, Fifth Edition, New Delhi, 2011.
Website and e-Learning Source	https://www.youtube.com/watch?v=SCvtxjpVQms
	https://www.youtube.com/watch?v=pBELpoglnvQ&list=PLgMDNELGJ1CbdGLyn7OrVAP-IKg-0q2U2

Title of the Course		**MATHEMATICAL PROGRAMMING**					
Paper Number		**ELECTIVE**					
Category	Elective	**Year**	I	**Credits**	3	**Course Code**	**23P1MADE02**
		Semester	I				
Instructional Hours per week		**Lecture**	**Tutorial**		**Lab Practice**	**Total**	
		3	1		--	4	
Objectives of the Course		This course introduces advanced topics in Linear and non-linear Programming					
Course Outline		**UNIT-I INTEGER LINEAR PROGRAMMING:** Types of Integer Linear Programming Problems - Concept of Cutting Plane - Gomory's All Integer Cutting Plane Method - Gomory's mixed Integer Cutting Plane method - Branch and Bound Method. - Zero-One Integer Programming. Dynamic Programming: Characteristics of Dynamic Programming Problem - Developing Optimal Decision Policy - Dynamic Programming Under Certainty - DP approach to solve LPP. Chapter-7: 7.1 - 7.7 Chapter-20: 20.1 - 20.5					
		UNIT-II CLASSICAL OPTIMIZATION METHODS: Unconstrained Optimization - Constrained Multi-variable Optimization with Equality Constraints - Constrained Multi-variable Optimization with inequality Constraints Non-linear Programming Methods: Examples of NLPP - General NLPP - Graphical solution - Quadratic Programming - Wolfe's modified Simplex Methods - Beale's Method Chapter-23: 23.1 - 23.4 Chapter-24: 24.1 - 24.4					
		UNIT-III THEORY OF SIMPLEX METHOD: Canonical and Standard form of LP - Slack and Surplus Variables - Reduction of any Feasible solution to a Basic Feasible solution - Alternative Optimal solution - Unbounded solution - Optimality conditions - Some complications and their resolutions - Degeneracy and its resolution. Chapter-25: 25.1 - 25.4, 25.6-25.9					
		UNIT-IV REVISED SIMPLEX METHOD: Standard forms for Revised simplex Method - Computational procedure for Standard formI - comparison of simplex method and Revised simplex Method. Bounded Variables LP problem: The simplex algorithm Chapter-26: 26.1 - 26.4 Chapter-28: 28.1, 28.2					
		UNIT-V PARAMETRIC LINEAR PROGRAMMING: Variation in the coefficients cj , Variations in the Right hand side, bi . Goal Programming: Difference between LP and GP approach - Concept of Goal Programming - Goal Programming Model formulation - Graphical Solution Method of Goal Programming - Modified Simplex method of Goal Programming. Chapter-29: 29.1 - 29.3					

Extended Professional Component	Questions related to the above topics, from various competitive examinationsUPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency,Professional Communication and Transferrable Skill

Recommended Text	1.J.K.Sharma, Operations Research, Theory and Applications, Third Edition (2007) Macmillan India Ltd.
Reference Books	1. Hamdy A. Taha, Operations Research, (seventh edition) Prentice - Hall of India Private Limited, New Delhi, 1997. 2. F.S. Hillier & J.Lieberman Introduction to Operation Research (7th Edition) TataMcGraw Hill ompany, New Delhi, 2001. 3. Beightler. C, D.Phillips, B. Wilde ,Foundations of Optimization (2nd Edition) Prentice Hall Pvt Ltd., New York, 1979 4. S.S. Rao - Optimization Theory and Applications, Wiley Eastern Ltd. New Delhi. 1990
Website and e-Learning Source	http://mathforum.org, http://ocw.mit.edu/ocwweb/Mathematics, http://www.opensource.org, www.mathpages.com

Course Learning Outcome (for Mapping with POs and PSOs)

	Pos						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	3	3	3	3	3	3	3	3
CLO2	3	2	2	1	2	2	3	2	3
CLO3	3	3	3	2	3	3	3	3	3
CLO4	3	1	3	3	3	3	3	2	3
CLO5	3	2	3	3	3	3	3	3	3

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">DIFFERENTIAL EQUATIONS USING SCILAB</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">SEC</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23P1MAS01</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2"></td><td>1</td><td colspan="2">1</td><td colspan="2">--</td><td>2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">UG level computer knowledge</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">To make the students aware of SCILAB Programming environment.
Students will learn to solving Ordinary Differential Equations.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT I
An Introduction to Scilab – Matrices</td></tr>
<tr><td colspan="6">UNIT II
Scilab Programming</td></tr>
<tr><td colspan="6">UNIT III
Functions –Plotting</td></tr>
<tr><td colspan="6">UNIT IV
Solving Ordinary Differential Equations</td></tr>
<tr><td colspan="6">UNIT V
Polynomials in Scilab</td></tr>
<tr><td colspan="2">Extended Professional Component</td><td colspan="6">Questions related to the above topics, from various competitive examinations UPSC /TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="6">1. PROGRAMMING USING SCILAB, AKHILESH KUMAR</td></tr>
<tr><td colspan="2">Reference Books</td><td colspan="6">1.Ordinary Differential Equations with Scilab by Gilberto E.Urroz</td></tr>
<tr><td colspan="2">Website and e-Learning Source</td><td colspan="6">http://mathforum.org, http://ocw.mit.edu/ocwweb/Mathematics, http://www.opensource.org, www.mathpages.com</td></tr>
</table>

Course Learning Outcome (for Mapping with POs and PSOs)

	Pos						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	3	3	3	3	3	3	3	3
CLO2	3	2	2	1	2	2	3	2	3
CLO3	3	3	3	2	3	3	3	3	3
CLO4	3	1	3	3	3	3	3	2	3
CLO5	3	2	3	3	3	3	3	3	3

<table>
<tr><td>Title of the Course</td><td colspan="8">APTITUDE SKILLS</td></tr>
<tr><td>Paper Number</td><td colspan="8">AECC 1</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td colspan="2" rowspan="2">23P1MAAC01</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td colspan="2">1</td><td>1</td><td colspan="2">--</td><td colspan="2">2</td></tr>
<tr><td>Pre-requisite</td><td colspan="8">UG level Aptitude skills.</td></tr>
<tr><td>Objectives of the Course</td><td colspan="8">1.The main aim of introducing “Quantitative Aptitude”for mathematics students is to develop skill to meet the competitive examinations for better job opportunity.
2.Effort has been made to accommodate fundamental, mathematical aspects to instill confidence among students.
3.Enrich their knowledge and to develop their logical reasoning thinking ability.</td></tr>
<tr><td>Course Outline</td><td colspan="8">UNIT I : Whole numbers, Integers, Rational and irrational numbers, Fractions, Square roots andCube roots, Surds and Indices, Problems on Numbers, Divisibility.
Steps of Long Division Method for Finding Square Roots</td></tr>
<tr><td></td><td colspan="8">UNIT II: Basic concepts, Different formulae of Percentage, Profit and Loss, Discount, Simpleinterest, Ratio and Proportion, Mixture.</td></tr>
<tr><td></td><td colspan="8">UNIT III: Time and Work, Pipes and Cisterns, Basic concepts of Time, Distance and Speed;relationship among them.</td></tr>
<tr><td></td><td colspan="8">UNIT IV: Concept of Angles, Different Polygons like triangles, rectangle, square, right angledtriangle, Pythagorean Theorem, perimeter and Area of Triangles, Rectangles, Circles.</td></tr>
<tr><td></td><td colspan="8">UNIT V: Raw and grouped Data, Bar Graphs, Pie charts, Mean, Median and Mode, Events andSample Space, Probability.</td></tr>
<tr><td>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="8">Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
</table>

Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1.Quantitative aptitude for Competitive examination By R S Agarwal 2. A Modern Approach To Verbal & Non Verbal Reasoning By R S Agarwal
Reference Books	Analytical and Logical reasoning for CAT and other management entrance test By Sijwali B S
	Quantitative Aptitude by Competitive Examinations by Abhijit Guha 4 th edition
	Analytical and Logical reasoning By Sijwali B S
Website and e-Learning Source	1. https://prepinsta.com/ 2. https://www.indiabix.com/ 3. https://www.javatpoint.com

Course Learning Outcome (for Mapping with POs and PSOs)

	Pos						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	3	3	3	3	3	3	3	3
CLO2	3	2	2	1	2	2	3	2	3
CLO3	3	3	3	2	3	3	3	3	3
CLO4	3	1	3	3	3	3	3	2	3
CLO5	3	2	3	3	3	3	3	3	3

<table>
<tr><td>Title of the Course</td><td colspan="6">ADVANCED ALGEBRA</td></tr>
<tr><td>Paper Number</td><td colspan="6">CORE IV</td></tr>
<tr><td rowspan="2">Category Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23P2MAC04</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td>Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td colspan="2">5</td><td>1</td><td>--</td><td colspan="2">6</td></tr>
<tr><td>Pre-requisite</td><td colspan="6">Algebraic Structures</td></tr>
<tr><td>Objectives of the Course</td><td colspan="6">To study field extension, roots of polynomials, Galois Theory, finite fields, division rings, solvability by radicals and to develop computational skill in abstract algebra.</td></tr>
<tr><td rowspan="5">Course Outline</td><td colspan="6">UNIT-I :Extension fields – Transcendence of e.
Chapter 5: Section 5.1 and 5.2</td></tr>
<tr><td colspan="6">UNIT-II : Roots or Polynomials.- More about roots
Chapter 5: Sections 5.3 and 5.5</td></tr>
<tr><td colspan="6">UNIT-III : Elements of Galois theory.
Chapter 5 : Section 5.6</td></tr>
<tr><td colspan="6">UNIT-IV : Finite fields - Wedderburn's theorem on finite division rings.
Chapter 7: Sections 7.1 and 7.2 (Theorem 7.2.1 only)</td></tr>
<tr><td colspan="6">UNIT-V :Solvability by radicals - A theorem of Frobenius - Integral Quaternions and the Four - Square theorem.
Chapter 5: Section 5.7 (omit Lemma 5.7.1, Lemma 5.7.2 and Theorem 5.7.1)
Chapter 7 : Sections 7.3 and 7.4</td></tr>
<tr><td>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="6">Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td>Skills acquired from this course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td>Recommended Text</td><td colspan="6">I.N. Herstein. Topics in Algebra (II Edition) Wiley EasternLimited, New Delhi, 1975.</td></tr>
</table>

Reference Books	1. M.Artin, *Algebra*, Prentice Hall of India, 1991. 2. P.B.Bhattacharya, S.K.Jain, and S.R.Nagpaul, *Basic Abstract Algebra* (II Edition) Cambridge University Press, 1997. (Indian Edition) 3. I.S.Luther and I.B.S.Passi, *Algebra,* Vol. I –Groups(1996); Vol. II *Rings*,Narosa Publishing House , New Delhi, 1999 4. D.S.Malik, J.N. Mordeson and M.K.Sen, *Fundamental of Abstract Algebra*, McGraw Hill (International Edition), New York. 1997. 5. N.Jacobson, *Basic Algebra*, Vol. I & II Hindustan Publishing Company, New Delhi.
Website and e-Learning Source	http://mathforum.org, http://ocw.mit.edu/ocwweb/Mathematics, http://www.opensource.org, www.algebra.com

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO1: Prove theorems applying algebraic ways of thinking.

CLO2: Connect groups with graphs and understanding about Hamiltonian graphs.

CLO3: Compose clear and accurate proofs using the concepts of Galois Theory.

CLO4: Bring out insight into Abstract Algebra with focus on axiomatic theories.

CLO5: Demonstrate knowledge and understanding of fundamental concepts including extension fields, Algebraic extensions, Finite fields, Class equations and Sylow's theorem.

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">REAL ANALYSIS II</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE V</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23P2MAC05</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td>Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td colspan="2">5</td><td>1</td><td>--</td><td colspan="2">6</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">Elements of Real Analysis</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">To introduce measure on the real line, Lebesgue measurability and integrability, Fourier Series and Integrals, in-depth study in multivariable calculus.</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="6">UNIT-I :Measure on the Real line - Lebesgue Outer Measure - Measurable sets - Regularity - Measurable Functions - Borel and Lebesgue Measurability
Chapter - 2 Sec 2.1 to 2.5 (de Barra)</td></tr>
<tr><td colspan="6">UNIT-II : Integration of Functions of a Real variable - Integration of Non- negative functions - The General Integral - Riemann and Lebesgue Integrals
Chapter - 3 Sec 3.1,3.2 and 3.4 (de Barra)</td></tr>
<tr><td colspan="6">UNIT-III : Fourier Series and Fourier Integrals - Introduction - Orthogonal system of functions - The theorem on best approximation - The Fourier series of a function relative to an orthonormal system - Properties of Fourier Coefficients - The Riesz-Fischer Thorem - The convergence and representation problems in for trigonometric series - The Riemann - Lebesgue Lemma - The Dirichlet Integrals - An integral representation for the partial sums of Fourier series - Riemann's localization theorem - Sufficient conditions for convergence of a Fourier series at a particular point –Cesarosummability of Fourier series- Consequences of Fejes's theorem - The Weierstrass approximation theorem
Chapter 11 : Sections 11.1 to 11.15 (Apostol)</td></tr>
<tr><td colspan="6">UNIT-IV : Multivariable Differential Calculus - Introduction - The Directional derivative - Directional derivative and continuity - The total derivative - The total derivative expressed in terms of partial derivatives - The matrix of linear function - The Jacobian matrix - The chain rule - Matrix form of chain rule - The mean - value theorem for differentiable functions - A sufficient condition for differentiability - A sufficient condition for equality of mixed partial derivatives - Taylor's theorem for functions of R^n to R^1
Chapter 12 : Section 12.1 to 12.14 (Apostol)</td></tr>
<tr><td colspan="6">UNIT-V : Implicit Functions and Extremum Problems : Functions with non-zero Jacobian determinants – The inverse function theorem- The Implicit function theorem-Extrema of real valued functions of severable variables-Extremum problems with side conditions.
Chapter 13 : Sections 13.1 to 13.7 (Apostol)</td></tr>
</table>

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. G. de Barra, *Measure Theory and Integration*, Wiley Eastern Ltd., New Delhi, 1981. (for Units I and II) 2. Tom M.Apostol : *Mathematical Analysis*, 2nd Edition, Addison-Wesley Publishing Company Inc. New York, 1974. (for Units III, IV and V)
Reference Books	1. Burkill,J.C.*The Lebesgue Integral*, Cambridge University Press, 1951. 2. Munroe,M.E.*Measure and Integration*. Addison-Wesley, Mass.1971. 3. Roydon,H.L.*Real Analysis*, Macmillan Pub. Company, New York, 1988. 4. Rudin, W. *Principles of Mathematical Analysis*, McGraw Hill Company, New York,1979. 5. Malik,S.C. and Savita Arora. *Mathematical Analysis*, Wiley Eastern Limited. New Delhi, 1991. 6. Sanjay Arora and Bansi Lal, *Introduction to Real Analysis*, Satya Prakashan, New Delhi, 1991
Website and e-Learning Source	http://mathforum.org, http://ocw.mit.edu/ocwweb/Mathematics, http://www.opensource.org

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO1: Understand and describe the basic concepts of Fourier series and Fourier integrals with respect to orthogonal system.

CLO2: Analyze the representation and convergence problems of Fourier series.

CLO3: Analyze and evaluate the difference between transforms of various functions.

CLO4: Formulate and evaluate complex contour integrals directly and by the fundamental theorem.

CLO5: Apply the Cauchy integral theorem in its various versions to compute contour integration.

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

<table>
<tr><td>Title of the Course</td><td colspan="6">PARTIAL DIFFERENTIAL EQUATIONS</td></tr>
<tr><td>Paper Number</td><td colspan="6">CORE VI</td></tr>
<tr><td rowspan="2">Category Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23P2MAC06</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td>Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td colspan="2">4</td><td>1</td><td>--</td><td colspan="2">5</td></tr>
<tr><td>Pre-requisite</td><td colspan="6">UG level partial differential equations</td></tr>
<tr><td>Objectives of the Course</td><td colspan="6">To classify the second order partial differential equations and to study Cauchy problem, method of separation of variables, boundary value problems.</td></tr>
<tr><td>Course Outline</td><td colspan="6">UNIT-I :Mathematical Models and Classification of second order equation : Classical equations-Vibrating string – Vibrating membrane – waves in elastic medium – Conduction of heat in solids – Gravitational potential – Second order equations in two independent variables – canonical forms – equations with constant coefficients – general solution
Chapter 2 : Sections 2.1 to 2.6
Chapter 3 : Sections 3.1 to 3.4 (Omit 3.5)</td></tr>
<tr><td></td><td colspan="6">UNIT-II :Cauchy Problem : The Cauchy problem – Cauchy-Kowalewsky theorem – Homogeneous wave equation – Initial Boundary value problem- Non-homogeneous boundary conditions – Finite string with fixed ends – Non-homogeneous wave equation – Riemann method – Goursat problem – spherical wave equation – cylindrical wave equation.
Chapter 4 : Sections 4.1 to 4.11</td></tr>
<tr><td></td><td colspan="6">UNIT-III :Method of separation of variables: Separation of variable-Vibrating string problem – Existence and uniqueness of solution of vibrating string problem - Heat conduction problem – Existence and uniqueness of solution of heat conduction problem – Laplace and beam equations
Chapter 6 : Sections 6.1 to 6.6 (Omit section 6.7)</td></tr>
<tr><td></td><td colspan="6">UNIT-IV : Boundary Value Problems : Boundary value problems – Maximum and minimum principles – Uniqueness and continuity theorem – Dirichlet Problem for a circle , a circular annulus, a rectangle – Dirichlet problem involving Poisson equation – Neumann problem for a circle and a rectangle.
Chapter 8 : Sections 8.1 to 8.9</td></tr>
<tr><td></td><td colspan="6">UNIT-V : Green’s Function: The Delta function – Green’s function – Method of Green’s function – Dirichlet Problem for the Laplace and Helmholtz operators – Method of images and eigen functions – Higher dimensional problem – Neumann Problem.
Chapter 10 : Section 10.1 to 10.9</td></tr>
</table>

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	TynMyint-U and Lokenath Debnath, *Partial Differential Equations for Scientists and Engineers* (Third Edition), North Hollan, New York, 1987.
Reference Books	1. M.M.Smirnov, *Second Order partial Differential Equations*, Leningrad, 1964. 2. I.N.Sneddon, *Elements of Partial Differential Equations*, McGraw Hill, New Delhi, 1983. 3. R. Dennemeyer, *Introduction to Partial Differential Equations and Boundary Value Problems*, McGraw Hill, New York, 1968. 4. M.D.Raisinghania, *Advanced Differential Equations*, S.Chand & Company Ltd., New Delhi, 2001. 5. S, Sankar Rao, *Partial Differential Equations*, 2nd Edition, Prentice Hall of India, New Delhi. 2004
Website and e-Learning Source	http://mathforum.org, http://ocw.mit.edu/ocwweb/Mathematics, http://www.opensource.org, www.mathpages.com

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO1: To understand and classify second order equations and find general solutions

CLO2: To analyse and solve wave equations in different polar coordinates

CLO3: To solve Vibrating string problem, Heat conduction problem, to identify and solve Laplace and beam equations

CLO4: To apply maximum and minimum principle's and solve Dirichlet, Neumann problems for various boundary conditions

CLO5: To apply Green's function and solve Dirichlet, Laplace problems, to apply Helmholtz operation and to solve Higher dimensional problem.

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

Programme code	M.Sc	Programme Title	Master of Science (Mathematics)	
Course Code	23P2MADE03	Title	Batch	2023-22025
		ELECTIVE III: MATHEMATICAL METHODS	Semester	II
Hrs/Week	4		Credits	03

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To understand the concepts ofVariational problems.	K2
CO2	To gain knowledge about Variational Problem.	K3, K4
CO3	To understand various types of integral equation.	K1,K2
CO4	To analyze the Fredholm integral equations.	K4
CO5	To Evaluate Gram Schmit orthogonlization process and Solution of Fredholm integral equation of first kind.	K5,K6

UNIT – I: Variational problems with fixed boundaries (18 Hrs)

The concept of variation and its properties- Euler's equation- Variational problems for Functionals- Functionals dependent on higher order derivatives – Functions of several independentvariables – Some applications to problems of Mechanics.

Chapter- 1 (Sec 1.1- 1.7)

UNIT – II : Variational problems with moving boundaries (18 Hrs)

Movable boundary for a functional dependent on two functions – one-side variations – Reflectionand Refraction of extermals – Diffraction of light rays.

Chapter – 2 (Sec 2.1 – 2.5)

UNIT – III :Integral Equation (18 Hrs)

Introduction – Types of Kernels – Eigen Values and Eigen Functions – Connection with differential equation – Solution of an integral equation – Initial value problems – Boundary value problems.

Chapter – 1(Sec 1.1 – 1.3 & 1.5 – 1.8)

UNIT – IV : Solution of Fredholm integral equation (18 Hrs)

Second kind with separable kernel – Orthogonality and reality eigen function - Fredholm integralequation with separable kernel - Solution of Fredholm integral equation by successive substitution – Successive approximation – Volterra integral equation - Solution of successive substitution . Chapter – 2 (Sec 2.1 – 2.3), Chapter – 4 (Sec 4.1 – 4.5)

UNIT – V : Hilbert – Schmidt Theory **(18 Hrs)**

Complex Hilbert Space – Orthogonal system of functions – Gram Schmit orthogonlizationprocess - Hilbert – Schmidt Theorem - Solution of Fredholm integral equation of first kind.

Chapter – 3(Sec 3.1 – 3.4 , 3.8 – 3.9)

TOTAL : 90 Hours

Power point Presentations, Seminar & Assignment

TEXT BOOKS:

1. **A.S. Gupta,** ***Calculus of Variations with Application,*** Prentice Hall of India, New Delhi, 2005.

2. **Sudir K.Pundir and Rimple Pundir**, ***Integral Equations and Boundary Value Problems,*** Pragati Prakasam, Meerut, 2005.

REFERENCE BOOKS:

1. F.B.Hildebrand, ***Methods of Applied Mathematics***, Prentice Hall of India Pvt. New Delhi, 1968.

2. R.P.Kanwal, ***Linear Integral Equations-Theory and Techniques***, Academic Press, New York, 1971.

3. L.Elsgolts, ***Differential Equations and Calculus of Variations***, Mir Publishers, Moscow, 1973.

Sadri Hassani, ***Mathematical Methods***, pub 2009.

ONLINE SOURCES:

1. http://physics.bgu.ac.il/~gedalin/Teaching/Master/mmp.pdf

2. http://home.iitk.ac.in/~dasgupta/Mathbook/Imastertrans.pdf

Mapping with Programme Outcomes

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S	M	L	S	S	L	M	L	S	L	S	L	L	L	S
CO2	S	S	M	M	S	M	L	S	M	L	S	M	M	S	M
CO3	S	L	S	S	M	L	S	M	S	M	S	M	M	M	S
CO4	S	L	S	M	M	L	L	M	M	L	M	L	L	L	S
CO5	S	M	L	S	S	S	S	M	S	M	L	S	M	M	M

S - Strong; M - Medium; L – Low

Programme code	M.Sc	Programme Title	Master of Science (Mathematics)	
Course Code	23P2MADE04	Title	Batch	2023-2025
		ELECTIVE IV: DISCRETE MATHEMATICS	Semester	II
Hrs/Week	4		Credits	03

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To Remember the basic ideas of foundations and logic.	K1, K2
CO2	To Gain knowledge about Permutations and Combinations	K4
CO3	Demonstrate the concept of Generating functions.	K2
CO4	To analyze the Boolean Functions and Logic gates.	K1,K2, K5
CO5	To Evaluate the theory of Modeling Computation .	K3,K6

UNIT-I: The Foundations - Logic and proofs (18Hrs)

Propositional – Applications of Propositional – Propositional Equivalences – Predicates andQuantifiers. Algorithms : The Growth of functions.

Chapter - 1 (Sec 1.1 – 1.3) , Chapter - 3 (Sec 3.1 – 3.2)

UNIT-II: Counting (18 Hrs)

The Basics of Counting – The Pigeonhole principle – Permutations and Combinations –Generalized Permutations and Combinations – Generating Permutations and Combinations.

Chapter - 5 (Sec 5.1 – 5.3, Sec 5.5, 5.6)

UNIT-III: Advanced Counting Techniques (18Hrs)

Recurrence Relations – Solving Linear Recurrence Relations – Generating

Functions.Chapter - 6 (Sec 6.1, 6.2, 6.4)

UNIT-IV: Boolean Algebra : (18 Hrs)

Boolean Functions – Representing Boolean Functions – Logic Gates – Minimization of

Circuits.Chapter - 10(Sec 10.1 – 10.4)

UNIT-V: Modeling Computation **(18 Hrs)**

Finite – State machines with Output – Finite – State machines with no Output – Turing Machines.Chapter - 12(Sec 12.2, 12.3, 12.5)

TOTAL : **90 Hours**

Power point Presentations, Seminar & Assignment

TEXT BOOK :

Kenneth H.Rosen, ***Discrete Mathematics and its Applications***,7th Edition, WCB/McGraw HillEducation, New York, 2008.

REFERENCE BOOKS :

1. **J.P.Trembley and R.Manohar,** ***Discrete Mathematical Structures applications to ComputerScience,***Tata McGraw Hills,New Delhi, 2013.
2. **T.Veerarajan,** ***Discrete Mathematics with Graph Theory and Combinatorics,*** Tata McGraw HillsPublishing Company Limited, 7th Reprint, 2008.
3. **Prof. V.Sundaresan, K.S. Ganapathy Subramaniyan, K.Ganesan,** ***Discrete Matheamtics***, Tata McGraw Hill, New Delhi, 2000.

ONLINE SOURCES:

1. www.freebook centre.net/
2. www.maths for college.com/nm/topics/text book

Mapping with Programme Outcomes

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S	M	S	S	M	L	M	L	M	L	S	L	L	L	S
CO2	S	L	S	M	M	L	L	M	M	L	M	L	L	L	S
CO3	S	M	L	S	S	L	M	L	S	L	S	L	L	L	S
CO4	S	M	S	S	S	M	S	M	S	L	S	M	M	L	S
CO5	L	L	S	M	S	M	L	S	M	M	L	L	L	L	S

S - Strong; M - Medium; L – Low

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	23P2MAS02	**Title**	**Batch**	2023-25
		SEC 2: Mathematical documentation using LATEX	**Semester**	II
Hrs/Week	2		**Credits**	02

Objectives : To introduce students with a software that is being widely used for typesetting especially in Mathematics field. To make students know importance of this software for publishing research articles,papers,project reports and books and thereby help them to be comfortable with the software .

Unit I : Installation of LaTeX 7 Hours

i) Installation of Kile and MikeTeX.

ii) Class and packages

iii) Latex programming and commands,sample packages

iv) Error messages : Some sample errors,list of LaTeX error messages

Unit II : Formatting of output document : 7 Hours

i) Fonts,symbols,indenting,paragraphs,line spacing,word spacing,titles and subtitles

ii) Document class,page style,parts of the documents,table of contents

Unit III : Formating of output document : 7 Hours

i) Command names and arguments,environments,declarations

ii) Theorem like declarations, comments within text

Unit –IV : Mathematical formulae : 7 Hours

i) Mathematical environments, math mode ,mathematical symbols

ii) Graphic package, multivalued functions, drawing matrices

iii) Tables, tables with captions

Unit –V : Drawing with LaTeX **7 Hours**

i) Picture environments

ii)\ Extended pictures,other drawing packages

iii) Preparing book,project report in LaTeX.

Reference Book :

Guide to LATEX, fourth edition, *Helmut Kopka,Patrick W.Daly*

Program mecode	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	23P2MAAC02	**Title**	**Batch**	2023-25
		AECC 2: LOGICAL SKILLS	**Semester**	II
Hrs/Week	2		**Credits**	02

Unit-1: Analogy: Common relationships, Simple Analogy, Number Analogy, Alphabet Analogy.

Unit-2: Coding- Decoding, Blood relations, Mathematical Operations.

Unit-3: Arithmetical Reasoning, Directional Sense Test.

Unit-4: Logic – Logical Reasoning, Logical Deduction, Two premise arguments, three premise arguments.

Unit-5: Classification. Mirror Images, Cubes and Dice.

Text Books:

1. A Modern Approach To Verbal & Non Verbal Reasoning By R S Agarwal

Reference books:

1. Analytical and Logical reasoning for CAT and other management entrance test By Sijwali B S
2. Quantitative Aptitude by Competitive Examinations by Abhijit Guha 4 th edition
3. Analytical and Logical reasoning By Sijwali B S
4. Quantitative aptitude for Competitive examination By R S Agarwal
5. Analytical and Logical reasoning for CAT and other management entrance test By Sijwali B S

Online Sources:

1. https://prepinsta.com/
2. https://www.indiabix.com/
3. https://www.javatpoint.com