VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN

[AUTONOMOUS]

ELAYAMPALAYAM, TIRUCHENGODE -637 205.

DEPARTMENT OF MATHEMATICS

M.Sc. – MATHEMATICS

COURSE PATTERN AND SCHEME OF EXAMINATIONS UNDER OBE

For the Candidates admitted from the year 2020-2021

SEM	SUBJECT CODE	COURSE	SUBJECT TITLE	Hrs/ Week	CREDIT	INT. MARK	EXT. MARK	TOT. MARK
I	20P1MA01	Core Course-I	Linear Algebra	6	5	25	75	100
	20P1MA02	Core Course-II	Real Analysis-I	6	5	25	75	100
	20P1MA03	Core Course-III	Number Theory	6	5	25	75	100
	20P1MA04	Core Course-IV	Ordinary Differential Equations	6	4	25	75	100
	20P1MAE01 20P1MAE02	Core Based Elective-I	Elective from Group-A	6	4	25	75	100
TOTAL				**30**	**22**	**125**	**375**	**500**
II	20P2MA05	Core Course-V	Abstract Algebra	6	5	25	75	100
	20P2MA06	Core Course-VI	Mechanics	6	5	25	75	100
	20P2MA07	Core Course-VII	Real Analysis-II	6	5	25	75	100
	20P2MA08	Core Course-VIII	Partial Differential Equations	6	4	25	75	100
	20P2MAE03 20P2MAE04	Core Based Elective-II	Elective from Group-B	6	4	25	75	100
TOTAL				**30**	**23**	**125**	**375**	**500**

III	20P3MA09	Core Course-IX	Complex Analysis	6	5	25	75	100
	20P3MA10	Core Course-X	Topology	5	5	25	75	100
	20P3MA11	Core Course-XI	Numerical Analysis	5	4	25	75	100
	20P3MA12	Core Course-XII	Graph Theory	4	4	25	75	100
	20P3MAE05 20P3MAE06	Core Based Elective-III	Elective From Group-C	5	4	25	75	100
	20P3CSED01	EDC	Introduction to Information Technology	3	2	25	75	100
	20P3HR04	Value based education	Human Rights	2	2	25	75	100
TOTAL				**30**	**26**	**175**	**525**	**700**

IV	20P4MA13	Core Course-XIII	Functional Analysis	6	5	25	75	100
	20P4MA14	Core Course-XIV	Probability Theory	6	4	25	75	100
	20P4MA15	Core Course-XV	Measure Theory and Integration	6	4	25	75	100
	20P4MAE07 20P4MAE08	Core Based Elective-IV	Elective from Group-D	6	4	25	75	100
	20P4CSSK01	Soft Skill	Mat Lab	2	2	25	75	100
	20P4MAPR01	PROJECT	Project	4	3	75	25	100
TOTAL				**30**	**22**	**275**	**425**	**700**
GRAND TOTAL				**120**	**93**	**700**	**1700**	**2400**

ELECTIVE PAPERS:

GROUP-A

20P1MAE01 DISCRETE MATHEMATICS

20P1MAE02 FLUID DYNAMICS

GROUP-B

20P2MAE03 MATHEMATICAL METHODS

20P2MAE04 COMBINATORIAL MATHEMATICS

GROUP-C

20P3MAE05 OPTIMIZATION TECHNIQUES

20P3MAE06 FUZZY SETS AND THEIR APPLICATIONS

GROUP-D

20P4MAE07 DIFFERENTIAL GEOMETRY

20P4MAE08 DIFFERENCE EQUATIONS

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DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20P1MA01	**Title**	**Batch**	2020-2022
		CORE I: LINEAR ALGEBRA	**Semester**	I
Hrs/Week	6		**Credits**	05

Course Outcomes (CO)

CO Number	**CO Statement**	**Knowledge Level**
CO1	Understand the concepts of linear transformations and its representation by matrices.	K1, K2
CO2	Discuss the concepts of polynomials and prime factorization of a polynomial	K1,K2,K3
CO3	Demonstrate the properties of determinants and characteristics values.	K4,K5
CO4	Analyze the concept of triangulation, diagonalization and decomposition	K4
CO5	Evaluate the concept of bilinear Transformation.	K5

Unit I : Linear transformations (18 Hrs)

Linear transformations- the algebra of Linear transformations- Isomorphism- Representation of Transformation by matrices. Chapter - 3 (Sec 3.1 – 3.4)

Unit II : Polynomials (18 Hrs)

Algebra- the algebra of polynomials- lagrange interpolation- polynomial ideals- the prime factorization of a polynomial. Chapter - 4 (Sec 4.1 – 4.5)

Unit III : Determinants (18 Hrs)

Commutative rings- determinant functions – permutations & the uniqueness of determinants-

additional properties of determinants. Chapter - 5 (Sec 5.1 – 5.4)

Unit IV: Elementary canonical forms (18Hrs)

Elementary canonical forms- introduction- characteristic values- annihilatery polynomials- invariant subspaces- simultaneous triangulation, simultaneous diagonalization.

Chapter - 6 (Sec 6.1 – 6.5)

Unit V: The rational & Jordan forms (18 Hrs)

Cyclic subspaces & annihilaters – cyclic decompositions & the rational form- the Jordan form.

Chapter - 7 (Sec 7.1 – 7.3)

TOTAL : **90 Hours**

Power point Presentations, Seminar & Assignment

TEXT BOOK:

Kenneth Hoffman & Ray Kunze, ***Linear algebra ,*** 2nd Edition, Prentice Hall of India Private Limited, New Delhi, 2015.

REFERENCE BOOKS:

1. Jim Defranza and Daniel Gagliardi, ***Introduction to Linear Algebra with application***, Indian Edition, 2011.

2. V. Krishnamurthy, ***An Introduction to Linear Algebra***, West press Pvt. Ltd., New Delhi, 1938.

3. H. Friedberg, A.J.Insel & L.E.Spence, ***Linear Algebra,*** PHI learning Pvt. Ltd., New Delhi, 2009.

4. L.A. Geza. Schay, ***Introduction to Linear Algebra***, Narosa publishing House, New Delhi, 1998.

ONLINE SOURCES:

1. www.ejournal.com
2. www.ebook.com
3. www.freebookcentre.net
4. www.webnotes.com

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	S	S	M	S	L	S	L	L	L	S
CO2	S	M	L	S	M	M	S	M	M	M	M	M	L	L	S
CO3	S	M	S	S	S	M	M	S	M	L	L	L	M	M	S
CO4	S	M	M	M	M	S	S	S	M	M	S	L	M	M	S
CO5	S	M	M	M	M	S	S	S	M	L	S	M	M	M	S

S - Strong; M - Medium; L – Low

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DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20P1MA02	**Title**	**Batch**	2020-2022
		CORE II: REAL ANALYSIS-I	**Semester**	I
Hrs/Week	6		**Credits**	05

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To remember countable and uncountable sets	K1, K2
CO2	To apply the Convergence in Sequences and Series	K3
CO3	To demonstrate Power series	K4
CO4	To analyze Continuity and Connectedness.	K4, K5
CO5	To Understand the concepts of Differentiation.	K1,K2

UNIT I: Basic Topology **(18 Hrs)**

Finite, Countable and Uncountable Sets – Metric Spaces – Compact Sets – Connected Sets – Problems (Perfect sets - Omitted) . Chapter- 2 (Page No.24 – 36, 42 - 46)

Unit II: Numerical Sequences and Series **(18 Hrs)**

Convergent sequences – Subsequences – Cauchy sequences - Upper and lower limits - Some special sequences – Series – Series of non negative terms - The number e - The root and ratio tests – Problems. Chapter - 3 (Page No. 47- 69)

Unit III: **(18 Hrs)**

Power series - Summation by parts - Absolute convergence - Addition and multiplication of series – Rearrangements – Problems Chapter - 3 (Page No.69 - 82)

Unit IV: Continuity: **(18 Hrs)**

Limit of Functions – Continuous functions - Continuity and Compactness – Continuity and Connectedness – Discontinuities – Monotonic functions – Infinite limits and Limits at infinity Problems. Chapter - 4 (Page No.83 - 102)

UNIT V: Differentiation **(18 Hrs)**

The derivative of a real function – Mean value theorems – The continuity of the Derivative – L'Hospital's Rule – Derivatives of Higher order – Taylor's theorem – Differentiation of Vector–valued functions – Problems. Chapter - 5(Page No. 103 – 119)

TOTAL : **90 Hours**

Power point Presentations, Seminar & Assignment

TEXT BOOK:

Walter Rudin, ***Principles of Mathematical Analysis***, Third Edition, Mc Graw Hill Book Co.., New Delhi, 2013.

REFERENCE BOOKS:

1. **Tom M .Apostol,** ***Mathematical Analysis***, Second Edition,Narosa Publishing House,2002.
2. **H.L.Royden,** ***Real Analysis***, Third Edition,Prentice-Hall of India,New Delhi,2009
3. **W.J. Kaczor and M.T. Nowak, "Problems in Mathematical Analysis I – Real Numbers , Sequences and Series", American Mathematical Society, 2000.**
4. **W.J. Kaczor and M.T. Nowak, "Problems in Mathematical Analysis II – Continuity and Differentiation", American Mathematical Society, 2000.**

ONLINE SOURCES :

1. www.analysiswebnotes.com
2. www.freebookcentre.net
3. http://nptl.ac.in

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	M	S	S	S	S	M	M	M	L	S	L	M	M	S
CO3	S	M	S	S	S	S	M	M	M	M	M	M	L	L	S
CO4	S	M	S	S	S	M	M	S	M	L	L	L	M	M	S
CO5	S	M	M	S	S	M	L	M	L	L	M	L	L	M	S

S - Strong; M - Medium; L – Low

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DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20P1MA03	**Title**	**Batch**	2020-2022
		CORE III: NUMBER THEORY	**Semester**	I
Hrs/Week	6		**Credits**	04

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To remember the basic ideas about Integers, Primes, Quadratic Residues.	K1, K2
CO2	Discuss the concepts of Congruence's and Solutions of congruence's	K3, K4
CO3	To demonstrate and understanding of Quadratic residues	K4,K5
CO4	To analyze the Mobius inversion formula.	K4
CO5	To Evaluate Diaphantine equations and farey fractions	K5

UNIT I: Divisibility **(18 Hrs)**

Introduction - Divisibility-Primes – The Binomial theorem.

Chapter - 1(Sec 1.1. – 1.4)

UNIT II: Congruence's **(18 Hrs)**

Congruence's-Solutions of congruence's – The Chinese remainder theorem – Prime power moduli –Prime modulus.

Chapter - 2(Sec 2.1. – 2.7)

UNIT III: Quadratic reciprocity **(18 Hrs)**

Quadratic residues - Quadratic reciprocity -The Jacobi symbol – Binary Quadratic forms.

Chapter - 3(Sec 3.1. – 3.4)

UNIT IV: Some functions of Number theory **(18 Hrs)**

Greatest integer function - Arithmetic functions - The Mobius inversion formula- The Recurrence functions.

Chapter – 4 (Sec 4.1. – 4.4)

UNIT V: Some Diaphantine equations and farey fractions (18 Hrs)

The equation ax+by= c – farey sequences – Rational approximations – Irrational numbers.

Chapter- 5 (Sec 5.1), Chapter - 6 (Sec 6.1 – 6.3)

TOTAL : 90 Hours

Power point Presentations, Seminar & Assignment

TEXT BOOKS :

Ivan Niven and H.S. Zuckerman,*An Introduction to the Theory of Numbers*, 3rd edition, Wiley Eastern Ltd, New Delhi, 1989.

REFERENCE BOOKS:

1. D.M. Burton, ***Elementary Number theory***, Universal Book Stall, New Delhi 2001

2. K. Ireland and M.Rosen, ***A Classical Introduction to Modern Number Theory***, Springer Verlag,

New York, 1972.

3. T.M. Apostol, ***Introduction to Analytic Number Theory***, Narosa Publication, House, Chennai, 1980.

4.*Elementary Number Theory,* Seventh Edition, MC Graw-Hill Companies, 2015.

ONLINE SOURCES:

1. www.mheeducation.co.in
2. www.wiley.com/go/permissions
3. http://www.powershow.com

Mapping with Programme Outcomes

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

S - Strong; M - Medium; L – Low

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ELAYAMPALAYAM, TIRUCHENGODE -637 205.

DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20P1MA04	**Title**	**Batch**	2020-2022
		CORE IV: ORDINARY DIFFERENTIAL EQUATIONS	**Semester**	I
Hrs/Week	6		**Credits**	04

Course Outcomes (CO)

CO Number	**CO Statement**	**Knowledge Level**
CO1	To Remember the Linear Equations with constant coefficients	K1
CO2	To gain Knowledge about Non homogeneous equations of orders two.	K1,K2
CO3	To Solve the Legendre's Equations.	K5
CO4	To analyze linear equations with regular singular points	K3, K4
CO5	To Evaluate Method of successive approximations	K5

UNIT I: Linear Equations with Constant Coefficients (18 Hrs)

Introduction -Second order homogeneous equations –Initial value problem- Linear dependence and independence- A formula for the Wornskian.

Chapter –2(Sec 1–5)

UNIT II: Linear Equations with Constant Coefficients (18 Hrs)

Non –homogeneous equations of order two – Homogeneous and non –homogeneous equations of order n –Initial value problem- A special method to solve a non-homogeneous equation –Algebra of constant coefficient.

Chapter –2 (Sec 6– 11)

UNIT III: Linear Equations with Variable Coefficients (18 Hrs)

Initial value problems for homogeneous equations –Solutions of homogeneous equations – Wronskian and linear independence – Reduction of the order of homogeneous equation **–** The Legendre equation.

Chapter – 3 (Sec 1–5)

UNIT IV: Linear Equations with Regular Singular points (18 Hrs)

Linear equations with regular singular points – Euler equation-second order equations with regular singular points – solutions and properties of Bessel's equation.

Chapter – 3 (Sec 8) , Chapter- 4(Sec 1 to 4, 7,8)

UNIT V: First Order Equation – Existence and Uniqueness (18 Hrs)

Introduction – Existence and uniqueness of solutions of first order equations – Equations with variable separable –Exact equations – Method of successive approximations – Lipschitz Condition –Convergence of the successive approximations.

Chapter – 8 (Sec 6.1 – 6.6)

TOTAL : 90 Hours

Power point Presentations, Seminar & Assignment

TEXT BOOK :

Earl A. Coddington, ***An Introduction to Ordinary Differential Equation***, Prentice Hall of India, New Delhi, 2011.

REFERENCE BOOKS :

1.**R.P.Agarwal** and **Ramesh C.Gupta**, ***Essentials of Ordinary Differential Equation***, Mc Graw Hill, New York, 1991.

2. **D.Somasundram**, ***Ordinary Differential Equations***, Narosa Publishing House,Chennai – 2002.

3. **D.Raj, D.P.Choudhury** and **H.I.Freedman**, ***A Course in Ordinary Differential Equations***, Narosa Publishing House, Chennai – 2004.

ONLINE SOURCES:

1. http://users.math.msu.edu/users/gnagy/teaching/ode.pdf
2. https://www.cs.bgu.ac.il/~leonid/ode_bio_files/lonascu_lectnotes.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	M	S	S	S	M	M	M	L	M	L	L	L	S
CO2	S	M	M	S	S	M	L	M	L	L	M	L	L	M	S
CO3	S	M	M	S	S	M	L	M	L	L	M	L	L	M	S
CO4	M	M	S	S	S	S	S	L	L	L	M	M	M	L	S
CO5	S	M	S	S	S	M	S	M	M	L	S	L	L	L	M

S - Strong; M - Medium; L – Low

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DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20P2MA05	**Title**	**Batch**	2020-2022
		CORE V: ABSTRACT ALGEBRA	**Semester**	II
Hrs/Week	6		**Credits**	05

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Remember the concepts of Group theory.	K1, K2
CO2	Understand the concept of a particular Euclidean ring and other forms of Polynomial rings.	K2
CO3	Analyze Extension Fields .	K4
CO4	Apply the concept of fields in Galois theory.	K3, K4
CO5	To gain knowledge about Linear transformation.	K2, K3

UNIT-I: Group Theory **(18 Hrs)**

Another counting principle – Sylow's theorem – Direct productsChapter -

2 (Sec 2.11 to 2.13.)

UNIT-II: Ring Theory **(18 Hrs)**

Euclidean rings – A particular Euclidean ring – Polynomial rings – Polynomials over therational field.

Chapter -3 (Sec 3.7 to 3.10)

UNIT-III: Fields **(18 Hrs)**

Extension Fields – Roots of polynomials – More about Roots.Chapter -5

(Sec 5.1,5.3 and 5.5.)

UNIT-IV: Fields **(18 Hrs)**

Chapter - 5 (Sec 5.6) , Chapter 7 – (Sec 7.1)

UNIT-V: Linear Transformations **(18 Hrs)**

Canonical forms: Triangular form – Trace and Transpose – Hermitian, Unitary and NormalTransformations.

Chapter 6 – (Sec 6.4,6.8 and 6.10)

TOTAL : **90 Hours**

Power point Presentations, Seminar & Assignment

TEXT BOOK:

N.Herstein (II Edition), ***Topics in Algebra,*** Wiley India Pvt. Ltd., New Delhi, 2016.

REFERENCE BOOKS:

1. **J.B.Fraleigh,** ***A First Course in Abstract Algebra***, 7th Edition, Narosa Publishing House, New Delhi, 2011.

2. **M.Artin,** ***Algebra***, Prentice-Hall, Englewood Cliff, 1991.

3. **I.S.Luthar and I.B.S.Passi,** ***Algebra***, Narosa Publishing House,New Delhi, 2007.

4. **P.N. Arora,** ***Topics in Algebra***, Sultan Chand &sons, Educational Publishers, New Delhi, 2009.

ONLINE SOURCES:

1. www.ejournal.com

2. www.bookcentre.net

3. www.webnotes.com

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	M	L	S	S	L	M	L	S	L	S	L	L	L	S
CO3	S	L	S	M	M	L	L	M	M	L	M	L	L	L	S
CO4	S	S	M	M	S	M	L	S	M	L	S	M	M	S	M
CO5	S	M	L	S	S	L	S	S	S	M	S	L	S	M	S

S - Strong; M - Medium; L – Low

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DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20P2MA06	**Title**	**Batch**	2020-2022
		CORE VI: MECHANICS	**Semester**	II
Hrs/Week	6		**Credits**	05

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Remember the concepts of Energy and momentum.	K1, K2
CO2	Understand the concept of Lagrange's Equations.	K2
CO3	Analyze Hamilton's Principle.	K4
CO4	Apply the concept of Hamilton Principle Function.	K3, K4
CO5	To gain knowledge about Differential forms and Generating Functions.	K2, K3

Unit I: **(18 Hrs)**

Introductory concepts: The Mechanical system – Generalized coordinates – Constraints –Virtual work –

Energy and Momentum.Chapter - 1 (Sec 1.1 – 1.5)

Unit II: **(18 Hrs)**

Lagrange's Equations : Derivation of Lagrange’s Equations – Examples – Integrals of themotion.Chapter - 2(Sec 2.1 – 2.3)

Unit III: **(18 Hrs)**

Hamilton's Equations: Hamilton's Principle – Hamilton’s Equations – Other variationalprinciples. Chapter - 4 (Sec 4.1 – 4.3)

Unit IV: **(18 Hrs)**

Hamilton – Jacobi Theory: Hamilton Principle Function – Hamilton-Jacobi Equation –Separability. Chapter - 5(Sec 5.1 – 5.3)

Unit V : **(18 Hrs)**

Canonical Transformation - Differential forms and Generating Functions – SpecialTransformations –

Lagrange and Poisson Brackets.

Chapter – 6(Sec 6.1 – 6.3)

TOTAL : **90 Hours**

Power point Presentations, Seminar & Assignment

TEXT BOOK :

D.T. Greenwood, "*Classical Dynamics*", Dover Publication, New York, 1977.

REFERENCE BOOKS:

1. **H. Goldstein, "*Classical Mechanics*"**, 2nd Edition, Narosa Publishing House, New Delhi.
2. **R.D. Gregory, "*Classical Mechanics*"**, Cambridge University Press, 2006
3. **F.Gantmacher,** ***Lectures in Analytic Mechanics***, MIR Publilshers, MOSCOW, 1975.
4. **I.M.Gelfand and S.V. Fomin**, ***Calculus of Variations***, Prentice hall.
5. **S.L.Loney,** ***An Elementary Treatise on Staics***, Kalyani Publishers, New Delhi.

ONLINE SOURCES:

1. https://www.britannica.com/science/mechanics
2. https://www.physics.upenn.edu
3. www.khanacademy.org

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	S	M	M	S	M	L	S	M	L	S	M	M	S	M
CO3	S	M	L	S	S	L	M	L	S	L	S	L	L	L	S
CO4	S	L	S	M	M	L	L	M	M	L	M	L	L	L	S
CO5	S	M	S	S	S	S	M	S	M	L	S	M	M	M	S

S - Strong; M - Medium; L – Low

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DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20 P2MA07	**Title**	**Batch**	2020-2022
		CORE VII: REAL ANALYSIS-II	**Semester**	II
Hrs/Week	6		**Credits**	05

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To Remember the concept of Integration and Differentiation.	K1, K2
CO2	To Classify integrals of a bounded function on a closed bounded interval.	K4, k5
CO3	To understand sequences and series of functions and its convergence.	K2, k3
CO4	To gainknowledge about Some special functions**.**	K3, K4
CO5	To Evaluate Functions of several variables.	K5,K6

UNIT I: Riemann – Stieltjes Integral **(18 Hrs)**

Definition and Existence of the Integral – Properties of the Integral – Integration and Differentiation – Integration of Vector–valued functions – Rectifiable curves – Problems Chapter - 6 (Page No: 120 – 142)

UNIT II: Sequences and Series of Functions **(18 Hrs)**

Discussion of main problem – Uniform Convergence - Uniform Convergence and Continuity -Uniform Convergence and Integration – Uniform Convergence and Differentiation – Problems. Chapter - 7 (Page No: 143 – 154)

Unit III: Sequences and Series of Functions (contd…) **(18 Hrs)**

Equicontinuous families of functions – Stone-Weierstrass Theorems – Algebra of complex valued functions – Problems .Chapter - 7(Page No: 154 – 171)

Unit IV: Some special functions **(18 Hrs)**

Power series – The Exponential and Logarithmic functions – Trigonometric Functions – Fourier series - The Gamma functions – Problems (Algebraic completeness of the complex field -omitted) Chapter – 8 (Page No: 172 – 203)

Unit V: Functions of several variables **(18 Hrs)**

Linear transformations – Differentiation – The contraction principle - The inverse function theorem – The implicit function theorem – Problems

Chapter – 9 (Page No: 204 – 227)

TOTAL : **90 Hours**

Power point Presentations, Seminar & Assignment

TEXT BOOK:

Walter Rudin, "Principles of Mathematical Analysis", 3 rd Edition, McGraw Hill Book Co., Kogaskusha, 1976.

REFERENCE BOOKS:

1. T.M. Apostol, "Mathematical Analysis", Narosa Publishers, New Delhi,1985.

2. W.J.Kaczor and M.T.Nowak, "Problems in Mathematical Analysis III - Integration", American Mathematical Society, 2000.

3. A. Browder, "Mathematical Analysis, An Introduction", Springer-Verlag, New York,1996.

4. K.A. Ross, "Elementary Analysis: The Theory of Calculus", 2 nd Edition, Springer, New York, 2013.

5. M. Stoll, "Introduction to Real Analysis", 2 nd Edition, Addison-Wesley Longman Inc,2001.

ONLINE SOURCES:

1. www.analysiswebnotes.com
2. www.freebookcentre.net
3. http://nptl.ac.in

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	M	S	S	S	M	M	S	M	L	L	L	M	M	S
CO3	S	M	S	S	S	M	S	S	L	M	L	S	M	S	S
CO4	S	M	S	S	S	S	M	M	M	L	S	S	M	L	S
CO5	S	M	L	S	S	S	S	M	S	M	L	S	M	M	M

S - Strong; M - Medium; L – Low

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN

[AUTONOMOUS]

ELAYAMPALAYAM, TIRUCHENGODE -637 205.

DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20P2MA08	**Title**	**Batch**	2020-2022
		CORE VIII: PARTIAL DIFFERENTIAL EQUATONS	**Semester**	II
Hrs/Week	6		**Credits**	04

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To Remember Second order partial differential equations.	K1, K2
CO2	Understand the concept of Cauchy problem.	K2
CO3	To Gain knowledge about separation of variables.	K3, K4
CO4	Analyze the boundary value problems.	K4,K5
CO5	Evaluate the Green's function.	K5

Unit I **(18 Hrs)**

Mathematical Models: The Classical equation – The vibrating string – The vibrating membrane – Conduction of Heat in solids. Classification of second order equations: Secondorder equations in two independent variables – Cannonical forms – equations with constant coefficients – general solution.

Chapter 2: Sections 2.2 – 2.5 (omit 2.4), Chapter 3: Sections 3.1 – 3.4

Unit II **(18 Hrs)**

The Cauchy problem: The Cauchy problem – Cauchy – Kowlalewsky theorem – Homogeneous wave equation – Initial – Boundary value problems – Non-homogeneousboundary conditions – Non-homogeneous wave equation, Riemann Method.

Chapter 4: Sections 4.1 – 4.8 (omit 4.6)

Unit III **(18 Hrs)**

Methods of separation of variables: Seperation of variables – The vibrating string problem – Existence and Uniqueness of solution of the vibrating string problem. The heat conduction problem – existence and uniqueness of solution of the heat conduction problem – The laplaceand beam equations.

Chapter 6: Sections 6.2 – 6.6

Unit IV **(18 Hrs)**

Boundary value problems: Boundary value problems – Maximum and minimum principles – Uniqueness and continuity theorems – Dirichlet problems for a circle – Dirichlet problems for a circular annulus – Neumann problem for a circle Drirchlet problem for a rectangle – Neumann problem for a rectangle.

Chapter 8: Sections 8.1 – 8.9 (omit 8.8)

Unit V **(18 Hrs)**

Green's function: The delta function – Green's function – method of Green's function – Dirichlet

problem for the Laplace operator – method of images – method of eigen functions.

Chapter 10: Sections 10.1 – 10.7 (omit 10.5)

TOTAL : **90 Hours**

Power point Presentations, Seminar & Assignment

TEXT BOOK:

Tyn Myint. U with Lokenath Debnath, ***Partial Differential Equations for Scientists and Engineers***,

3rd Edition ,2004.

REFERENCE BOOKS:

1. **I.N.Sneddon,** ***Elements of Partial Differential Equations,*** McGraw Hill, London, 1957.

2. **L.C.Evans,** ***Partial Differential Equations***, AMS, Providence, R I, 2003.

3. **Stanley j. Farlow,** ***Partial Differential Equations***, Scientist and Engineers, 1982.

4. **E. C. Zachmanoglou,** ***Introduction to Partial Differential Equation***, 1976.

ONLINE SOURCES:

1. https://en.m.wikipedia.org>wiki>partaildifferentialequations
2. Homepage.univ.ac.at>pdeintro
3. https://www.math.upenn.edu

Mapping with Programme Outcomes

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

S - Strong; M - Medium; L – Low

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN

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ELAYAMPALAYAM, TIRUCHENGODE -637 205.

DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20P3MA09	**Title**	**Batch**	2020-2022
		CORE IX: COMPLEX ANALYSIS	**Semester**	II
Hrs/Week	6		**Credits**	05

Course Outcomes (CO)

CO Number	**CO Statement**	**Knowledge Level**
CO1	Understand the concepts of Limits and continuity.	K1, K2
CO2	Apply Cauchy's theorem for a Rectangle and Cauchy's theorem in a Disk.	K3
CO3	Analyze the Calculus of Residues and Harmonic Functions.	K4, K5
CO4	Determine Series and Product Development, Partial Fractions and Factorization.	K5
CO5	Evaluate the Riemann Mapping Theorem, Conformal Mapping of Polygons and Mapping on Rectangle.	K5,K6

Unit I: **(18 Hrs)**

Introduction to the concept of analytic function: Limits and continuity – Analytic functions – Polynomials – Rational functions – Conformality : Arcs and closed curves – Analytic functions in regions – Conformal Mapping – Length and Area – Linear Transformations: The Linear group – The Cross ratio – Elementary Riemann Surfaces.
Chapter – 2 (Sec 1.1 – 1.4), Chapter – 3 (Sec 2.1 – 2.4, 3.1, 3.2, 3.4)

Unit II: **(18 Hrs)**

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 Removable singularities, Taylor's Theorem – Zeros and Poles – The Local Mapping – The Maximum principle – chains and cycles.
Chapter – 4 (Sec 1.1 – 1.5, 2.1 – 2.3, 3.1 - 3.4, 4.1)

Unit III: **(18 Hrs)**

The Calculus of Residues: The Residue theorem – The Argument principle – Evaluation of definite integrals, Harmonic functions: The Definitions and basic Properties – Mean value property – Poisson's Formula.
Chapter – 4 (Sec 5.1 – 5.3, 6.1 – 6.3)

Unit IV: **(18 Hrs)**

Series and Product Developments: Weierstrass Theorem – The Taylor Series – The

Laurent Series – Partial fractions and Factorization: Partial Fractions – Infinite Products – Canonical Products.

Chapter – 5 (Sec 1.1 – 1.3, 2.1 – 2.3)

Unit V: **(18 Hrs)**

The Riemann Mapping Theorem – Statement and Proff – Boundary Behaviour – Use of the reflection principle – Analytic arcs – Conformal mapping of Polygons: The Behaviour at an angle – The Schwarz – Christoffel Formula – Mapping on a rectangle.

Chapter – 6 (Sec 1.1 – 1.4, 2.1 – 2.3)

TOTAL : **90 Hours**

Power point Presentations, Seminar & Assignment

TEXT BOOK:

L.V. Ahlfors, *Complex Analysis,* Mc Graw Hill, New York, 2016.

REFERENCE BOOKS:

1. **Walter Rudin,*Real and Complex Analysis,***McGraw. HiII Book Company.
2. **Tristan neetham, *Visual complex analysis,***clarentan press, Oxford.
3. **S.Arumugam, A.Thangapandi Issac, A.Somasundaram, *Complex Analysis***, Scitech Publications(India), Pvt.Ltd., Chennai, 2014.
4. **A.R.Vasishtha, Vipin Vasishtha, *Complex Analysis,*** Krishna Prakashan Media, Ltd, 2002.

ONLINE SOURCES:

1. www.freebookcentre.net
2. www.nptel.ac.in/courses/complex
3. https://www.math.upenn.edu

Mapping with Programme Outcomes

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

S - Strong; M - Medium; L – Low

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN

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ELAYAMPALAYAM, TIRUCHENGODE -637 205.

DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20P3MA10	**Title**	**Batch**	2020-2022
		CORE X: TOPOLOGY	**Semester**	III
Hrs/Week	5		**Credits**	5

CO Number	CO Statement	Knowledge Level
CO1	To recall the basic ideas about Topology, Open set, Closed set.	K1
CO2	Discuss the concepts Topological spaces, order topology and product topology.	K2, K3
CO3	To analyze the Connectedness.	K4
CO4	To Gain knowledgein Compactness.	K3, K4
CO5	To Evaluate Countability axioms and Separation axioms.	K5

Unit-I: Topological spaces **(15 hrs)**

Topological spaces - Basis for a Topology - The order topology - Product topology on XxY-The subspace topology - Closed sets and Limit points.

Chapter – 2 (Sec 12-17)

Unit-II: Continuous Functions **(15 hrs)**

Continuous functions - The product topology - The metric topology.Chapter – 2 (Sec 18-21)

Unit-III: Connectedness **(15 hrs)**

Connected spaces - Connected subspaces of the real line - Components and local connectedness.

Chapter – 3 (Sec 23-25)

Unit-IV: Compactness **(15 hrs)**

Compact spaces - Compact subspaces of the real line - limit point compactness - local c ompactness. Chapter – 3 (Sec 26-29)

Unit-V: Countability and separation axioms **(15 hrs)**

The Countability axioms - The separation axioms - Normal spaces - The Urysohn lemma - The Urysohn metrization theorem - The Tietze extension theorem.

Chapter – 4 Sections 30-35

TOTAL : **(75 Hours)**

Power point Presentations, Seminar & Assignment

TEXT BOOK:

James R. Munkres, "***Topology"***, Second Edition, Prentice Hall of India Private Limited, New Delhi, 2014.

REFERENCE BOOKS:

1. **J. Dugundji, "*Topology"***, Allyn and Bacon, 1975.
2. **George F.Simmons**, "***Introduction to Topology and Modern Analysis"***, McGraw Hill 2006.
3. S.**T.Hu**, "***Elements of general topology"***, Holden day,Inc,New York, 1988.
4. **K. Chandrasekara Rao**, "***Topology"***, Narosa Publishing House, Pvt., Ltd., 2009.

ONLINE SOURCES:

1. https://nptel.ac.in/downloads/111106054/
2. https://ocw.mit.edu.
3. https://swayam.gov.in
4. www.freebookcentre.net

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	M	L	S	S	L	S	S	S	M	S	L	S	M	S
CO3	S	L	S	M	M	L	L	M	M	L	M	L	L	L	S
CO4	S	S	M	M	S	M	L	S	M	L	S	M	M	S	M
CO5	S	M	S	S	S	S	M	M	M	M	S	L	L	L	M

S - Strong; M - Medium; L – Low

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN

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ELAYAMPALAYAM, TIRUCHENGODE -637 205.

DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20P3MA11	**Title**	**Batch**	2020-2022
		CORE PAPER XI: NUMERICAL ANALYSIS	**Semester**	III
Hrs/Week	5		**Credits**	4

Course Outcomes (CO)

CO Number	**CO Statement**	**Knowledge Level**
CO1	To recall the basic concepts of Newton's method, Trapezoidal rule and Simpson's rules	K1, K2
CO2	To understand various types of methods to solve the Differential Equations.	K2
CO3	To solve the problems of ODE.	K5, K6
CO4	To gain knowledge in Boundary Value Problems And Characteristic Value Problems	K3, K4
CO5	To Analyze the concept of Numerical Solution Of Partial Differential Equations	K4, K5

Unit I: Solution Of Nonlinear Equations (15 Hrs)

Newton's method – Convergence of Newton's method – Bairstow"s Method for quadratic factors. **Numerical Differentiation And Integration:** Derivatives from Differences tables – Higher order derivatives – Divided difference, Central-Difference formulas – Composite formula of Trapezoidal rule – Romberg integration – Simpson's rules. Chapter 1

Unit II : Solution Of System Of Equations (15 Hrs)

The Elimination method – Gauss and Gauss Jordan methods – LU Decomposition method – Matrix inversion by Gauss-Jordan method – Methods of Iteration – Jacobi and Gauss Seidal Iteration – Relaxation method – Systems of Nonlinear equations. Chapter 2

Unit III: Solution Of Ordinary Differential Equations (15 Hrs)

Taylor series method – Euler and Modified Euler methods – Rungekutta methods – Multistep methods Milne's method – Adams Moulton method. Chapter 6

Unit IV: **Boundary Value Problems And Characteristic Value Problems (15 Hrs)**

The shooting method – solution through a set of equations – Derivative boundary conditions – Characteristic value problems – Eigen values of a matrix by Iteration – The power method. Chapter 6

Unit V:Numerical Solution Of Partial Differential Equations (15 Hrs)

(Solutions of Elliptic, Parabolic and Hyperbolic partial differential equations) Representation as a difference equation – Laplace's equation on a rectangular region – Iterative methods for Laplace equation – The Poisson equation – Derivative boundary conditions – Solving the equation for time-dependent heat flow (i) The Explicit method (ii) The Crank Nicolson method – solving the wave equation by Finite Differences.Chapter 8

TOTAL : 75 Hours

Power point Presentations, Seminar & Assignment

TEXT BOOK:

C.F.Gerald and P.O.Wheatley, *"Applied Numerical Analysis"*, Fifth Edition, Addison Wesley, (1998).

REFERENCE BOOKS :

1. **M.K. Venkatraman, *"Numerical Methods in Science and Technology",*** National Publishers Company, 2nd Edition,(1992).
2. **S.C. Chapra and P.C. Raymond, *"Numerical Methods for Engineers",*** tata McGraw Hill, (2000)
3. **P. Kandasamy et al., *"Numerical Methods",*** S.Chand & Company Ltd.(2003).

ONLINE SOURCES:

1. https://nptel.ac.in/downloads/111106054/
2. https://ocw.mit.edu.
3. https://swayam.gov.in
4. www.freebookcentre.net

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	M	M	M	M	L	S	M	L	L	S
CO2	S	L	S	M	M	L	L	M	M	L	M	L	L	L	S
CO3	S	M	S	S	S	S	M	S	M	L	S	M	M	M	S
CO4	S	M	S	S	S	S	L	S	L	L	S	L	M	M	S
CO5	M	M	S	S	S	S	M	L	L	L	S	M	S	S	S

S - Strong; M - Medium; L – Low

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN

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ELAYAMPALAYAM, TIRUCHENGODE -637 205.

DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20P3MA12	**Title**	**Batch**	2020-2022
		CORE XII: GRAPH THEORY	**Semester**	III
Hrs/Week	4		**Credits**	4

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To Understand the concepts of related to Graphs and Trees.	K1, K2
CO2	To gain knowledge about connectivity and trees.	K3, K4
CO3	To apply the Concept in Matchings and colorings	K3
CO4	To analyze Graph Colorings.	K4
CO5	To Evaluate Planarity.	K5, K6

Unit I: **(12 Hrs)**

Basic Results: Introduction-Basic Concepts-Subgraphs-Degrees of Vertices - Paths and Connectedness - Automorphism of a Simple Graph. Directed Graphs: Introduction-Basic Concepts-Tournaments.

Chapter 1 (Sec 1.1 – 1.6), Chapter 2 (Sec 2.1 – 2.3)

Unit II: **(12 Hrs)**

Connectivity and Trees: Connectivity: Introduction-Vertex cut and Edge Cut-Connectivity and Edge Connectivity. Trees: Introduction-Definition, Characterization and Simple Properties-Centers and Centroids- Cutting the Number of Spanning Trees-Cayley's Formula.

Chapter 3 (Sec 3.1 – 3.3), Chapter 4(4.1 – 4.4)

Unit III: **(12 Hrs)**

Independent Sets, Matchings and Cycles: Independent Sets and Matchings: Introduction-Vertex-Independent Sets and Vertex Coverings-Edge-Independent sets-Matchings and

Factors-Matchings in Bipartite Graphs. Cycles: Introduction-Eulerian Graphs - Hamiltonian Graphs.

Chapter 5 (Sec 5.1 – 5.5), Chapter 6(6.1 – 6.3)

Unit IV: **(12 Hrs)**

Graph Colorings: Introduction-Vertex colorings-Critical Graphs-Edge colorings of Graphs-Kirkman's Schoolgirl- Problem-Chromatic Polynomials.

Chapter 7(7.1 – 7.3,7.6,7.8,7.9),

UNIT V: **(12 Hrs)**

Planarity: Introduction- Planar and Nonplanar Graphs –Euler Formula and its Consequences and

$K_{3,3}$ are Nonplanar Graphs – Dual of a Plane Graph- The Four-Color Theorem and the Heawood Five-

Color Theorem-Hamiltonian Plane Graphs-Tait Coloring.

Chapter 8(8.1 – 8.6,8.8,8.9)

TOTAL : **60 Hours**

Power point Presentations, Seminar & Assignment

TEXT BOOK:

R.Balakrishnan and K.Ranganathan, "Text Book of Graph Theory", (2nd Edition), Springer, 2012.

REFERENCE BOOKS:

1. **J.A.Bondy and U.S.R. Murty**, "**Graph Theory with Applications"**, 1982.

2. **Narasing Deo,**"**Graph Theory with Application to Engineering and Computer Science"**, Prentice Hall of India, 2003.

3. **F. Harary**, "**Graph Theory"**, Addison – Wesely Pub. Co. The Mass. 1969. 4. L. R.. Foulds, Graph Theory Application, Narosa Publ. House, Chennai, 1933.

4.**K.R.Partha sarathy "Introduction to graph theory",** Prentice Hall of India, 2003.

ONLINE SOURCES :

1. https://nptel.ac.in/downloads/111106054/
2. https://ocw.mit.edu.
3. https://swayam.gov.in

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	M	M	M	M	L	S	M	L	L	S
CO2	S	L	S	S	S	S	S	S	M	L	S	L	S	M	S
CO3	S	M	S	S	S	S	M	M	M	L	L	L	M	M	M
CO4	M	M	S	S	S	S	S	L	L	L	M	M	M	L	S
CO5	S	M	S	S	S	S	M	S	M	L	S	M	M	M	S

S - Strong; M - Medium; L – Low

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN

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ELAYAMPALAYAM, TIRUCHENGODE -637 205.

DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20P4MA13	**Title**	**Batch**	2020-2022
		CORE XIII: FUNCTIONAL ANALYSIS	**Semester**	IV
Hrs/Week	6		**Credits**	5

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To understand the concept of Banach spaces.	K1, K2
CO2	To apply the Concept in Hilbert spaces.	K3
CO3	To demonstrate Orthogonal complements.	K4, K5
CO4	To analyzeself adjoint operators.	K4
CO5	To gain knowledge about Finite dimensional spectral theory.	K2, K3

Unit I: **(18 Hrs)**

Banach spaces: The definition and some examples – Continuous linear transformations – T

he Hahn-Banach theorem.

Chapter 9 (Sec 46 - 48)

Unit II: **(18 Hrs)**

The natural imbedding of N in N** - The open mapping theorem- The conjugate of an operator. Hilbert spaces: The definition and some simple properties.

Chapter 9 (Sec 49 - 51), Chapter 10 (Sec 52)

Unit III: **(18 Hrs)**

Orthogonal complements - Orthonormal sets- The Conjugate space H* - The adjoint of an operator.

Chapter 10 (Sec 53 - 56)

Unit IV: **(18 Hrs)**

Self-adjoint operators – Normal and unitary operators – Projections.

Chapter 10 (Sec 57 - 59)

Unit V: **(18 Hrs)**

Finite dimensional spectral theory: Matrices –The spectral theorem – General preliminaries on Benach's Algebra: The definition and some examples - Regular and singular elements.

Chapter 11 (Sec 60,62), Chapter 12 (Sec 64,65)

TOTAL : **90 Hours**

Power point Presentations, Seminar & Assignment

TEXT BOOK:

G.F. Simmons, ***Introduction to Topology and Modern Analysis***, TATA McGraw –Hill Book Company, New Delhi, 1963, 5th Reprint 2006.

REFERENCE BOOKS :

1. Dr. D. Somasundaram, ***Functional Analysis,*** S.Viswanathan Pvt.Ltd, 2008.

2. G. Bachman and L. Narici, ***Functional Analysis,*** Academic Press, New York, 2000.

3. H.C. Goffman and G. Fedrick, ***First Course in Functional Analysis,*** Prentice Hall of India, New Delhi, 2000.

4. E. Kreyszig, ***Introductory Functional Analysis with Applications,*** John Wiley & Sons, New York, 1978.

5. E.S.Suhubi, ***Functional Analysis,*** Springer International Edition, India, 2009.

ONLINE SOURCES:

1. https://ocw.mit.edu
2. www.sciencedirect.com
3. www.elsevier.com
4. www.khanacademy.org

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	S	S	L	M	L	L	S	M	M	M	S
CO2	M	M	S	S	S	M	S	L	L	L	M	L	M	M	S
CO3	M	M	S	S	S	S	M	L	L	L	S	M	S	S	S
CO4	S	L	S	M	M	L	L	M	M	L	M	L	L	L	S
CO5	S	M	S	S	S	M	S	S	L	M	L	S	M	S	S

S - Strong; M - Medium; L – Low

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN

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ELAYAMPALAYAM, TIRUCHENGODE -637 205.

DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20P4MA14	**Title**	**Batch**	2020-2022
		CORE XIV: PROBABILITY THEORY	**Semester**	IV
Hrs/Week	6		**Credits**	4

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To given the basic concept of Probability theory.	K1, K2
CO2	To understand the concept of moments.	K2, K3
CO3	To analyze the characteristic functions	K4
CO4	To apply the concepts of discrete and continuous distributions.	K3, K4
CO5	To gain knowledge about Bernoulli Law of Large Numbers.	K4,K5

Unit I: **(18 Hrs)**

Random Events and Random variables – Random events – Probability axioms – Combinatorial formulae – Conditional Probability - Bayes Theorem – Independent events – Random variables – Distribution function – Joint Distribution – Marginal Distribution – Conditional Distribution – Independent random variables – Functions of random variables.

Chapter 1 (Sec 1.1 – 1.7), Chapter 2 (Sec 2.1 – 2.9)

Unit II: **(18 Hrs)**

Parameters of the distribution – Expectation – Moments – The Chebyshev inequality – Absolute moments – Order parameters – Moments of random vectors – Regression of the first and second types.

Chapter 3 (Sec 3.1 – 3.8)

Unit III: **(18 Hrs)**

Characteristic functions – Properties of Characteristic functions - Characteristic functions and moments – Semi-invariants - Characteristic function of the sum of the independent random variables – Determination of distribution function by the characteristic function – Probability generating functions.

Chapter 4 (Sec 4.1 – 4.7)

Unit IV: **(18 Hrs)**

Some probability distributions – One point, two point, Binomial – Polya – Hypergeometric – Poisson (discrete) distributions – Uniform – normal gamma – Beta – Cauchy and Laplace (continuous) distributions.

Chapter 5 (Sec 5.1 – 5.10)

Unit V: **(18 Hrs)**

Limit theorems – Stochastic convergence – Bernoulli Law of Large Numbers – Convergence of sequence of distribution functions – Levy-Crammer Theorem – De Moivre Laplace theorem – Borel-Cantelli Lemma – Kolmogorov inequality and Kolmogorov Strong Law of Large numbers.

Chapter 6 (Sec 6.1 – 6.4, 6.6 - 6.9, 6.11, 6.12)

TOTAL : **90 Hours**

Power point Presentations, Seminar ,Quiz, Assignment

TEXT BOOK:

M. Fisz, "*Probability theory and Mathematical Statistics*", John Wiley and Sons, 1963.

REFERENCE BOOKS:

1. B.R.BHAT " **Modern Probability theory: an introductory** " 4th edition,new age international publisher, 2007.
2. R.B. Ash, "*Real Analysis and Probability*", Academic Press, 1972.
3. K. L. Chung, "*A course in Probability*", Academic press, 1974.
4. Y.S.Chow and H. Teicher, "*Probability Theory*", Springer Verlag, 1988.
5. V. K. Rohatgi, "*An Introduction to Probability Theory and Mathematical Statistics*", Wiley Eastern
Ltd., 2015.

ONLINE SOURCES:

1. https://nptel.ac.in
2. https://www.britannica.com/topic/probability-theory
3. https://en.m.wikibooks.org
4. http://study.com/academy/lesson/basic-probability-theory-rules-formulas.html

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	M	S	S	S	M	L	M	L	L	M	L	L	L	S
CO3	S	L	S	M	M	L	L	M	M	L	M	L	L	L	S
CO4	S	L	S	S	S	S	S	S	M	L	S	L	S	M	S
CO5	S	M	S	S	M	S	L	S	M	L	S	L	S	S	S

S - Strong; M - Medium; L – Low

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ELAYAMPALAYAM, TIRUCHENGODE -637 205.

DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	**20P4MA15**	**Title**	**Batch**	2020-2022
		CORE IX :MEASURE THEORY AND INTEGRATION	**Semester**	III
Hrs/Week	6		**Credits**	4

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To Know about the Measurable functions and its Properties	K1
CO2	To understand the Riemann integral.	K1, K2
CO3	To gain knowledge about Monotone functions.	K3, K4
CO4	To analyze the Radon-Nikodym Theroem.	K4, K5
CO5	To evaluate Measure and outer measure.	K5,K6

UNIT – I: Lebesgue Measure (18Hrs)

Introduction-Outer Measure-Measurable Sets and Lebesgue Measure-Measurable Functions-Littlewood's Three Principles.

Chapter 3 (Sec 1 – 3, 5,6)

UNIT - II : Lebesgue Integral (18 Hrs)

The Riemann Integral-the Lebesgue Integral of a Bounded Function over a Set of FiniteMeasure-the integral of a Nonnegative Function –the General Lebesgue Integral.

Chapter 4 (Sec 1 – 4)

UNIT – III : Differentiation and Integration (18 Hrs)

Differentiation of Monotone Functions- Functions of Bounded Variation-Differentiation of anIntegral-Absolute continuity.

Chapter 5 (Sec 1 – 4)

Unit – IV :General Measure and Integration (18 Hrs)

Measure and Integration- Measure Spaces- Measurable Functions- Integration-Signed measures-the Radon-Nikodym Theroem.

Chapter 11 (Sec 1 – 3, 5,6)

UNIT - V : Measure and Outer Measure **(18 Hrs)**

Out**er** Measure and Measurability-the Extension Theorem-Product Measures.

Chapter 12 (Sec 1, 2,4)

TOTAL : **(90 Hours)**

Power point Presentations, Seminar & Assignment

TEXT BOOK :

H. L. Royden, "**Real Analysis"**, 3rd Edition, Prentice Hall of India Private Ltd., New Delhi-110001, 2009.

REFERENCE BOOKS:

1. G.de.Barra, "*Measure Theory and Integration"*, WILEY Eastern Ltd,1981.

2. P.K.Jain and V.P.Gupta, "*Lebesgue Measure and integration"*, New Age INT(P)Ltd., 2000.

3. Walter Rudin,"*Real and Complex Analysi"s*, Tata Mc Graw Hill Publ.Co.Ltd.,1966.

Simmons G.F, "*Topology and Modern Analysis"*, Mc Graw Hill Book Company, 1963.

ONLINE SOURCES:

1. https://ocw.mit.edu.
2. https://nptel.ac.in
3. https://swayam.gov.in

Mapping with Programme Outcomes

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

S - Strong; M - Medium; L – Low

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DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20P1MAE01	**Title**	**Batch**	2020-2022
		ELECTIVE I:	**Semester**	I
Hrs/Week	6	**DISCRETE MATHEMATICS**	**Credits**	04

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.

UNIT-II: Counting (18 Hrs)

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

UNIT-III: Advanced Counting Techniques (18Hrs)

Applications of Recurrence Relations – Solving Linear Recurrence Relations – GeneratingFunctions.

UNIT-IV: Boolean Algebra : (18 Hrs)

Boolean Functions – Representing Boolean Functions – Logic Gates – Minimization ofCircuits.

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

Finite – State machines with Output – Finite – State machines with no Output – Turing Machines.

TOTAL : **90 Hours**

Power point Presentations, Seminar & Assignment

TEXT BOOK :

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

REFERENCE BOOKS :

1. J.P.Trembley and R.Manohar, ***Discrete Mathematical Structures applications to Computer Science,*** Tata McGraw Hills,New Delhi, 2013.

2.T.Veerarajan, ***Discrete Mathematics with Graph Theory and Combinatorics,*** Tata McGraw Hills Publishing Company Limited, 7th Reprint, 2008.

3. Prof. V.Sundaresan, K.S. Ganapathy Subramaniyan, K.Ganesan, ***Discrete Matheamtics***, Tata Mc Graw 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

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DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20P1MAE02	**Title**	**Batch**	2020-2022
		ELECTIVE I: FLUID DYNAMICS	**Semester**	I
Hrs/Week	6		**Credits**	4

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To know about the kinematics of fluid and its terminology.	K1, K2
CO2	To Gain knowledge in Equations of Motion of a Fluid	K3, K4
CO3	To understand the concepts of Some Three –Dimensional Flows	K2
CO4	To analyze Some Two -Dimensional Flows	K4
CO5	To Evaluate Viscous Flow and connected properties	K5 ,K6

Unit -I : Kinematics of Fluids in Motion (18 Hrs)

Real Fluids and Ideal Fluids- Velocity of a Fluid at a Point- Stream lines and path lines:Steady and Unsteady Flows- the Velocity Potential-The Vorticity Vector-Local and Particle Rates of change-the equation of Continuity-Worked Examples-Acceleration of a fluid Conditions at arigid Boundary.Chapter -2 (Sec 2.1 – 2.10)

Unit-II : Equations of Motion of a Fluid (18 Hrs)

Pressure at a Point in a Fluid at Rest-Pressure at a Point in a Moving Fluid-Conditions at a Boundary of Two inviscid Immiscible Fluids-Euler's Equations of Motion –Bernoulli's Equation –Worked Examples-Discussion of the Case of Steady Motion under Conservative Body Forces.

Chapter- 3 (Sec 3.1 – 3.7)

Unit – III: Some Three –Dimensional Flows (18 Hrs)

Introduction-Sources, Sinks and Doublets-Images in a Rigid Infinite Plane-Axi-Symmetric Flows: Stokes's Stream Function.Chapter -4 (Sec 4.1 – 4, 4.5)

Unit IV: Some Two -Dimensional Flows (18 Hrs)

Meaning of Two -Dimensional Flow-Use of Cylindrical Polar Co-ordinates-the Stream Function –theComplex Potential for Two –Dimensional, Irrotational, In Compressible Flow –Complex Velocity Potential for Standard Two –Dimensional flows-Some Worked Examples.

Chapter -5 (Sec 5.1 – 5.6)

Unit V: Viscous Flow **(18Hrs)**

Stress Components in a Real Fluid –Relations between Cartesian Components of Stress-Translational Motion of Fluid Element-the Rate of Strain Quadric and Principal Stresses- Some Further Properties of the Rate of Strain Quadric-Stress Analysis in Fluid Motion- Relations between Stress and Rate of Strain-the co-efficient of Viscosity and Laminar Flow-the Navier –Stokes Equations of Motion of a Viscous Fluid.Chapter -5 (Sec 8.1 – 8.9)

TOTAL : **90 Hours**

Power point Presentations, Seminar & Assignment

TEXT BOOK :

F.Chorlton, ***Text book of Fluid Dynamics***, CBS Publication New Delhi, 2004.

REFERENCE BOOKS:

1. **G.K.Batchaelor**, ***An Introduction to Fluid Mechanics***, Foundation Books,New Delhi,2002.
2. **S.W .Yuan**, ***Foundations of Fluid Mechanics,*** Prentice Hall of India Pvt. LtD., New Delhi,2000.
3. **R.K.Rathy,** ***An Introduction to Fluid Dynamic***, IBH Publ.Comp.New Delhi, 2002.

ONLINE SOURCES:

1. www.efluids.com
2. www.springer.com

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	S	M	M	S	M	L	S	M	L	S	M	M	S	M
CO3	S	M	L	S	S	L	M	L	S	L	S	L	L	L	S
CO4	S	L	S	M	M	L	L	M	M	L	M	L	L	L	S
CO5	S	M	S	S	S	S	M	S	M	L	S	M	M	M	S

S - Strong; M - Medium; L – Low

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN

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ELAYAMPALAYAM, TIRUCHENGODE -637 205.

DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	**20P2MAE03**	**Title**	**Batch**	2020-2022
		ELECTIVE II: MATHEMATICAL METHODS	**Semester**	II
Hrs/Week	6		**Credits**	04

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 independent variables – 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 – Reflection and 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 integral equation 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 orthogonlization process - 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

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ELAYAMPALAYAM, TIRUCHENGODE -637 205.

DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20P2MAE04	**Title**	**Batch**	2020-2022
		ELECTIVE PAPER IV: COMBINATORIAL MATHEMATICS	**Semester**	I
Hrs/Week	6		**Credits**	05

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To Understand the concepts of Permutations and Combinations.	K1, K2
CO2	To analyze the concepts of Generating functions	K4
CO3	To solve the problems of recurrence relations with two indices.	K5, K6
CO4	To gain knowledge in rook polynomials	K2, K3
CO5	To analyze the concept of Polya's theory of counting	K4,K5

UNIT-I: **(18 Hrs)**

Permutations and combinations – distributions of distinct objects – distributions of non distinct objects – Stirlings formula.

UNIT-II: **(18 Hrs)**

Generating functions – generating function for combinations – enumerators for permutations – distributions of distinct objects into non – distinct cells – paetitions of integers – the Ferrwr's graphs – elementary relations.

UNIT-III: **(18 Hrs)**

Recurrence relation – linear recurrence relations with constant coefficients solutions by the technique of generating functions – a special class of non linear difference equations – recurrence relations with two indices.

UNIT-IV: **(18 Hrs)**

The principle of inclusion and exclusion – general formula – permutations with restriction on relative positions – derangements – the rook polynomials – permutations with forbidden positions.

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

Polya's theory of counting – equivalence classes under a permutation group Burnside theorem – equivalence classes of functions – weights and inventories of functions – Polya's fundamental theorem – generation of Polya's theorem.

TOTAL : **90 Hours**

Power point Presentations, Seminar & Assignment

TEXT BOOK:

C.L.Liu, ***Introduction of Combinatorial Mathematics,*** McGraw Hill, 1968.

REFERENCE BOOKS:

1. **Marshall Hall Jr,** ***Combinatorial Theory,*** John Wiley & sons, second edition.

2. **H.J. Rayser,** ***Combinatorial Mathematics,*** Carus Mathematical Monograph.

ONLINE SOURCES:

1. www.ejournal.com

2. www.ebook.com

3. www.freebookcentre.net

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	S	S	M	S	M	L	S	M	M	M
CO4	S	M	S	S	S	M	L	M	L	L	M	L	L	L	S
CO5	S	M	S	S	S	M	M	S	M	L	L	L	M	M	S

S - Strong; M - Medium; L – Low

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ELAYAMPALAYAM, TIRUCHENGODE -637 205.

DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20P3MAE05	**Title**	**Batch**	2020-2022
		CORE BASED ELECTIVE III: OPTIMIZATION TECHNIQUES	**Semester**	**III**
Hrs/Week	5		**Credits**	4

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To understand the concepts of duality in Linear programming problem.	K1, K2
CO2	To know about decision analysis and games.	K2, K3
CO3	To apply the idea about Simulation modeling through Monte Carlo simulation.	K3, K4
CO4	To analyze Non linear programming problem.	K4
CO5	To Evaluate Quadratic programmingproblem.	K5

Unit I: Duality Linear Programming (15 Hrs)

General Primal-Dual – Formulating a Dual problem – Duality and Simplex Method – Dual Simplex Method.

Chapter 4 (Sec 4.1 – 4.3)

Unit II: Decision analysis and games (15 Hrs)

Decision environment – Decision making under certainty (Analytical Hierarchy approach) Decision making under risk – Expected value criterion – Variations of the expected value criterion – Decision under uncertainty -Game theory – optimal solution of two – Person Zero – Sum games – Solution of mixed strategy games.

Chapter 13 (Sec 13.1 – 13.4)

Unit III: Simulation modeling (15 Hrs)

What is simulation – Monte Carlo simulation – Types of simulation – Elements of discrete event simulation – Generic definition of events – Sampling from probability distributions -

Methods for gathering statistical observations – Sub interval method – Replication method – Regenerative (Cycle) method – Simulation languages.

Chapter 16 (Sec 16.1 – 16.7)

Unit IV: Nonlinear Programming Problem **(15 Hrs)**

Formulation – General NLPP – Constrained optimization with equality constraints - Constrained optimization with inequality constraints.

Chapter 27 (Sec 27.1 – 27.7)

Unit V: Nonlinear programming Methods **(15 Hrs)**

Graphical solution – Khun-Tucker Conditions with non-negative constraints - Quadratic programming – Wolfe's method - Separable convex programming - Geometric programming.

Chapter 28 (Sec 28.1 – 28.5, 28.8), Chapter 29 (Sec 29.1 – 29.4)

TOTAL: **75 Hours**

Power point Presentations, Seminar ,Quiz, Assignment

TEXT BOOK:

1. H.A. Taha, "*Operation Research an Introduction",* Prentice Hall India**,** 2003.**(Unit I , II , & III)**

2. Kanti swarup, P.K. Gupta and Man Mohan , "*Operations Research",* Sultan Chand & Sons, 2015. **(Unit IV & V)**

REFERENCE BOOKS:

1. F.S. Hillier and G.J. Lieberman, "*Introduction to Operation Research",*

Mc Graw Hill Book Company, 1989.

2. **Philips D.T.Ravindra A. and J. Solbery,**"***Operations Research", Principles and Practice,*** John Wiley and Sons, New York.

3. **B.E.Gillett,** ***Operations research – A Computer Oriented Algorithmic Approach,***TMH Edition, New Delhi, 1976.

ONLINE SOURCES:

1. https://nptel.ac.in/downloads/111106054/
2. https://ocw.mit.edu.
3. https://swayam.gov.in

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	M	S	S	S	M	S	S	L	M	L	S	M	S	S
CO3	S	S	M	M	S	M	L	S	M	L	S	M	M	S	M
CO4	S	M	S	S	S	S	M	M	M	L	S	S	M	L	S
CO5	S	M	L	S	S	S	S	M	S	L	S	M	M	M	M

S - Strong; M - Medium; L – Low

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN

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ELAYAMPALAYAM, TIRUCHENGODE -637 205.

DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20P3MAE06	**Title**	**Batch**	2020-2022
		CORE BASED ELECTIVE III: FUZZY SETS AND THEIR APPLICATIONS	**Semester**	III
Hrs/Week	5		**Credits**	4

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To understand the basic concepts of fuzzy sets.	K1, K2
CO2	To know about fuzzy complements and intersections.	K2, K3
CO3	To apply the idea about linguistic variables.	K3, K4
CO4	To analyze the binary relations of fuzzy .	K4
CO5	To Evaluate ranking methods.	K5

UNIT-I: From Classical Sets To Fuzzy Sets , Fuzzy Sets Verses Crisp Sets (15 Hrs)

Fuzzy sets : Basic types – Fuzzy sets : Basic Concepts – Additional Properties – cuts – Extension Principle for fuzzy sets.

UNIT-II: Operations On Fuzzy Sets (15 Hrs)

Types of operations – Fuzzy complements- Fuzzy Intersections : t – Norms – Fuzzy Unions – conforms- Combinations of Operations.

UNIT-III: Fuzzy Arithmetic (15Hrs)

Fuzzy Numbers – Linguistic Variables – Arithmetic Operations On Intervals – Arithmetic Operations On Fuzzy Numbers.

UNIT-IV: Fuzzy Relations (15 Hrs)

Binary Fuzzy Relations- Binary Relations On A Single Set –Fuzzy Equivalene Relations- Fuzzy Compatibility Relations- Fuzzy Ordering Relations-Fuzzy Morphisms.

UNIT-V : Fuzzy decision making **(15 Hrs)**

Individual Decision Making- Muliti person Decision Making- Ranking Methods- Fuzzy Linear Programming.

TOTAL: **75 Hours**

Power point Presentations, Seminar ,Quiz, Assignment

TEXT BOOK:

George J.klir and Bo Yuan, ***Fuzzy Sets and Fuzzy Logic Theory and Applications,*** Prentice Hall of India, (2005).

REFERENCE BOOKS:

1. **H.J.Zimmermann,** ***Fuzzy set theory and its applications ,*** Allied publishers limited (1991).

2. **M.Ganesh ,** ***Introduction to Fuzzy sets and Fuzzy logic,*** Prentice Hall of India , New Delhi, 2006.

ONLINE SOURCES:

- www.ejournal.com
- www.ebook.com
- www.freebookcentre.net

Mapping with Programme Outcomes

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

S - Strong; M - Medium; L – LoW

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN

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ELAYAMPALAYAM, TIRUCHENGODE -637 205.

DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20P4MAE07	**Title**	**Batch**	2020-2022
		ELECTIVE IV:	**Semester**	IV
Hrs/Week	6	**DIFFERENTIAL GEOMETRY**	**Credits**	4

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To gain the knowledge about space curves	K3, K4
CO2	To understand the concept of theory of surfaces.	K1, K2
CO3	To apply the concepts to global analysis and topology of manifolds.	K2, K3
CO4	To determine the new techniques of differential geometric methods.	K5, K6
CO5	To focus on Geodesic on a surface.	K4, K5

Unit: I **(18 Hrs)**

Theory of Space Curves: Introduction – Representation of space curves –Unique parametric representation of a space curve –Arc length – Tangent and osculating plane –Principle normal and binormal–Curvature and torsion – The curvature and torsion of a curve as the intersection of two surfaces.

Chapter I (Sec 1.1 - 1.7,1.9)

Unit :II **(18 Hrs)**

Theory of Space Curves (Contd): Contact between curves and surfaces-Osculating circle and osculating sphere –Locus of centres of spherical curvature – Tangent surfaces – Involutes and Evolutes – Intrinsic equations of space curves – Fundamental Existence theorem for space curves.

Chapter I (Sec 1.10 - 1.13 ,1.16 - 1.17)

Unit :III **(18 Hrs)**

The first fundamental form and Local Intrinsic properties of a surface: Introduction - Definition of a surface – Nature of points on a surface – Representation of a surface – Curves on

surfaces – Tangent plane and surface normal – The general surfaces of revolution – Helicoids – Metric on a surface – The first fundamental form - Direction coefficients on a surface.

Chapter II (Sec 2.1 - 2.10)

Unit :IV **(18 Hrs)**

The first fundamental form and Local Intrinsic properties of a surface (Contd) and geodesic on a surface: Families of curves – Orthogonal trajectories – Double family of curves – Isometric correspondence – Intrinsic properties – Introduction - Geodesics and their differential equations – Canonical Geodesic equations.

Chapter II (Sec 2.11 - 2.15) , Chapter III (Sec 3.1 - 3.3)

Unit :V **(18 Hrs)**

Geodesic on a surface: Normal property of Geodesics – Differential equations of geodesics using normal property – Existence theorems – Geodesics parallels – Geodesic curvature – Gauss Bonnet Theorems – Gaussian curvature.

Chapter III (Sec 3.5 - 3.8, 3.10- 3.12)

TOTAL : **90 Hours**

Power point Presentations, Seminar ,Quiz, Assignment

TEXT BOOK:

1. **D. Somasundaram,** ***Differential Geometry***, Narosa Publ.House, Chennai-2006.

REFERENCE BOOKS :

1. **T.Wilmore,*An Introduction to Differential Geometry,*** Clarendan Press,Oxford,2015.

2. **D.T. Struik,*Lectures on classical Differential Geometry,*** Addison-Wesely,Mass 2006

3. **J.A. Thorpe,*Elementary Topics in Differential Geometry,*** Springer-Verlag, NewYork,1979.

4. **Erwin Kreyszig,*Differential Geometry, Dover publications,*** INC, New York 2000.

ONLINE SOURCES:

1. https://nptel.ac.in/downloads/111106054/
2. https://ocw.mit.edu.
3. https://swayam.gov.in
4. www.freebookcentre.net

Mapping with Programme Outcomes

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

S - Strong; M - Medium; L – Low

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN

[AUTONOMOUS]

ELAYAMPALAYAM, TIRUCHENGODE -637 205.

DEPARTMENT OF MATHEMATICS

M.Sc., Mathematics

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	20P4MAE08	**Title**	**Batch**	2020-2022
		ELECTIVE IV: DIFFERENCE EQUATIONS	**Semester**	IV
Hrs/Week	6		**Credits**	4

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To learn about difference operator.	K2, K4
CO2	To gain knowledge about the first order equations..	K1, K2
CO3	To understand the concept of z-transform.	K3
CO4	To determine the stability of linear systems .	K5, K6
CO5	To develop asymptotic analysis of sums.	K4, K5

UNIT-I: Difference Calculus **(18 Hrs)**

Difference operator – Summation – Generating function – Approximate summation.

Chapter 2(Sec 2.1 - 2.3)

UNIT-II: Linear Difference Equations **(18 Hrs)**

First order equations – general results for linear equations.

Chapter 3(Sec 3.1 - 3.2)

UNIT-III: Linear Difference Equations (Contd.) **(18 Hrs)**

Equations with constant coefficients – Equations with variable coefficients –z- transform.

Chapter 3 (Sec 3.3 - 3.5, 3.7)

UNIT-IV: **(18 Hrs)**

Intial value problems for linear systems – Stability of linear systems.

Chapter 4(Sec 4.1, 4.2)

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

Asymptotic analysis of sums – linear equations.

Chapter 5(Sec 5.1 – 5.3)

TOTAL : **90 Hours**

Power point Presentations, Seminar ,Quiz, Assignment

TEXT BOOK :

1.**W.G.Kelly and A.C.Peterson,** ***Difference Equations,*** Academic press, New York, 1991.

REFERENCE BOOKS:

1. **S.N.Elaydi,** ***An Introduction to Difference Equations,*** Springer – Verleg, New York, 1990.

2.**R.Mickens,** ***Difference Equations,*** Van Nostrand Reinhold, New York, 1990.

3.**R.P.Agarwal,** ***Difference Equations and Inequalities,*** Marcel Dekkar, New York, 1992.

ONLINE SOURCES:

- www.ejournal.com
- www.ebook.com
- www.freebookcentre.net

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	S	S	L	M	L	L	S	M	M	M	S
CO2	M	M	S	S	S	M	S	L	L	L	M	L	M	M	S
CO3	M	M	S	S	S	S	M	L	L	L	S	M	S	S	S
CO4	S	L	S	M	M	L	L	M	M	L	M	L	L	L	S
CO5	S	M	S	S	S	M	S	S	L	M	L	S	M	S	S

S - Strong; M - Medium; L – Low