DWARAKA DOSS GOVERDHAN DOSS VAISHNAV COLLEGE
(Autonomous)
College with Potential for Excellence
Linguistic Minority Institution. Affiliated to University of Madras

POST GRADUATE AND RESEARCH
DEPARTMENT OF MATHEMATICS

M.Sc. Mathematics

CURRICULUM AND SCHEME OF EXAMINATIONS

Choice Based Credit System (CBCS)

&

Outcome Based Education (OBE)

(with Effect from the Academic Year 2024-2025)

POST GRADUATE AND RESEARCH DEPARTMENT OF MATHEMATICS

VISION

- To promote and support a comprehensive, innovative and dynamic learning environment
- To assist students in acquiring a conceptual understanding of the nature and structure of mathematics its processes and applications.

MISSION

- To establish an atmosphere of creative endeavor that supports interdisciplinary collaborations, innovative projects, significant research and informal discussions that mutually benefit students, faculty and community at large.

PROGRAM OUTCOME FOR POST GRADUATE

At the end of the programme the student will be able :

PO1	To attain suitable scientific knowledge and technical skills to realize, calibrate and develop innovative processes / skills for creation of inventive products which are beneficial to society.
PO2	To implement discipline, professionalism, team spirit, communication skills, social and ethical commitment in the post graduates in order to embellish leadership roles expediting perfection in different sector with a categorical professional distinctiveness, business savvy, international recognition and imperishable expansion
PO3	To be habituated with the emerging expanses of erudition and their applications in several domains of biological sciences and to enlighten the students of its relevance in forthcoming studies
PO4	To enhance the insight of research-oriented knowledge in conjunction with literature survey, design of experimental methodology, analysis and interpretation of results and draw valid conclusions.
PO5	To provoke entrepreneurship among the students along with strong ethics and communication skills
PO6	To engage in Lifelong learning and enduring proficient progress

Program Specific Outcomes (PSO)

At the end of the program, the student will be able to:

PSO1	**Mathematical Thinking:** Acquire abstract mathematical thinking and the capability of developing ideas based on them.
PSO2	**Career:** Analyze different methods and techniques and apply them effectively in different fields and in everyday life.
PSO3	**Creativity:** Develop research quest in interdisciplinary and multidisciplinary areas of Mathematics.

Curriculum and scheme of Examination under CBCS and OBE

(Applicable to the students admitted during the Academic Year 2024-2025 and Onwards)

Semester	Subject Code	Title of the Paper	Instruction hours/cycle	Exam. Marks			Duration of Exam (hours)	Credits
				CIA	ESE	TOTAL		
I		Core Paper I Algebra I	6	50	50	100	3	4
		Core Paper II Real Analysis I	6	50	50	100	3	4
		Core Paper III Ordinary DifferentialEquations	6	50	50	100	3	4
		Core Paper IV Probability Theory	6	50	50	100	3	4
		Elective I Numerical Analysis and Wavelets	4	50	50	100	3	3
		Soft Skills - I	2	50	50	100	3	2
	Total		**30**	**-**	**-**	**600**	**-**	**21**
II		Core Paper V Algebra II	6	50	50	100	3	4
		Core Paper VI Real Analysis II	6	50	50	100	3	4
		Core Paper VII Partial Differential Equations	6	50	50	100	3	4
		Core Paper VIII Graph Theory	6	50	50	100	3	4
		Elective II Fuzzy sets and its applications	4	50	50	100	3	3
		Internship(Summer Internship Report will be submitted in third semester)	-	-	-	-	-	-
		Soft Skills - II	2	50	50	100	3	2
		Value added course						-
		Research Methodology						1
	Total		**30**	**-**	**-**	**600**	**-**	**22**

III		Core Paper IX Complex Analysis - I	5	50	50	100	3	4
		Core Paper X Topology	5	50	50	100	3	4
		Core Paper XI Mechanics	5	50	50	100	3	4
		Core Paper XII Operations Research	5	50	50	100	3	4
		Elective III Number Theory and Cryptography	4	50	50	100	3	3
		Extra Disciplinary I Calculus of Variations and Integral Equations **(Skill Enhancement Course)**	4	50	50	100	3	3
		Internship						2
		Soft Skills III	2	50	50	100	3	2
		Value added course						-
	Total		**30**	**-**	**-**	**700**	**-**	**26**
IV		Core Paper XIII Complex Analysis - II	5	50	50	100	3	4
		Core Paper XIV Functional Analysis	5	50	50	100	3	4
		Core Paper XV Differential Geometry	5	50	50	100	3	4
		Elective IV Fluid Dynamics	4	50	50	100	3	3
		Elective V Formal Languages and Automata Theory	4	50	50	100	3	3
		Extra Disciplinary II Financial Mathematics Using R **(Skill Enhancement Course)**	4	50	50	100	3	3
		Soft skills IV	2	50	50	100	3	2
		Project	1					2
	Total		**30**	**-**	**-**	**700**	**-**	**25**
Grand Total			120			**2600**	**-**	**94**

Note:

CBCS – Choice Based Credit system
CIA – Continuous Internal Assessment
ESE – End of Semester Examinations

Elective Papers

1. Numerical Analysis and Wavelets
2. Fuzzy sets and its Applications
3. Number Theory and Cryptography
4. Fluid Dynamics
5. Formal Languages and Automata Theory

Extra Disciplinary Papers

1. Calculus of Variations and Integral Equations
2. Financial Mathematics using R.

Value added Courses

1. Cyber Security
2. IMAGE PROCESSOR WITH OPEN CV
3. Skill enhancement courses.
4. Data Analytics
5. Aptitude training

Tally Table:

Subject	No. of Subjects	Total Marks	Credits
Core – Theory	15	1500	15x4= 60
Major Elective Papers	5	500	15
Extra Disciplinary	2	200	6
Soft Skills	4	400	8
Internship	1	-	2
Project	1		2
Value added courses	2		-
Research Methodology	1		1
Grand Total	**-**	**2600**	**94**

- Industrial visit relevant to the course will be undertaken.

Components of Continuous Internal Assessment

Components		Marks	Total
Theory			
CIA I	50	30	50
CIA II	50		
Generic Activity		15	
Attendance		5	

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

K1-Remembering; **K2**-Understanding; **K3**-Applying; **K4**-Analyzing; **K5**-Evaluating

Theory Examination

Time: 1 hour and 30 minutes

CIA I & II: 50 Marks Each

CIA Tests -I	Multiple choice questions
CIA- II	Descriptive: Section A: 7 x 2 = 14 (Answer any 7 out of 10) Section B: 3 x 7 = 21 (Answer any 3 out of 5) Section C : 1 x 15 = 15 (Answer any 1 out of 3) Total - 50 marks
Generic Activity	Conducting Seminars or Micro projects or Groupdiscussion or Problem solving or Assignments.
Value Added Course	Conducting Group discussion or Paper Presentation orSeminars or viva.
Project	External Viva- Voce
Research Methodology	Conducting Group discussion or Paper Presentation or Seminars or viva

Time: 3 hours

ESE: 100 Marks

Knowledge Level	Section	Marks	Description	Total
K1 Q1 to 12	**Section A** **Answer all the 10Questions.**	10 x 2 = 20	Short Answer Questions	100
K2 Q13 to 19	**Section B** **Answer all the 5 Questions (Each unit2 questions either orpattern)**	5 x 7 = 35	Long Answer Questions	
K3 & K4 Q20 to 24	**Section C** **Q.No.16 is compulsory.** Remaining two questions either or pattern. (should be equally distributed among all the units)	3 x 15 = 45	Descriptive /Detailed	

END SEMESTER THEORY EXAMINATION QUESTION PAPER PATTERN M.SC MATHEMATICS

Pattern

Time : 3 hours Max Marks : 100

Section A Answer all the 10 Questions.	10x2 = 20 Marks
Section B Answer all the 5 Questions (Each unit 2 questions either or pattern)	5x7 =35Marks
Section C Q.No.16 is compulsory. Remaining two questions either or pattern.	3x15 = 45 Marks
Total	**100 Marks**

Distribution of Marks for CIA

CIA Tests (2)	30 Marks
Generic Activity	15 Marks
Attendance	5 Marks
Total	**50 Marks**

SEMESTER- 1

Course Title: ALGEBRA – I

Programme	**M.Sc (Mathematics)**
Exam Hours	**03**

Credits	**04**
CIA Marks	**50**
ESE Marks	**50**

Course Objectives: Students will acquire knowledge about the concepts of Counting principle, Modules, linear transformations and real quadratic form.

Course Outcomes: At the end of the Course, the Student will be able to

CO1	Explain counting principle and discuss its applications.
CO2	Explain solvable groups, direct products, finite abelian groups and modules.
CO3	Describe linear Transformations , Canonical forms ,Triangular form and Nilpotent transformations
CO4	Demonstrate Jordan form , rational canonical form with some examples
CO5	Determine Trace and transpose of Hermitian, unitary, normal transformations and real quadratic form.

COs	**CONTENTS OF MODULE**
CO1	UNIT I–Another Counting Principle, Sylow's theorems Chapter 2: Sections 2.11and 2.12
CO2	UNIT II - Direct products - Finite abelian groups- Modules Chapter 2: Sections 2.13 and 2.14 Chapter 4: Section 4.5
CO3	UNIT III - Linear Transformations - Canonical forms -Triangular form –Nilpotent transformations. Chapter 6: Sections 6.4 , 6.5
CO4	UNIT IV - Jordan form - rational canonical form. Chapter 6 : Sections 6.6 and 6.7
CO5	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)

Recommended Text

I.N. Herstein. Topics in Algebra (II Edition) Wiley, 2002.

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, (1999) Narosa Publishing House , New Delhi.

4. D.S.Dummit and R.M.Foote, Abstract Algebra, 2nd edition, Wiley, 2002.

5. N.Jacobson, Basic Algebra, Vol. I & II Hindustan Publishing Company, New Delhi.

6, John. B. Fraleigh, Abstract Algebra. 7. Birkhoff, Mac Lane – A Brief Survey of Modern Algebra.

e-resources: **https://nptel.ac.in**

Mapping of Course Outcomes to Program Outcomes & Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PS02	PS03
CO1	3	3	2	2	1	2	3	3	2
CO2	3	3	2	2	1	2	3	2	3
CO3	3	3	1	1	1	2	3	1	2
CO4	3	3	1	1	1	2	2	2	2
CO5	3	2	1	2	1	2	3	2	2

3 – High 2 – Medium 1 - Low

Course Title: Real Analysis I

Programme	M.Sc Mathematics
Exam Hours	03

Credits	04
CIA Marks	50
ESE Marks	50

Course objectives

- To introduce the ideas of adherent and accumulation points, compactness, connectedness, uniform continuity, function of bounded variation, total variation, cesaro summation, Riemann – Stieltjes Integrals.

- The content of this course is viewed as extension of the ideas presented in Under Graduate course in Real Analysis. The course contains brief analysis of topological properties of sets in the space R^n and the concept of Riemann – Stieltjes integrals.

Course outcomes: At the end of the course, students will be able to

CO1	Explain the concepts of Adherent points, Accumulation points and prove The Bolzano-Weierstrass theorem, The Cantor intersection theorem,The Lindeloff covering theorem, The Heine Borel covering theorem, Formulating the concept of Compactness in R^n with suitable examples
CO2	Point out the relationship between connectedness and Arc-wise connectedness, Homeomorphisms and Isometry and use contractions to prove fixed point theorem.
CO3	Categorize the concepts of Monotonic functions, functions of Bounded variation and Total variation and construct the proofs of Additive property of total variation, Functions of bounded variation expressed as the difference of two increasing functions, Continuous functions of bounded variation and define multiplication of Infinite Series and Infinite products with illustrations
CO4	Define the concept of Riemann – Stieltjes (RS) Sum and Riemann – Stieltjes (RS) Integral and discuss its properties
CO5	Proving properties of RS integrals, establish its existence and prove mean value theorems and two fundamental theorems of calculus regarding RS integrals.

CONTENTS OF MODULE
UNIT I: Elements of Point set Topology Definition of Adherent points, Accumulation points, Closed sets and adherent points with suitable illustrations, Constructing the proofs of: The Bolzano-Weierstrass theorem ,The Cantor intersection theorem ,The Lindeloff covering theorem , The Heine Borel covering theorem, Formulating the concept of Compactness in R^n with suitable examples. Chapter 3: sections: 3.6 - 3.12
UNIT-II: Limits and Continuity Definition and Explanation of Connectedness, Components of a metric space, arc wise connectedness, uniform continuity, Formulating the concept of compact sets through uniform continuity, Construction of the proof of fixed point theorem with respect to contraction mappings. Chapter 4: sections: 4.16 – 4.21

UNIT-III: Functions of bounded variation Classifying and explaining the Properties of monotonic functions, Explanation of Functions of bounded variation, Total variation with suitable illustrations. Constructing the proofs of 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. Defining the Infinite Series, Explaining Multiplication of series and Illustrating the concept of Cesaro summability with examples and proofs. Chaper 6: Sections: 6.1 to 6.8 Chapter 8: Sections: 8.24, 8.25.
UNIT-IV: The Riemann - Stieltjes Integral Definition of the Riemann - Stieltjes integral, Constructing the proofs of Linear Properties, Integration by parts, Change of variable in a Riemann-Stieltjes integral, Reduction to a Riemann Integral, Step functions as integrators, Reduction of a Riemann – Stieltjes integral to a finite sum, Euler's summation formula. Definition of Monotonically increasing integrators upper and lower integrals and classifying Riemann's condition with equivalent conditions. Chapter 7: Sections: 7.3 to 7.14
UNIT-V: The Riemann-Stieltjes Integral Explanation of Integrators of bounded variation, Construction of proofs of Sufficient conditions for the existence of Riemann-Stieltjes integrals, Necessary conditions for the existence of Riemann-Stieltjes integrals, First and Second Mean value theorems for Riemann - Stieltjes integrals, The integrals as a function of the interval, First and Second fundamental theorem of integral calculus. Chapter 7: Sections: 7.15 to 7.22

Recommended Text : Tom M.Apostol : Mathematical Analysis, 2nd Edition, Narosa,1989.

Reference Books:

1. Bartle, R.G. *Real Analysis*, John Wiley and Sons Inc., 1976.
2. 2. Rudin,W. *Principles of Mathematical Analysis*, 3rd Edition. McGraw Hill Company, New York, 1976.
3. 3. Malik,S.C. and Savita Arora. *Mathematical Anslysis*, Wiley Eastern Limited.New Delhi, 1991.
4. 4. Sanjay Arora and Bansi Lal, *Introduction to Real Analysis*, Satya Prakashan, New Delhi, 1991.
5. 5. Gelbaum, B.R. and J. Olmsted, *Counter Examples in Analysis*, Holden day, San Francisco, 1964.
6. 6. A.L.Gupta and N.R.Gupta, *Principles of Real Analysis*, Pearson Education, (Indian print) 2003.
7. 7. Ganapathi Iyar, Real Analysis

e-resources: **https://nptel.ac.in**

Mapping of Course Outcomes to Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	1	3	2	1
CO2	2	2	2	3	2	2	3	2	1
CO3	3	2	2	2	2	1	3	2	2
CO4	2	2	2	2	2	2	3	2	2
CO5	3	2	2	3	2	1	3	2	2

3 – High **2 – Medium** **1 - Low**

Course Title: Ordinary Differential Equations

Programme	M. Sc Mathematics
Exam Hours	03

Credits	04
CIA Marks	50
ESE Marks	50

Course objectives

- To solve Ordinary differential equations
- To understand analytic functions, singular points and evaluate power series solutions
- To study the existence and uniqueness of solutions of ordinary differential equations
- To analyze the convergence of the solution.

Course Outcomes: At the end of the course, students will be able to

CO1	Solve Second order Differential Equations and Demonstrate the linear dependence and independence of the solutions.
CO2	Evaluate higher order differential equations
CO3	Illustrate analytic functions, regular points and Obtain the series solutions of Legendre equation.
CO4	Classify the singular points and Describe the series solutions of Bessel's Equation and Sturm-Liouville problems
CO5	Illustrate the existence and uniqueness of solution of ordinary differential equation and Analyze the concept of convergence.

Course Outline	**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: Section 1 to 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
	Unit III: Linear equation with variable coefficients: Initial value problems – Existence and uniqueness theorems – Solutions to solve 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)
	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
	Unit V: Existence and uniqueness of solutions to first order equations: Equation with variable separated – Exact equation – method of successive approximation – the Lipschitz condition – Convergence of the successive approximations and the existence theorem. Chapter 5: Sections 1 to 6

Recommended Text

E. A. Coddington, An 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.

e-resources: https://nptel.ac.in

Mapping of Course Outcomes to Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	2	1	2	2
CO2	3	3	2	1	2	1	1	2	2
CO3	2	2	2	1	2	1	2	3	2
CO4	2	3	2	2	3	2	2	2	3
CO5	3	2	3	2	2	2	2	2	2

3 – High 2 – Medium 1 - Low

Course Title: Probability Theory

Programme	M. Sc Mathematics
Exam Hours	03

Credits	04
CIA Marks	50
ESE Marks	50

Course objectives

- Understand basic knowledge of the Random events, random variables and Parameters of the distributions
- Understand the probability distributions and application of limit theorem.
- Understand the concepts of Characteristics functions and its properties.

Course outcomes: At the end of the course, students will be able to

CO1	Able to Solve problems on Random Variables and functions of Random Variable.
CO2	Demonstrate the concepts of Expectations and Moments.
CO3	Able to understand Characteristics functions and Probability Generating Functions.
CO4	Able to distinguish between the Discrete and Continuous Distributions
CO5	Able to Solve the limit theorems.

CONTENTS OF MODULE
UNIT I: 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: Sections 1.1 to 1.7 Chapter 2 : Sections 2.1 to 2.9**
UNIT-II; 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 : Sections 3.1 to 3.8 (**Generalization of Regression line of second type is omitted)
UNIT-III: 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 – Characteristic function of multidimensional random vectors – Probability generating functions. **Chapter 4: Sections 4.1 to 4.7**
UNIT-IV: Some Probability distributions: One point, two point, Binomial – Polya – Hypergeometric – Poisson distributions (**Discrete distributions)** – Uniform – Normal – Gamma – Beta – Cauchy and Laplace distributions (**Continuous distributions)**. **Chapter 5 : Section 5.1 to 5.10 (Omit Section 5.11)** (Omit examples 5.5.1 and 5.5.2)
UNIT-V: Limit Theorems : Stochastic convergence – Bernoulli law of large numbers – Levy-Cramer Theorems (only one part of the theorem can be asked) – De Moivre-Laplace Theorem – Poisson, Chebyshev, Khintchine Weak law of large numbers – Lindberg Theorem –Lapunov Theorem – Borel- Cantelli Lemma – Kolmogorov Inequality and Kolmogorov Strong Law of large numbers. **Chapter 6: Sections 6.1 to 6.4, 6.6 to 6.9, 6.11 and 6.12. (Omit Sections 6.5, 6.10,6.13 to 6.15)** (Omit example 6.9.1)

Recommended Text:

M. Fisz, Probability Theory and Mathematical Statistics, John Wiley and Sons, New York, 1963.

Reference Books:

1. R.B. Ash, Real Analysis and Probability, Academic Press, New York, 1972
2. K. L. Chung, A course in Probability, Academic Press, New York, 1974.
3. R. Durrett, Probability: Theory and Examples, (2nd Edition) Duxbury Press, New York, 1996.
4. V. K. Rohatgi: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern Ltd., New Delhi, 1988(3rd Print).
5. S. I. Resnick, A Probability Path, Birhauser, Berlin, 1999.
6. B. R. Bhat, Modern Probability Theory (3rd Edition), New Age International (P) Ltd, New Delhi, 1999

e-resources: https://nptel.ac.in

Mapping of Course Outcomes to Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	2	1	2	2	3	3	2
CO2	3	2	2	1	2	2	2	2	3
CO3	3	3	2	1	1	1	3	2	2
CO4	3	2	1	2	2	2	2	2	2
CO5	3	2	1	1	2	2	2	3	3

3 – High 2 – Medium 1 – Low

Course Title: Numerical Analysis and Wavelets

Programme	M.Sc Maths
Exam Hours	03
Elective	I

Credits	3
CIA Marks	50
ESE Marks	50

Course Objectives:

Students will acquire knowledge about the concepts of Numerical methods and Wavelet Analysis

Course outcomes: At the end of the course, students will be able to

CO1	Demonstrate and examine interpolations for the given data
CO2	Approximating differentiation and integration numerically
CO3	Extracting the solutions of Ordinary Differential Equations using Picard, Euler and Runge-kutta Methods
CO4	Illustrate Haar wavelet system and Shauder basis
CO5	Establish multiresolution analysis and multiscale algorithms

CONTENTS OF MODULE
UNIT-I: Finite differences, Lagrange interpolations, Hermite interpolation and spline interpolation Sections: 3.1, 3.2, 3.4 and 3.5
UNIT II: Numerical Differentiation: Methods based on Finite Difference and Interpoation, Numerical Integration: Trapezoidal, Simpson's $1/3^{rd}$ and $3/8^{th}$ rule Sections: 4.1, 4.2 and 4.7
UNIT III: Numerical solutions of ODEs using Euler, modified Euler and Runge-Kutta methods Sections: 5.1 to 5.3
UNIT IV: Wavelets: The Haar system, Decomposition and Reconstruction algorithms, The Shauder hierarchical basis Sections: 1.1 to 1.3
UNIT V: Multiresolution Approximation: Multiresolution Analysis, Refinable functions, Wavelets and multiscale algorithms Sections: 2.1 to 2.3 and 2.6

Recommended Text

1. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods, New Age International Publications, Second edition.
2. Albert Cohen, Numerical Analysis of Wavelet Methods, North-Holland Elsevier, 2003

Reference Books

1. B.S. Grewal, Numerical Methods in Engineering and Science, Khanna Publications.
2. K. Sankara Rao, Numerical methods for scientists and engineers, fourth edition, Phi learning.
3. S. S. Sastry, Introductory methods of Numerical Analysis, Prentice Hall of India, New Delhi.
4. Charles K. Chui, An introduction to wavelets, Academic Press.

e-resources: https://nptel.ac.in

Mapping of Course Outcomes to Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	1	1	1	2	3	3	3
CO2	3	3	2	1	1	2	3	2	2
CO3	3	2	1	2	1	1	2	2	3
CO4	3	2	2	1	1	2	2	3	2
CO5	3	3	1	2	1	2	3	2	3

3 – High 2 – Medium 1 - Low

Course Title Algebra - II

Programme	M. Sc (Maths)
Exam Hours	03

Credits	04
CIA Marks	50
ESE Marks	50

Course Objectives

Students will acquire knowledge about the extension fields, Galois theory, Finite fields and Four - Square theorem.

Course Outcomes: At the end of the Course, the Student will be able to

CO1	Prove theorems applying algebraic ways of thinking.
CO2	Connect groups with graphs and understanding about Hamiltonian graphs.
CO3	Compose clear and accurate proofs using the concepts of Galois Theory.
CO4	Bring out insight into Abstract Algebra with focus on axiomatic theories.
CO5	Demonstrate knowledge and understanding of fundamental concepts including extension

COs	CONTENTS OF MODULE
CO1	**UNIT-I** :Extension fields – Transcendence of e. Chapter 5: Section 5.1 and 5.2
CO2	**UNIT-II** : Roots of Polynomials.- More about roots Chapter 5: Sections 5.3 and 5.5
CO3	**UNIT-III** : Elements of Galois theory. Chapter 5 : Section 5.6
CO5	**UNIT-IV** : Finite fields - Wedderburn's theorem on finite division rings. Chapter 7: Sections 7.1 and 7.2 (Theorem 7.2.1 only)
CO4	**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

Contents and treatment as in

I.N. Herstein. Topics in Algebra (II Edition) Wiley EasternLimited, New Delhi, 1975.

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.

e-resources: https://nptel.ac.in

Mapping of Course Outcomes to Program Outcomes & Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PS02	PS03
CO1	3	3	2	1	1	2	3	3	2
CO2	3	3	2	1	1	2	3	2	3
CO3	3	3	1	1	1	2	3	1	2
CO4	3	3	1	1	1	2	2	2	2
CO5	3	2	1	2	1	2	3	2	2

3 – High 2 – Medium 1 - Low

Course Title: Real Analysis II

Programme	M.Sc Mathematics
Exam Hours	03

Credits	04
CIA Marks	50
ESE Marks	50

Course objectives

- To introduce the ideas of Measure Theory, Lebesgue Integrals, Functions of Several Variables and Fourier Series, Fourier Integrals and their convergence aspects.
- The content of this course is viewed as extension of the ideas presented in previous semester in Real Analysis. Overall, the content forms the core of understanding Real Analysis at Advanced Level.

Course outcomes: At the end of the course, students will be able to

CO1	Demonstrate important theorems regarding measures and expressing measure in terms of open sets and closed sets.
CO2	Discuss theorems concerned with integration of non-negative measurable functions and demonstrate one of the classical result in analysis namely Lebesgue Montone Convergence Theorem
CO3	Point out properties related to Lebesgue Integrals, Fatou's Lemma and Dominated convergence theorem and establish the relation between Lebesgue and Riemann Integrable functions and solve problems using Lebesgue Dominated Convergence Theorem.
CO4	Prove several important theorems concerned with Fourier Series and their coefficients.
CO5	Solve problems concerned with computation of directional and partial derivatives, Jacobian Matrix, Chain Rule and establish the sufficient condition for Mean Value theorem for functions of several variables and other related theorems namely Taylor's Formula for functions of several variables

CONTENTS OF MODULE
UNIT I: Measure on the Real line Definition of Lebesgue Outer Measure, Measurable sets with suitable examples. Developing Regularity conditions and constructing the proofs regarding measurable sets. Chapter 2: Section 2.1 to 2.3
UNIT 2: Measure on the real line and Integration of Functions of a Real variable Definition of Measurable Functions, Borel and Lebesgue Measurability, Explanation of Integration of Non- negative functions and constructing proofs of properties of such functions. Chapter 2: Section 2.4, 2.5 Chapter 3.1

UNIT 3: Integration of Functions of a Real variable

Definition of the general integral, Developing Integration of series, Classifying and Distinguishing between the concepts of Riemann and Lebesgue integrals.

Chapter 3 : Section 3.2, 3.4 (Omit section 3.3)

UNIT 4: Fourier Series and Fourier Integrals

Restating Orthogonal system of functions, Constructing the proofs of: The theorem on best approximation, The Fourier series of a function relative to an orthonormal system, Properties of Fourier Coefficients, The Riesz-Fischer Theorem, Developing the convergence and representation problems in for trigonometric series, Explanation of the proofs of: 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, Explanation of Cesaro summability of Fourier series, Consequences of Fejes's theorem, Constructing the proof of Weierstrass approximation theorem .

Chapter 11: Section 11.1 to 11.15

UNIT 5: Multivariable Calculus

Definition of the concepts like Directional derivative, Continuity, The total derivative, The total derivative expressed in terms of partial derivatives with illustration of suitable examples, Definition of the matrix of linear function, The Jacobian matrix. Construction of the proofs of: The chain rule, The mean - value theorem for differentiable functions, Sufficient condition for differentiability, 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 (Omit section 12.10)

Recommended Text :

1. D. G. de Barra, *Measure Theory and Integration*, New Age International, second Edition, 2013 (for Units I ,II and III)
2. Tom M.Apostol : *Mathematical Analysis*, 2nd Edition, Narosa 1989 (for Units IV and V)

Reference Books:

1. Burkill,J.C. *The Lebesgue Integral*, Cambridge University Press,
2. Munroe,M.E. *Measure and Integration*. Addison-Wesley, Mass.1971.
3. Royden,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. I.K.Rana. *Measure Theory and Integration*
7. Halmos, Measure Theory

e-resources: https://nptel.ac.in

Mapping of Course Outcomes to Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	2	2	2	2
CO2	2	2	2	2	2	2	2	2	2
CO3	2	2	2	2	2	2	2	2	2
CO4	3	2	2	2	2	3	3	3	3
CO5	3	2	2	2	2	3	3	3	3

3 – High 2 – Medium 1 - Low

Partial Differential Equations

Programme	M.Sc Mathematics
Exam Hours	03

Credits	04
CIA Marks	50
ESE Marks	50

Course objectives

- To solve first order partial differential equations and to classify second order partial differential equations and obtain its canonical form.
- To understand the concepts of Laplace and Poisson equations
- To study Cauchy problem, method of separation of variables, boundary value problems.

Course Outcomes: At the end of the course, students will be able to

CO1	Solve first order partial differential equations, classify second order partial differential equations and obtain its canonical form.
CO2	Derive Laplace and Poisson Equations, discuss the interior and exterior problems and demonstrate the solution of some elliptic problems.
CO3	Derive Diffusion equation and Illustrate some of the solution methods for parabolic equations.
CO4	Formulate Hyperbolic equations and demonstrate some of the solution methods for hyperbolic equations.
CO5	Illustrate the solutions of Laplace, Diffusion and Wave equations using Green's function, Laplace Transform and Fourier Transform.

Course Outline	**Unit I: Partial Differential Equations of First Order:** Formation and solution of PDE- Integral surfaces – Cauchy Problem for first order equation- Orthogonal surfaces – First order non-linear – Characteristics – Compatible system –Charpit method. Fundamentals: Classification and canonical forms of PDE. Chapter 0: 0.4 to 0.11 (omit .1,0.2.0.3 and 0.11.1) and Chapter 1: 1.1 to 1.3
	Unit II: Elliptic Differential Equations: Derivation of Laplace and Poisson equation – BVP – Separation of Variables – Dirichlet's Problem and Newmann Problem for a rectangle – Interior and Exterior Dirichlets's problems for a circle – Interior Newmann problem for a circle – Solution of Laplace equation in Cylindrical coordinates – Miscellaneous examples (2.11,2.12,2.16). Chapter 2: 2.1, 2.5 to 2.11 (omit 2.2, 2.3 , 2.4, 2.12)
	Unit III: **Parabolic Differential Equations:** Occurance of the Diffusion equation – Boundary conditions – Elementary solutions of the Diffusion equation- Separation of variables method – Solution of Diffusion Equation in Cylindrical -Examples. Chapter 3: 3.1 , 3.2, 3.3, 3.5 , 3.6.(omit 3.4)
	Unit IV: Hyperbolic Differential equations: Occurrence of the wave equation – Derivation and solution of one dimensional wave equation by canonical reduction – Initial value problem: D'Alembert's solution – Vibrating string – Forced Vibrations- Boundary and initial value problem for two-dimensional wave equation – Periodic solution of one dimensional wave equation in cylindrical coordinate. Chapter 4: 4.1 to 4.8

	Unit V: Green's Function: Introduction - Green's function for Laplace Equation – methods of Images – Eigen function Method – Green's function for the wave and Diffusion equations. Laplace Transform method: Solution of PDE- solution of Diffusion and Wave equation by Laplace Transform. Chapter 5: 5.1 to 5.6 Chapter 6: 6.13, 6.13.1 and 6.13.2 only (omit (6.14) .

Text Book:

1. S, Sankar Rao, Introduction to Partial Differential Equations, Third Edition, Prentice Hall of India, New Delhi. 2019.

Reference Books:

1. R.C.McOwen, Partial Differential Equations, 2ndEdn. Pearson Eduction, New Delhi, 2005.
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.

e-resources: **https://nptel.ac.in**

Mapping of Course Outcomes to Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	2	1	2	2
CO2	2	2	3	1	2	1	2	2	2
CO3	3	3	2	1	2	1	3	3	2
CO4	2	2	2	2	3	2	2	2	3
CO5	3	3	3	2	2	2	2	2	2

3 – High 2 – Medium 1 - Low

Course Title: Graph Theory

Programme	M. Sc Mathematics
Exam Hours	03

Credits	04
CIA Marks	50
ESE Marks	50

Course objectives

- To understand the different concepts of Graph Theory and its application in day today life.
- To enable the students to model the real world problems into Graph Theory problems and get solutions.
- To motivate the students to pursue their research in this field.

Course outcomes: At the end of the course, students will be able to

CO1	Illustrates graphs and it's properties
CO2	Describe connectedness of graphs, Euler and Hamilton cycles
CO3	Explain matchings and colourings in graphs and measure edge chromatic number
CO4	Define Ramsey numbers, classify critical graphs and calculate chromatic polynomials of graphs
CO5	Summarize planar graphs and survey the planarity using Euler's formula

CONTENTS OF MODULE
UNIT I: Graphs, **Subgraphs and Trees :** Graphs and simple graphs – Graph Isomorphism – The Incidence and Adjacency Matrices – Subgraphs – Vertex Degrees – Paths and Connection – Cycles – Trees – Cut Edges and Bonds – Cut Vertices. Chapter 1 (Section 1.1 – 1.7) Chapter 2 (Section 2.1 – 2.3)
UNIT-II Connectivity, Euler tours and Hamilton Cycles : Connectivity – Blocks – Euler tours – Hamilton Cycles. Chapter 3 (Section 3.1 – 3.2) Chapter 4 (Section 4.1 – 4.2)
UNIT-III: Matchings, Edge Colourings: Matchings – Matchings and Coverings in Bipartite Graphs – Edge Chromatic Number – Vizing's Theorem. Chapter 5 (Section 5.1 – 5.2) Chapter 6 (Section 6.1 – 6.2)
UNIT-IV : Independent sets and Cliques, Vertex Colourings: Independent sets – Chromatic Number – Brooks' Theorem – Chromatic Polynomials Chapter 7 (Section 7.1) Chapter 8 Section 8.1 – 8.2.

UNIT-V: Planar graphs : Plane and planar Graphs – Dual graphs – Euler's Formula – The Five-Colour Theorem and the Four-Colour Conjecture (concept only).
Chapter 9 (Section 9.1 – 9.3).

Recommended Text:
J. A. Bondy and U.S.R. Murthy, Graph Theory and Applications, Macmillan, London, 1976.

Reference Book:
1. J.Clark and D.A.Holton, A First look Graph Theory, at Allied Publishers, New Delhi , 1995.
2. R. Gould. Graph Theory, Benjamin/Cummings, Menlo Park, 1989.
3. A.Gibbons, Algorithmic Graph Theory, Cambridge University Press, Cambridge, 1989.
4. R. J. Wilson and J. J. Watkins, Graphs: An Introductory Approach, John Wiley and Sons, New York, 1989.
5. R.J. Wilson, Introduction to Graph Theory, Pearson Education, 4 th Edition, 2004, Indian Print.
6. Kenneth & Roshan, Discrete Mathematics & its Applications.
7. S. A. Choudum: A First Course in Graph Theory, MacMillan India Ltd. 1987.
8. Vadim Zverovich: Modern Applications of Graph Theory.
9. D.B. West, Graph Theory

e-resources: https://nptel.ac.in

Mapping of Course Outcomes to Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	2	1	2	2
CO2	2	2	1	1	2	1	1	2	2
CO3	3	2	1	1	2	1	2	3	2
CO4	2	2	1	2	3	2	2	2	3
CO5	3	2	2	2	2	2	2	2	2

3 – High 2 – Medium 1 – Low

Course Title: FUZZY SETS AND ITS APPLICATIONS

Programme	M. Sc Mathematics
Exam Hours	03
Elective	II

Credits	03
CIA Marks	50
ESE Marks	50

Course Outcomes:

- To apply the concepts of fuzzy sets and fuzzy relations
- Apply analysis of function of fuzzy variable using fuzzy logic
- Construct fuzzy numbers using operations.

Course Outcomes: At the end of the Course, the Student will be able to

CO1	**Solve problems on simple operations of fuzzy subsets**
CO2	Demonstrate the concepts of fuzzy relations
CO3	Infer the properties of fuzzy binary relation
CO4	Simplify fuzzy variables using properties of fuzzy logic
CO5	Construct various types of fuzzy numbers using operations.

Course Outline

UNIT I: Fundamental Notions: Introduction, review of the notion of membership, the concept of a fuzzy subsets, dominance relations, simple operations on fuzzy subsets, sets of fuzzy subsets for **E** and **M** finite, properties of the set of fuzzy subsets, product and algebraic sum of two fuzzy subsets. Chapter I: Sec. 1 to 8.
UNIT-II: : Fuzzy Graphs: Introduction, fuzzy graphs, fuzzy relation composition of two fuzzy relation, fuzzy subsets induced by a mapping, conditioned fuzzy subsets, properties of fuzzy binary relation, transitive closure of fuzzy binary relation and paths in a finite fuzzy graph. Chapter II: Sec. 10 to 18
UNIT-III: Fuzzy Relations: Fuzzy pre order relation, similitude relation, similitude sub relations in a fuzzy preorder, antisymmetric, fuzzy order relations, antisymmetric relations without loops, dissimilitude relations, resemblance relation. Chapter II: Sec. 19 to 26.
UNIT-IV : Fuzzy Logic: Introduction, characteristic function of a fuzzy subset, Polynomial forms, analysis of a function of fuzzy variables, logical structure of a function of fuzzy variables, composition of intervals. Chapter III: Sec.31 to 36

UNIT-V: The Laws of Fuzzy Composition: Introduction, review of the notion of a law of composition, law of Fuzzy internal composition, fuzzy groupoids, principal properties of fuzzy groupoids, fuzzy monoids, fuzzy external composition and operations of fuzzy numbers. Chapter IV: Sec.43 to 49.
Recommended Text: *A. Kaufmann*, Introduction to the theory of Fuzzy subsets,Vol.I, Academic Press, New York, 1975.
Reference Books: *H.J.Zimmermann*, Fuzzy Set Theory and its Applications, Allied Publishers, Chennai, 1996. 2. *George J.Klir and Bo Yuan*, Fuzzy sets and Fuzzy Logic- Theory and Applications, Prentice Hall India, New Delhi,2001.
e-resources: **https://nptel.ac.in**.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**2**
CO2	**3**	**2**	**2**	**2**	**2**	**3**	**1**	**2**	**3**
CO3	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**3**	**2**
CO4	**2**	**2**	**2**	**3**	**2**	**2**	**1**	**2**	**3**
CO5	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**

3 – High **2 – Medium** **1 - Low**

SEMESTER-III

Course Title: Complex Analysis I

Programme	M Sc Mathematics
Exam Hours	03

Credits	04
CIA Marks	50
ESE Marks	50

Course objectives

- Explain the meaning of basic concepts, theorems and methods within the parts of complex analysis described by the course content.
- Use concepts, theorems and methods to solve and present solutions to problems within the parts of complex analysis described by the course content in order to solve applied problems and to communicate with the help of mathematical language, even in other contexts.

Course Outcomes: At the end of the Course, the Student will be able to

CO1	Explain Cauchy's integral formula and the concepts of singularities, zeros and poles of a function.
CO2	Examine the line integral of an analytic function as a consequence of the general version of Cauchy's theorem.
CO3	Evaluate definite integrals using suitable contours as an application of the residue theorem.
CO4	Represent a function as an infinite series and establish the region of convergence.
CO5	Express any meromorphic function as a sum of partial fractions and establish the convergence of an infinite product of complex numbers.

COs	CONTENTS OF MODULE
CO1	**UNIT-I: Cauchy's Integral Formula:** The Index of a point with respect to a closed curve – The Integral formula – Higher derivatives. **Local Properties of analytical Functions :** Removable Singularities-Taylors's Theorem – Zeros and poles – The Maximum Principle . **Chapter 4 : Section 2 : 2.1 to 2.3, Section 3 : 3.1 , 3.2, 3.4 (Omit 3.3)**
CO2	**UNIT-II: The general form of Cauchy's Theorem :** Chains and cycles- Simple Connectivity - Homology - The General statement of Cauchy's Theorem - Proof of Cauchy's theorem - Multiply connected regions - Residue theorem - The argument principle. **Chapter 4 : Section 4 : 4.1 to 4.5, 4.7, Section 5: 5.1 and 5.2**
CO3	**UNIT-III: Evaluation of Definite Integrals and Harmonic** **Functions:** Evaluation of definite integrals - Definition of Harmonic functions and basic properties - Mean value property - Poisson formula. **Chapter 4 : Section 5 : 5.3, Section 6 : 6.1 to 6.3**

CO4	**UNIT-IV: Harmonic Functions and Power Series Expansions:** Schwarz theorem - The reflection principle - Weierstrass theorem – Taylor Series – Laurent series. **Chapter 4 : Sections 6.4 and 6.5** **Chapter 5 : Sections 1.1 to 1.3**
CO5	**UNIT-V: Partial Fractions and Entire Functions:** Partial fractions - Infinite products – Canonical products – Gamma Function- Jensen's formula – Hadamard's Theorem **Chapter 5 : Sections 2.1 to 2.4, Sections 3.1 and 3.2**

Recommended Text Book :

Lars V. Ahlfors, Complex Analysis, (3rd edition) McGraw Hill Co., New York, 1979

Reference Books :

1. H.A. Priestly, Introduction to Complex Analysis, Clarendon Press, Oxford, 2003.
2. J.B.Conway, Functions of one complex variable Springer International Edition, 2003
3. T.W Gamelin, Complex Analysis, Springer International Edition, 2004.
4. D.Sarason, Notes on complex function Theory, Hindustan Book Agency, 1998
5. Ponnuswamy, Foundations of Complex Analysis, Narosa
6. Karunakaran Complex Analysis, Alpha Science

e-Resources:

1. http://ebooks.lpude.in.complexanalysis.
2. https://nptel.ac.in.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	2	3	2	3
CO2	3	3	2	2	2	2	3	2	3
CO3	3	3	2	2	2	2	3	2	3
CO4	3	3	2	2	2	2	3	2	3
CO5	3	3	2	2	2	2	3	2	3

3 – High 2 – Medium 1 - Low

Course Title: Topology

Programme	M.Sc Mathematics
Exam Hours	03

Credits	04
CIA Marks	50
ESE Marks	50

Course objectives

- To define the concept of convergence, completeness and continuous mappings in metric spaces and topological spaces
- To distinguish and explain the concept of compact spaces, T1 spaces, Hausdorff spaces and connected spaces.
- To demonstrate the concepts of connected spaces and totally connected spaces.

Course outcomes: At the end of the course, students will be able to

CO1	Distinguish between convergence and completeness and demonstrate these concepts in Baire's theorem and to develop the concepts of topological spaces with examples.
CO2	Understand the concepts of open bases , compact spaces and product spaces
CO3	Demonstrate the importance of Heine-Borel theorem, Tychonoff theorem, Lebesgue's covering lemma and Ascoli's theorem,.
CO4	Classify and categorize the T1 space, Hausforff space, completely regular space and normal space and can demonstrate these concepts in Tietze extension theorem, Urysohn imbedding theorem.
CO5	Compare the connected spaces, components of a space and a totally disconnected spaces.

CONTENTS OF MODULE	
CO1	**UNIT-I** : **Metric Spaces:** Convergence, completeness and Baire's Theorem; Continuous mappings; Spaces of continuousfunctions; Euclidean and Unitary spaces. **Topological Spaces:** Definition and Examples; Elementary concepts. Chapter Two (Sec 12 - 15) Chapter Three (Sec 16 -17)
CO2	**UNIT-II** : Open bases and open subbases; Weak topologies; the function algebras C(X,R) and C(X,C), Compact spaces, product spaces Chapter 3 (Sec 18-20) Chapter 4 (21-22)
CO3	**UNIT-III** : **Compact spaces.** Tychonoff's theorem and locally compact spaces;Compactness for metric spaces; Ascoli's theorem. Chapter Four (Sec 23 - 25)
CO4	**UNIT-IV** : **:** T1 – spaces and Hausdorff spaces; Completely regular spaces and normal spaces; Urysohn's lemma and the Tietze extension theorem; The Urysohn imbedding theorem. Chapter Five (Sec 26 - 29)

CO5	**UNIT-V**: The Stone – Cech compactification; Connected spaces; The components of a space; Totally disconnected spaces; Locallyconnected spaces; The Weierstrass approximation Theorem. Chapter Five (Sec 30) Chapter Six (Sec 31 - 34) Chapter Seven(Sec 35)

Recommended Text :

1. George F. Simmons, Introduction to Topology and Modern Analysis, Tata-McGraw Hill, New Delhi, 2004.

Reference Books:

1. J. Dugundji, Topology, Prentice Hall of India, New Delhi, 1975.
2. J.L. Kelly, General Topology, Van Nostrand, Reinhold Co.,New York
3. S.Willard, General Topology, Addison - Wesley, Mass., 1970
4. James R. Munkres, Topology (2nd Edition) Pearson Education Pvt. Ltd., Delhi-2002 (ThirdIndian Reprint)

e-resources: https://nptel.ac.in

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PS03
CO1	3	3	2	2	2	2	3	2	3
CO2	3	2	2	1	2	1	2	2	3
CO3	3	2	2	2	1	2	2	3	2
CO4	2	2	3	1	1	1	3	2	3
CO5	3	3	3	1	1	2	2	2	2

3 – High 2 – Medium 1 - Low

Course Title: Mechanics

Programme	M.Sc Mathematics
Exam Hours	03

Credits	04
CIA Marks	50
ESE Marks	50

Course objectives

- Recognize and use basic concepts and principles of classical mechanics, and apply them to simple examples.
- To represent the equations of motion for complicated mechanical systems using the Lagrangian and Hamiltonian formulation of classical mechanics, Legendre transformations, Canonical transformations and Poisson brackets.
- To formulate and express a physical law in terms of tensors and simplify it by use of the common form which is independent of the reference coordinate system

Course Outcomes: At the end of the Course, the Student will be able to

CO1	Recall the concept of Newtonian Mechanics for a system of particles, demonstrate D' Alembert's Principle and to classify the constraints (holonomic, non-holonomic, Sceleronomic,Rheonomic) derive Lagrangian Formulation for both Holonomic and Non-Holonomic System and discuss its applications
CO2	Derive Hamilton's principle for both holonomic and non holonomic system
CO3	Define and demonstrate Hamilton- Jacobi equation, Separability, orthogonal system and discuss its applications.
CO4	Define Canonical transformation and discuss about various forms of generating function , Lagrange and Poisson Brackets with an illustration.
CO5	Explain the basics concepts of Tensors with illustrations. Define metric tensor, conjugate or reciprocal tensor, associated tensor and illustrate with examples.

COs	CONTENTS OF MODULE
CO1	**UNIT-I**: Mechanical Systems: The Mechanical system- Generalizedcoordinates – Constraints - Virtual work - Energy and Momentum Chapter 1: Sections 1.1 to 1.5 Lagrange's Equations: Derivation of Lagrange's equations-Examples-Integrals of motion. Chapter 2: Sections 2.1 to 2.3
CO2	**UNIT-II**: Hamilton's Equations: Hamilton's Principle - Hamilton'sEquation - Other variational principles. Chapter 4: Sections 4.1 to 4.3
CO3	UNIT III Hamilton-Jacobi Theory: Hamilton Principle function – Hamilton-Jacobi Equation – Separability Chapter 5: Sections 5.1 to 5.3
CO4	**UNIT – IV: :** Canonical Transformation : Differential forms and generating functions – Special Transformations– Lagrange andPoisson brackets. Chapter 6: Sections 6.1, 6.2 and 6.3
CO5	**UNIT-V: Tensor Algebra :** Systems of Different orders – Summation Convention – Kronecker Symbols - Transformation of coordinates in Sn - Invariants – Covariant and Contravariant vectors -Tensors of Second Order – Mixed Tensors – Zero Tensor – Tensor Field – Algebra of Tensors – Equality of Tensors – Symmetric and Skew- symmetric tensors - Outer multiplication, Contraction and InnerMultiplication – Quotient Law of Tensors – Reciprocal Tensor –Relative Tensor – Cross Product of Vectors. **Chapter I : I.1 – I.3,I.7 and I.8 and Chapter II : II.1 – II.19**

Recommended Text

1. D. Greenwood, Classical Dynamics, Prentice Hall of India, New Delhi, 1985.
2. U.C. De, Absos Ali Shaikh and Joydeep Sengupta, Tensor Calculus, Narosa Publishing House, New Delhi, 2004.

Reference Books

1. H. Goldstein, Classical Mechanics, (2nd Edition) Narosa Publishing House, New Delhi.
2. N.C.Rane and P.S.C.Joag, Classical Mechanics, Tata McGraw Hill, 1991.
3. J.L.Synge and B.A.Griffth, Principles of Mechanics (3rd Edition) McGraw Hill Book Co., New York, 1970.
4. J.L.Synge and A.Schild, Tensor Calculus, Toronto, 1949.
5. S.Eddington. The Mathematical Theory of Relativitity, Cambridge University Press, 1930.
6. P.G.Bergman, An Introduction to Theory of Relativity, Newyor, 1942.
7. C.E.Weatherburn, Riemannian Geometry and the Tensor Calculus, Cambridge, 1938.

e-resources: https://nptel.ac.in

Mapping of Course Outcomes to Program Outcomes & Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PS02	PS03
CO1	3	3	2	1	1	2	3	3	2
CO2	3	3	2	1	1	2	3	2	3
CO3	3	3	1	1	1	2	3	1	2
CO4	3	3	1	1	1	1	2	2	2
CO5	3	2	1	2	1	1	3	2	2

3 – High 2 – Medium 1 - Low

Course Title: OPERATIONS RESEARCH

Programme	M. Sc Mathematics
Exam Hours	03

Credits	04
CIA Marks	50
ESE Marks	50

Course objectives

- Identify and develop operational research models from the verbal description of the real system
- Understand the Concepts of Decision Theory, Network Models and Inventory Control Models
- Understand the concepts of Queueing systems, Replacement and Maintenance Models.

Course outcomes: At the end of the course, students will be able to

CO1	Able to Understand the steps of decision-making process, to construct decision trees for making decision and analysis.
CO2	Formulate and solve a number of network models
CO3	To Understand different Deterministic Inventory Control Models and Probabilistic Inventory Control Models
CO4	Understand different queuing situations and find the optimal solutions using models for different situations.
CO5	Able to realize the need to study replacement and maintenance analysis techniques

CONTENTS OF MODULE
UNIT-I : Decision Theory : Steps in Decision theory Approach – Types of Decision-Making Environments – Decision Making Under Uncertainty – Decision Making under Risk – Posterior Probabilities and Bayesian Analysis – Decision Tree Analysis – Decision Making with Utilities. Chapter 10 : Sec. 10.1 to 10.8
UNIT-II: Network Models : Scope of Network Applications – Network Definition – Minimal spanning true Algorithm – Shortest Route problem – Maximum flow model – Minimum cost capacitated flow problem - Network representation – Linear Programming formulation – Capacitated Network simplex Algorithm. Chapter 6 : Sections 6.1 to 6.6 H.A.Taha : Operations Research
UNIT-III: Deterministic Inventory Control Models: Meaning of Inventory Control – Functional Classification – Advantage of Carrying Inventory – Features of Inventory System – Inventory Model building - Deterministic Inventory Models with no shortage – Deterministic Inventory with Shortages **Probabilistic Inventory Control Models:** Single Period Probabilistic Models without Setup cost – Single Period Probabilities Model with Setup cost. Chapter 13: Sec. 13.1 to 13.8 Chapter 14: Sec. 14.1 to 14.3
UNIT-IV: Queueing Theory: Essential Features of Queueing System – Operating Characteristic of Queueing System – Probabilistic Distribution in Queueing Systems – Classification of Queueing Models – Solution of Queueing Models – Probability Distribution of Arrivals and Departures – Erlangian Service times Distribution with k-Phases. Chapter 15 : Sec. 15.1 to 15.8
UNIT-V: Replacement and Maintenance Models: Failure Mechanism of items – Replacement of Items that deteriorate with Time – Replacement of items that fail completely – other Replacement Problems- Simulation. Chapter 16: Sec. 16.1 to 16.5

Recommended Text:

1. For Unit 2 : H.A. Taha, Operations Research, 6th edition, Prentice Hall of India
2. For all other Units: J.K.Sharma, Operations Research , MacMillan India, New Delhi, 2001.

Reference Books:

1. F.S. Hiller and J.Lieberman -,Introduction to Operations Research (7th Edition), Tata McGraw Hill Publishing Company, New Delhui, 2001.
2. Beightler. C, D.Phillips, B. Wilde ,Foundations of Optimization (2nd Edition) Prentice Hall Pvt Ltd., New York, 1979
3. Bazaraa, M.S; J.J.Jarvis, H.D.Sharall, Linear Programming and Network flow, John Wiley and sons, New York 1990.
4. Gross, D and C.M.Harris, Fundamentals of Queueing Theory, (3rd Edition), Wiley and Sons, New York, 1998.
5. Anderson & Sweeny, Introduction to Management Sciences.

e-resources: **https://nptel.ac.in**

Mapping of Course Outcomes to Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	1	2	2	2	3	2	3	1	2
CO2	3	2	2	1	2	2	2	2	3
CO3	3	1	2	2	1	1	3	2	2
CO4	2	2	1	2	1	2	2	2	2
CO5	3	2	1	1	1	2	2	1	3

3 – High 2 – Medium 1- Low

Course Title: : Number Theory and Cryptography

Programme	M.Sc Mathematics
Exam Hours	03
Elective	III

Credits	03
CIA Marks	50
ESE Marks	50

Course objectives

- To demonstrate the application of some simple cryptosystem using matrices.
- To prepare a formula for primality test and application of elliptic curves in cryptography

Course outcomes: At the end of the course, students will be able to

CO1	Illustrate the time estimates for doing arithmetic and distinguish the concepts of Euclidean algorithm , congruences and its applications to factoring.
CO2	Judge the encryption and decryption of digraph vectors using matrices.
CO3	Develop the importance of Legendre symbol and Jacobi symbol to apply in quadratic residues and reciprocity.
CO4	Compare classical cryptosystem , public key cryptosystem and develop it to discrete logarithms in finite fields.
CO5	Examine primality, factoring and formulate it to elliptic curve cryptosystem.

CONTENTS OF MODULE
Unit I : Some Topics in Elementary Number Theory: Time estimates for doing arithmetic – Divisibility and the Euclidean algorithm – Congruences – Some applications to factoring. Chapter 1 Sections 1.1 to 1.4
Unit II: Cryptography : Some simple cryptosystems – Enciphering matrices. Chapter 3 Sections 3.1 to3.2
Unit III: Finite Fields and Quadratic Residues: Finite fields – Quadratic residues and reciprocity. Chapter 2 Sections 2.1 to2.2
Unit IV: Public Key: The idea of Public key cryptography – RSA – Discrete log. Chapter 4 Sections 4.1 to4.3
Unit V: Primality and Factoring: Pseudo primes - rho method. – Fermat Factorization and factor bases. The quadratic sieve method. Elliptic Curves: Basic facts – Elliptic curve cryptosystem. Chapter 5 Section 5.1 to5.5 (Omit Section 5.4) Chapter 6 Section 6.1 to6.2

Recommended Text :

Neal Koblitz,A Course in Number Theory and Cryptography (Edn 2),Springer Verlag,1994.

Reference Books:

1. *I.Niven and H.S. Zuckermahn*, An Introduction to Theory of Numbers (Edn.3), Wiley Eastern Ltd., New Delhi 1976.
2. *David M.Burton*, Elementary Number Theory, Brown Publishers, Dubuque, lowa, 1989.
3. *K.Ireland and. Rosesn*, A classical Introduction to Modern Number Theory, Springer verlag, 1972.
4. *N.Koblitz*, Algebraic aspect of cryptography, Springer 1998.

e-resources: **https://nptel.ac.in**

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	3	3	2	2	3	3	2	3
CO2	3	3	3	2	1	2	2	2	3
CO3	3	3	2	1	2	3	2	3	3
CO4	3	2	3	1	2	3	3	2	3
CO5	2	2	3	3	2	3	2	3	3

3 – High 2 – Medium 1 - Low

Course Title: Calculus of Variations and Integral Equations

Programme	**M Sc Mathematics**
Exam Hours	**03**
Extra Disciplinary	**I**

Credits	**03**
CIA Marks	**50**
ESE Marks	**50**

Course Objective:

The students will be able to

- Understand the foundations of calculus of variations and its Applications in mathematics and physics.
- Formulate variational problems and analyse them to deduce key properties of system behavior.

Course Outcomes: At the end of the Course, the Student will be able to

CO1	**Able to solve problems with fixed boundaries**
CO2	Explain the concepts of Variational Problems with Moving Boundaries
CO3	Able to solve variational Problems Involving a conditional Extremum
CO4	Demonstrate Integral Equations with Separable Kernels and Method of successive approximations.
CO5	Analyze the concepts of Classical Fredholm Theory , Symmetric Kernels and Singular Integral Equations

COs	CONTENTS OF MODULE
CO1	**Unit I:** The Method of Variations in Problems with Fixed Boundaries Chapter 6 : Sections 1 to 7 (Elsgolts)
CO2	**UNIT-II:** Variational Problems with Moving Boundaries and certain other problems and Sufficient conditions for an Extremum Chapter 7 : Sections 1 to 4 (Elsgolts) Chapter 8 : Sections 1to 3(Elsgolts)
CO3	**UNIT-III:** Variational Problems Involving a conditional Extremum Chapter 9 : Sections 1 to 3. (Elsgolts)

CO4	**UNIT-IV:** Integral Equations with Separable Kernels and Method of successive approximations. Chapter 1 : Sections 1.1 to 1.7 (Kanwal) Chapter 2 : Sections 2.1 to 2.5 (Kanwal) Chapter 3 : Sections 3.1 to 3.5 (Kanwal)
CO5	**UNIT-V:** Classical Fredholm Theory , Symmetric Kernels and Singular Integral Equations Chapter 4 : Sections 4.1 to 4.5 (Kanwal) Chapter 7 : Sections 7.1 to 7.6 (Kanwal) Chapter 8 : Sections 8.1 to 8.5 (Kanwal)

Recommended Text Book :

1. For Units I,II and III : L. Elsgolts , Differential Equations and the Calculus of variations, Mir Publishers, Moscow, 1973 (2nd Edition)
2. For Units IV and V :Ram P.Kanwal,Linear Integral Equations, Academic Press, New York, 1971.

Reference Books :

1. I.M.Gelfand and S.V.Fomin, Calculus of Variations, Prentice-Hall Inc. New Jersey, 1963.
2. 2. A.S.Gupta, Calculus of Variations with Applications, Prentice-Hall of India, New Delhi, 1997.
3. 3. M.Krasnov, A.Kiselev and G.Makarenko, Problems and Exercises in Integral Equations, Mir Publishers, Moscow, 1979.
4. 4. S.G.Mikhlin, Linear Integral Equations, Hindustan Publishing Corp. Delhi,1960.
5. 5. L.A.Pars, An Introduction to the Calculus of Variations, Heinemann, London, 1965.
6. 6. R.Weinstock, Calculus of Variations with Applications to Physics and Engineering, McGraw-Hill Book Company Inc. New York, 1952.

e-resources: https://nptel.ac.in

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	2	3	2	3
CO2	3	3	2	2	2	2	3	2	3
CO3	3	3	2	2	2	2	3	2	3
CO4	3	3	2	2	2	2	3	2	3
CO5	3	3	2	2	2	2	3	2	3

3 – High 2 – Medium 1 - Low

Course Title : Complex Analysis II

Programme	**M Sc Mathematics**
Exam Hours	**03**

Credits	**04**
CIA Marks	**50**
ESE Marks	**50**

Course objectives

- Explain the meaning of basic concepts, theorems and methods within the parts of complex analysis described by the course content
- Use concepts, theorems and methods to solve and present solutions to problems within the parts of complex analysis described by the course content in order to solve applied problems and to communicate with the help of mathematical language, even in other contexts.

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

CO1	Explore the properties of normal families of analytical functions.
CO2	Analyze the boundary behaviour and the behaviour at an angle of a polygon of a conformal mapping.
CO3	Investigate the properties of an elliptic function.
CO4	Examine the Weierstrass theory.
CO5	Able to extend the domain over which a complex function is defined.

COs	CONTENTS OF MODULE
CO1	**UNIT-I : Riemann Zeta Function and Normal Families :** Product development – Extension of $\zeta(s)$ to the whole plane – The zeros of zeta function – Equicontinuity – Normality and compactness – Arzela's theorem – Families of analytic functions **Chapter 5 : Sections 4.1 to 4.4, Sections 5.1 to 5.4**
CO2	**UNIT-II : Riemann mapping Theorem :** Statement and Proof – Boundary Behaviour – Use of the Reflection Principle. **Conformal mappings of polygons :** Behaviour at an angle, Schwarz-Christoffel formula. **Harmonic Functions :** Functions with mean value property – Harnack's principle. **Chapter 6 : Sections 1.1 to 1.3 (Omit Section 1.4)** **Sections 2.1 to 2.2 (Omit section 2.3, 2.4), Section 3.1 and 3.2**
CO3	**UNIT-III : Elliptic functions :** Simply periodic functions – Doubly periodic functions **Chapter 7 : Sections 1.1 to 1.3, Sections 2.1 to 2.4**
CO4	**UNIT-IV : Weierstrass Theory :** The Weierstrass $\wp$-function – The functions $\zeta(s)$ and $\sigma(s)$ – The differential equation – The modular equation $\lambda(\tau)$ – The Conformal mapping by $\lambda(\tau)$. **Chapter 7 : Sections 3.1 to 3.5**
CO5	**UNIT-V: Analytic Continuation:** The Weierstrass Theory – Germs and Sheaves – Sections and Riemann surfaces – Analytic continuation along Arcs – Homotopic curves – The Monodromy Theorem – Branch points. **Chapter 8 : Sections 1.1 to 1.7**

Recommended Text Book :

Lars V. Ahlfors, Complex Analysis, (3rd edition) McGraw Hill Co., New York, 1979

Reference Books :

1. H.A. Priestly, Introduction to Complex Analysis, Clarendon Press, Oxford, 2003.
2. J.B.Conway, Functions of one complex variable Springer International Edition, 2003
3. T.W Gamelin, Complex Analysis, Springer International Edition, 2004.
4. D.Sarason, Notes on complex function Theory, Hindustan Book Agency, 1998
5. Ponnuswamy, Foundations of Complex Analysis, Narosa
6. Karunakaran Complex Analysis, Alpha Science

e-Resources:

1. http://ebooks.lpude.in.complexanalysis.
2. https://nptel.ac.in.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	2	3	2	3
CO2	3	3	2	2	3	2	3	2	3
CO3	3	3	2	2	3	2	3	2	3
CO4	3	3	2	2	3	2	3	2	3
CO5	3	3	2	2	3	2	3	2	3

3 – High 2 – Medium 1 - Low

Course Title: Functional Analysis

Programme	M.Sc Mathematics
Exam Hours	03

Credits	04
CIA Marks	50
ESE Marks	50

Course objectives

1. To summarize Continuous linear transformations and Normed linear spaces.
2. To Classify and categorize the Banach spaces, Hilbert spaces and Banach Algebras.
3. To understand involutions in Banach Algebras.

Course outcomes: At the end of the course, students will be able to

CO1	Compare the concepts of Normed linear space, Banach space, continuous Linear transformations.
CO2	Compare the Hilbert space , conjugate space H^* and Normal and Unitary Operators with examples.
CO3	Describe finite dimensional spectral theory.
CO4	Validate orthogonal and orthonormal sets.
CO5	Analyze and establish the regular and singular elements

CONTENTS OF MODULE
UNIT-I: Banach Spaces: The definition and some examples – Continuous linear transformations – The Hahn-Banach theorem – The natural imbedding of N in N ** - The open mapping theorem – The conjugate of an Operator. Chapter 9:Sections 46-51
UNIT-II : Hilbert Spaces: The definition and some simple properties– Orthogonal complements–Orthonormal sets–The conjugate space H*- The adjoint of an operator– self-adjoint operators-Normal and unitary operators – Projections. Chapter10:Sections52-59
UNIT-III : Finite-Dimensional Spectral Theory: Matrices – Determinants and the spectrum of an operator –The spectral theorem. Chapter 11:Sections 60-62
UNIT-IV : Preliminaries on Banach Algebras : Definition and some examples – Regular and singular elements – Topological divisors of zero – spectrum – the formula for the spectral radius – the radical and semi-simplicity **Chapter 12 : Sections 64 to 69.**
UNIT-V: . Gelfand mapping – Spectral radius formula - Involutions in Banach Algebras – Gelfand-Neumark Theorem. **Chapter 13 : Sections 70 to 73**

Recommended Text :

1. George F.Simmons, Introduction to Topology and Modern Analysis, Tata- McGraw Hill. New Delhi, 2004.

Reference Books:

1. *W. Rudin,* Functional Analysis, Tata McGraw-Hill Publishing Company, New Delhi, 1973
2. *G. Bachman & L.Narici*, Functional Analysis, Academic Press, New York ,1966.
3. *H.C. Goffman and G.Fedrick*, First course in Functional Analysis, Prentice Hall of India, NewDelhi, 1987
4. *E. Kreyszig*, Introductory Functional Analysis with Applications, John Wiley& Sons, New York., 1978.

e-resources: **https://nptel.ac.in**

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PS03
CO1	3	2	3	1	2	2	3	3	3
CO2	3	3	2	2	1	1	2	2	3
CO3	2	2	3	2	1	1	3	2	2
CO4	2	3	2	3	3	2	2	2	3
CO5	3	2	3	2	1	1	2	3	2

3 – High 2 – Medium 1 - Low

Course Title: Differential Geometry

Programme	**M.Sc Mathematics**
Exam Hours	**03**

Credits	**04**
CIA Marks	**50**
ESE Marks	**50**

Course objectives

- Know and use geometric quantities such as length, curvature, and torsion associated to planar and spatial curves
- Understand the technical definition of a smooth surface and its significance
- Use the first and second fundamental form for a surface and give formal and informal definitions of it.
- To define, use, and articulate the differences between normal curvature, geodesic curvature, Gaussian curvature, and mean curvature
- To define a geodesic on a surface and prove the basic properties of geodesics

Course Outcomes: At the end of the Course, the Student will be able to

CO1	Diagnose the concepts of space curve,tangent, normal and binormal associated with tangent, normal, rectifying plane leading to formulae of Serret-Frenet and Examine the concepts of curves, surfaces,involutes and evolutes
CO2	Examine the concept of surfaces and their properties, surface of revolution and metric
CO3	Analyze isometric correspondence with intrinsic properties, and Recognize geodesic on a surface, canonical geodesic equation and its normal property
CO4	Describe geodesic curvature leading to Gauss-Bonnet theorem and analyze the curvatures
CO5	Analyse the developable surfaces, compare the minimal and the ruled surfaces.

Cos	**CONTENTS OF MODULE**
CO1	**Unit-I : Space curves:** Definition of a space curve – Arc length – tangent – normal and binormal – curvature and torsion – contact between curves and surfaces- tangent surface- involutes and evolutes **Chapter I : Sections 1 to 7**
CO2	**Unit-II :** Intrinsic equations – Fundamental Existence Theorem for space curves- Helices. **Intrinsic properties of a surface:** Definition of a surface – curves on a surface – Surface of revolution – Helicoids – Metric- Direction coefficients **Chapter I : Sections 8 and 9** **Chapter II: Sections 1 to 6**

CO3	**Unit-III :** Families of curves- Isometric correspondence- Intrinsic properties. **Geodesics:** Geodesics – Canonical geodesic equations – Normal property of geodesics- Existence Theorems – Geodesic parallels **Chapter II : Sections 7 to 14**
CO4	**Unit-IV :** Geodesics curvature- Gauss- Bonnet Theorem – Gaussian curvature- surface of constant curvature. Nonintrinsic properties of a surface**:** The second fundamental form- Principal curvature – Lines of curvature **Chapter II: Sections 15 to 18** **Chapter III : Sections 1 to 3**
CO5	**Unit V**: Developable - Developable associated with space curves and with curves on surfaces - Minimal surfaces – Ruled surfaces. **Chapter III: Sections 4 to 8**

TEXT BOOK:

T.J.Willmore, An Introduction to Differential Geometry, Oxford University Press, (17th Impression) New Delhi 2002. (Indian Print)

REFERENCE BOOKS :

1. Struik, D.T. *Lectures on Classical Differential Geometry*, Addison – Wesley, Mass.1950.
2. Kobayashi. S. and Nomizu. K. *Foundations of Differential Geometry*, Interscience Publishers, 1963.
3. Wilhelm Klingenberg: *A course in Differential Geometry*, Graduate Texts inMathematics, Springer-Verlag 1978.
4. J.A. Thorpe *Elementary topics in Differential Geometry*,Under- graduate Texts in Mathematics, Springer - Verlag 1979.

e-resources: **https://nptel.ac.in**

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	3	1	2	3	3	2	2
CO2	3	2	2	1	1	2	3	2	3
CO3	2	3	3	1	2	2	3	2	2
CO4	3	2	2	1	1	2	3	2	3
CO5	3	2	2	1	2	2	3	2	2

3 – High 2 – Medium 1 - Low

Course Title : Fluid Dynamics

Programme	M.Sc Mathematics
Exam Hours	03
Elective	IV

Credits	03
CIA Marks	50
ESE Marks	50

Course objectives:

- To demonstrate the concept of equation of continuity and classify it for incompressible fluids
- To prepare a formula for coefficient of viscosity of a viscous fluid.

Course outcomes: At the end of the course, students will be able to

CO1	Demonstrate the concept of equation of continuity and classify it for incompressible fluids.
CO2	Distinguish the pressure in fluids and judge the case of steady motion under conservative body forces.
CO3	Compare sources, sinks , doublets and develop the importance of Stoke's stream function.
CO4	Differentiate equipotentials and streamlines of two dimensional flow and demonstrate the applications of Milne Thomson circle theorem.
CO5	Formulate the coefficient of viscosity of a viscous fluid.

CONTENTS OF MODULE
Unit I: Kinematics of fluids in motion:- Real fluids and Ideal fluids – velocity of a fluid at a point – Streamlines and Path lines - Steady and Unsteady flows - Velocity Potential – Vorticity vector - Local and Particle rates of change - Equation of Continuity – Examples: Acceleration of a fluid – Conditions at a Rigid Boundary.
Unit II Equations of motion of a fluid: Pressure at a point in a fluid at rest – pressure at a point in a moving fluid – Conditions at a Boundary of two invisid immiscible fluids – Enler's equation of motion – Bernoulli's equation. Example: Discussion of the case of study motion under Conservative body focus.
Unit III Some three – Dimensional flows: Introduction – Sources, Sinks and doublets – Images in a Rigid Infinite plane – Axi – symmetric flows – Stoke's stream function.
Unit IV Some Two – Dimensional flows: Meaning of two – dimensional flow – Use of Cylindrical Polar Coordinates – Stream function – Complex Potential for Two – Dimensional, Irrotational, Incompressible flow – complex velocity potentials for standard two – Dimensional flows – Uniform stream, Line Sources and Line Sinks, Line Doublets, Line vortices – Examples – Two – Dimensional Image Systems – Milne Thomson Circle theorem – Applications of Circle therein, Extension of Circle therein.
Unit V Viscous flow: Stress Components in a real fluid – Relation between Cartesian components of stress – Translational motion of fluid clement – The Rate of strain Quadric and principal stresses – Some further properties of Rate of strain Quadric - stress Analysis in fluid motion – Relations

Chapter 2	**Sections 2.1 to 2.10**
Chapter 3	**Sections 3.1 to 3.7**
Chapter 4	**Sections 4.1 to 4.5 (omit Section 4.4)**
Chapter 5	**Section 5.1 to 5.8**
Chapter 8	**Section 8.1 to 8.9**

between Stress and Rate of strain – Coefficient of viscosity and Laminar flow – Navier – Stokes equation of motion of viscous fluid.

Recommended Text :

F..Chorlton, Textbook of Fluid Dynamics, CBS Publishers, New Delhi, 1985.

Reference Books:

1. R.W. Fox and A.T. McDonald, Introduction to Fluid Mechanics, Wiley 1985.
2. E. Krause, Fluid Mechanics with Problems and solutions, Springer 2005.
3.T.Petrila, Basics of Fluid Mechanics and Introduction to Computational Fluid Dynamics, Springer, Berlin, 2004.

e-resources: **https://nptel.ac.in**

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	**2**	**3**	**3**	**1**	**1**	**2**	**3**	**2**	**3**
CO2	**3**	**3**	**3**	**1**	**2**	**2**	**3**	**2**	**3**
CO3	**3**	**2**	**3**	**1**	**2**	**3**	**3**	**3**	**2**
CO4	**3**	**3**	**3**	**2**	**1**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**2**	**2**	**2**	**3**	**3**	**3**

3 – High **2 – Medium** **1 - Low**

Course Title: Formal Languages and Automata Theory

Programme e	M.Sc Mathematics
Exam Hours	03
Elective	V

Credits	03
CIA Marks	50
ESE Marks	50

Course objectives

- Understand basic Finite automata and regular sets
- Understand the fundamental concepts of Grammars.
- Understand the concepts of Languages

Course outcomes: At the end of the course, students will be able to

CO1	Able to Solve problems on finite automata and non-deterministic automata.
CO2	Able to regular sets using their properties
CO3	Able to understand the concepts of context free grammars and its normal form
CO4	Able to solve problems on context free languages.
CO5	Demonstrate the concepts of pumping lemma, closure properties for CFL.

CONTENTS OF MODULE
UNIT-I: *Finite automata, regular expressions and regular grammars Finite state systems – Basic definitions – Non deterministic finite automata – Finite automata with moves – Regular expressions – Regular grammars.* *Chapter 2 : 2.1- 2.4 ,* *Chapter 3: 3.1-3.3*
UNIT-II: Properties of regular sets. *The Pumping lemma for regular sets – Closure proper ties of regular sets – Decision algorithms for regular sets – The Myhill- N erode Theorem and minimization of finite automata.* *Chapter 4: 4.1- 4.3*
UNIT-III: Context-free grammars *Motivation and introduction – Context-free grammars – Derivation trees- Simplification of context-free grammars – Chomsky normal form – Greibach normal form.* *Chapter 5 : 5.1, 5.2* *Chapter 6: 6.1, 6.2*
UNIT-IV: Pushdown automata *Informal description- Definitions-Pushdown automata and context- free languages – Normal forms for deterministic pushdown automata.* *Chapter 7 : 7.1-7.3*

UNIT-V: Properties of context-free languages
The pumping lemma for CFL's – Closure properties for CFL's – Decision algorithms for CFL's.
Chapter 8 : 8.1, 8.2

Recommended Text:

Peter Linz, AnIntroduction to formal Languages amd Automata, Jones and Bartlett Learning 2019

Reference Books:

1. A. Salomaa, Formal Languages, Academic Press, New York, 1973.
2. John C. Martin, Introduction to Languages and theory of Computations (2nd Edition) Tata-McGraw Hill Company Ltd., New Delhi, 1997
3. *John E.Hopcraft and Jeffrey D.Ullman, Introduction to Automata Theory, Languages and Computation, Narosa Publishing House, New Delhi,1987*

e-resources: **https://nptel.ac.in**

Mapping of Course Outcomes to Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	1	1	1	2	3	3	3
CO2	3	2	1	1	1	2	2	2	3
CO3	3	3	1	2	1	1	3	2	3
CO4	3	2	2	1	1	2	2	3	3
CO5	3	3	1	1	1	2	3	2	3

3 – High 2 – Medium 1 - Low

Course Title: Financial Mathematics using R

Programme	M. Sc Mathematics
Exam Hours	03
Extra Disciplinary	II

Credits	03
CIA Marks	50
ESE Marks	50

Course objectives

- To understand the fundamental concepts of Probability distribution and Testing of Hypothesis.
- To enable the students to model the real-world problems through Multi Factor model and Discrete Time Model.
- To understand the concepts of Continuous Time Model.

Course outcomes: At the end of the course, students will be able to

CO1	Demonstrate understanding of basic concepts in probability distributions and test the significance
CO2	Demonstrate understanding of concepts relating to Time series analysis
CO3	Develop the concepts of modern portfolio theory
CO4	Employ methods related to these concepts in Discrete time model
CO5	Apply logical thinking to problem solving in Continuous time model

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CONTENTS OF MODULE
UNIT-I: Statistical Analysis with R: Basic statistics, Probability distribution and random numbers, Regression Analysis Section 1 : 2.1, 2.2 and 2.4
UNIT-II: Time Series Analysis with R: Time series data, Data normalization, Residual Analysis, Forecasting Section: 3.1, 3.2 and 3.3
UNIT-III: Modern Portfolio Theory and CAPM: Mean-variance portfolio, Market portfolio, Derivation of CAPM Section 2 : 4.1, 4.2 and 4.3
UNIT-IV: Discrete Time Model - Tree Model: Single period binomial model, Derivative pricing, Pricing by risk neutral measure, Multi period binomial model, Generalization to the multi period model, Pricing call options, Trinomial model Section 2 : 6.1, 6.2 and 6.3
UNIT-V: Continuous Time Model and the Black-Scholes Formula: Continuous rate of return, Ito's lemma, The Black-Scholes formula, Implied volatility Section 3: 7.1, 7.2, 7.3 and 7.4

Recommended Text:
Shuichi Ohsaki, Jori Ruppert-Felsot, Daisuke Yoshikawa, "R Programming and Its Applications in Financial Mathematics", CRC Press, 2018.

Reference Book:

1. Martin Boxter and Andrew Rennie, *Financial Calculus: An Introduction to Derivatives Pricing*, Cambridge University Press, Cambridge, 1996.
2. Damien Lamberton and Bernard Lapeyre, (Translated by Nicolas Rabeau and Farancois Mantion), *Introduction to Stochastic Calculus Applied to Finance*, Chapman and Hall, 1996
3. Marek Musiela and Marek Rutkowski, *Martingale Methods in Financial Modeling*,Springer Verlag, New York, 1988.
4. Robert J.Elliott and P.Ekkehard Kopp, *Mathematics of Financial Markets,* Springer Verlag, New York, 2001 (3rd Printing).

e-resources: **https://nptel.ac.in**

Mapping of Course Outcomes to Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	2	1	**2**	**3**	2	2	3	2
CO2	3	2	2	**1**	**2**	1	1	2	3
CO3	3	3	1	**2**	**2**	1	2	3	2
CO4	2	2	1	**1**	**1**	2	1	2	3
CO5	2	2	2	**2**	**1**	1	2	2	2

3 – High **2 – Medium** **1 - Low**

Title of the Course	Research Methodology - PG
Course Outline	**UNIT-I :** Research Methodology: A review of the Fundamentals 1. Meaning of Research 2. Definitions of Research 3. Objectives of Research 4. Motivation in Research 5. General Characteristics of Research 6. Criteria of Good Research 7. Types of Research
	UNIT-II : The Research Problem and Review of Literature 1. Scientific Thinking 2. Selecting the Problem 3. Defining a Problem 4. Statement of a Problem 5. Delimiting a Problem 6. Evaluation of a Problem. 7. Meaning of Review of Literature 8. Objectives of Review of Literature 9. How to Conduct the Review of Literature
	UNIT-III : The Research Hypotheses 1. Meaning of Hypothesis 2. Definitions of Hypothesis 3. Nature of Hypothesis 4. Functions of Hypothesis 5. Importance of Hypothesis 6. Kinds of Hypothesis 7. Characteristics of a Good Hypothesis 8. Variables in a Hypothesis 9. Formulating a Hypothesis 10. Testing the Hypothesis
	UNIT-IV : The Research Approach and Strategies 1. The Philosophical Background 2. The Qualitative Approach 3. The Quantitative Approach 4. The Mixed-Methods Approach 5. Criteria for Selecting a Research Approach 6. What are the Research Strategies? 7. Case Studies 8. Experiments 9. Ethnography 10. Phenomenology
	UNIT-V Data Collection and Sampling 1. Questionnaires 2. Interviews 3. Focus Groups 4. Observation 5. Meaning and Definition of Sampling 6. Functions of Population and Sampling 7. Methods of Sampling 8. Characteristics of a Good Sample 9. Size of a Sample 10. The Sample Cycle
Reference Books	1.Cohen, L. Lawrence, M., & Morrison, K. (2005). Research Methods in Education (5th edition). Oxford: Oxford University Press. 2. Denscombes, M. (2010). The Good Research Guide: For small-scale social research projects. Maiden-Read: Open University Press. 3. Dornyei, Z. (2007). Research Methods in Applied Linguistics. Oxford: Oxford University Press. 4. Hoadjli, A.C. (2015). The Washback Effect of an Alternative Testing Model on Teaching and Learning: An exploratory study on EFL secondary

	classes in Biskra. Unpublished Doctoral Thesis, University of Mohamed Kheider, Biskra. 5. Kothari, C. R. (1980). Research Methodology: Research and techniques, New Delhi: New Age International Publishers. 6. Kumar, R. (2011). Research Methodology: a step-by-step guide for beginners (3rd edition). London, UK: TJ International Ltd, Padstow, Corwall. 7. Leedy, P. D. (1980). Practical Research: Planning and design. Washington: Mc Millan Publishing Co., Inc. 8. Singh, Y. K. (2006). Fundamental of Research Methodology and Statistics. New Delhi. New International (P) Limited, Publishers.

Value Added Courses

CYBER SECURITY

UNIT – I: **Cyber Security introduction and Concepts**

Overview of Cyber Security- CIA, Risk Management (Vulnerabilities, Likelihood) s, What differentiate Cyber Security, Introduction to NIST framework , Breaches, Attacks vectorsand Threats agents, Social Engineering, Cyber criminals and Exploits. Different Types of attacks, malware, APTs ransomware, mobile attacks etc., Policy Framework, Identity andaccess Restrictions.

UNIT – II - Security architecture and Cryptography

Module - 1 Introduction to Security Architecture

Environment - Virtual, Cloud, Network, Systems, applications, Data, Assets, Processes, Overview of TOGAF framework

Module – II: Cryptography and Cryptanalysis

Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography.

UNIT - III – Infrastructure Security

Network security, Overview of Firewalls- Types of Firewalls, IDS/ IPS User Management, VPN Security, Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec. Cloud Security, systems and Data security. Vulnerability Management and Penetration Testing Information Gathering (Social Engineering, Foot Printing & Scanning). Monitoring, Detection and logging network traffic - Open Source/ Free/ Trial Tools: nmap, zenmap, Port Scanners, Network scanners

UNIT-IV -Cyber Laws and Forensics

Introduction, Cyber Security Regulations, Roles of International Law, the state and PrivateSector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013.

UNIT-V

Incident response- Events and incidents, incident category, Introduction to Cyber Forensics, Need of Cyber Forensics, Cyber Evidence, Documentation and Management ofCrime Sense, Image Capturing and its importance, Partial Volume Image, Web Attack Investigations, Denial of Service Investigations, Internet Crime Investigations, Internet Forensics, Steps for Investigating Internet Crime, Email Crime Investigations.

Introduction to Business Continuity planning and Disaster Recovery

BOOKS FOR REFERENCE:

1. William Stallings, "Cryptography and Network Security", Pearson Education/PHI, 2006.
2. V.K. Jain, "Cryptography and Network Security", Khanna Publishing House.
3. www.mitre.org – for common attack pattern Enumeration and classification
4. National Institute of Standards and Technology (NIST), Special Publication 800-30,Revision 1, Guide for Conducting Risk Assessments, USA, September 2012
5. NIST Cybersecurity Framework Version 1.1
6. "Will Gradigo" and "John PIRC" by Syngress, Cyber Crime and Espionage_ An Analysis of Subversice Multi-vector Threats
7. "Eric C. Thompson" by Apress, Cyber Security Incident Response

IMAGE PROCESSOR WITH OPEN CV

No. of Hours: 45Credit:

UNIT – I

Digital Image Fundamentals Light, brightness adaption and discrimination, Human visualsystem, Image as a 2D data, Image representation Gray scale and Colour images, Image sampling and quantization

UNIT-II

Image enhancement and filtering in spatial domain: Intensity transformation functions: Contraststretching, Thresholding, Image negative, Log transformation, Power-low transformation, Intensity level slicing and Bit-plane slicing. Image histogram, Histogram equalisation process. Fundamentals of spatial filtering, Correlation and convolution, Spatial filtering mask for low pass filtering (smoothing) and high pass filtering (sharpening).

UNIT-III

Image restoration: Reasons for image degradation, Model of image degradation/restoration process, Noise probability density functions, Image restoration using spatial filtering (Mean filters, Order statistic filters and adaptive filters), Inverse Filtering, MMSE (Wiener) Filtering**UNIT – IV**

Colour Image Processing: Color Fundamentals, Color Models, Pseudo-colour image processing.

UNIT – V

Image Compression: Fundamentals of redundancies, Basic Compression Methods: Huffman coding, Arithmetic coding, LZW coding, JPEG Compression standard, Wavelet based imagecompression.

Reference Books:

1. Digital Image Processing, Rafael C. Gonzalez and Richard E. Woods, Third Edition, PearsonEducation
2. Digital Image Processing, S Jayaraman, S Esakkirajan, T Veerakumar, Tata McGraw HillPublication
3. Digital Image Processing, S Sridhar, Oxford University Press.

SOFT SKILLS-1

COMMUNICATION SKILLS

Unit-1: Concept of Communications

Introduction: Definition and Process of Communication - Forms of Verbal and Non-verbal Communication. Barriers of Communication: Communication Barriers and Overcoming Communication Barriers - Guidelines for Effective Communication. Business Writing: Direct and Indirect approaches to Business Writing - Five Main Stages of Writing Business Messages. **Exercise: Role Play, Square Talk Activity**.

Unit-II: Written Business Communication

External Communication: The Seven C's of Letter writing - Kinds of Business Letters - Business Reports and Proposals - Purpose of Business Reports. Internal Communication: Format and Principles of Writing Memos - General Warning - Cautions. **Exercise: Preparation of Reports on different issues.**

Unit-III: Oral Communication

Public Speaking: Types of Public Speaking - importance of Public Speaking. Power Point Presentation: Planning the Presentation - Delivering the Presentation - Developing & Displaying Visual Aids - Handling Questions from the Audience. Listening: Definition - Types of Listening Skills - Features of a Good Listener - Causes and effects of Poor Listening. **Exercise: Elocution and Extempore**

Unit-IV: Behavioral Techniques

Body Language: Facial Expressions - Body Posture - Gestures - Eye Movement - Touch and the use of Personal Space. Business Attire and Grooming: Different types of Attire - Guidelines for Business Attire. **Exercise: Power of Body Language, Charades.**

Unit-V: Etiquettes

Etiquettes: Greeting Etiquette - Corporate Etiquette - Telephone Etiquette - E-mail Etiquette - Meeting Etiquette - Netiquette - Personal Etiquette - Social Etiquette - Dining Etiquette. **Exercise: Introduction and Art of Conversation, Telephonic Activity.**

REFERENCES:

- Meenakshi Raman and Prakash Singh, Business Communication, Oxford
- Lesikar: Basic Business Communication, TMH
- David Irwin: Effective Business Communications, Viva- Thorogood.
- Rajendra Pal, J S Korlaha HI: Essentials of Business Communication: Sultan Chand & Sons, New Delh

SOFT SKILLS-2

QUANTITATIVE APTITUDE

Unit – I: Number System I & II – HCF, LCM, Decimal Fractions - Simplifications, Square roots and Cube Roots, Surds and Indices, Logarithms

Unit – II: Ratio, Proportion and Variation, Averages, Problems on Ages, Mixtures and Allegations, Percentages, Simple Interest and Compound Interest

Unit – III: Profit and Loss, Partnership – Chain Rule, Linear Equations, Areas and Volumes – Basics, Quadratic Equations, Time, Speed and Distance – basics, Time and work

Unit – IV: Time, Speed and Distance – intermediate & advanced, Pipes & Cistern, Problems on Trains, Boats & Streams, Height and Distance

Unit – V: Probability, Permutation & Combination – basics, intermediate & advanced, Calendar and Clocks.

Reference Books

1. R.S. Aggarwal, “Quantitative Aptitude for Competitive Examinations”, S Chand Publisher, 20th edition (2013), ISBN-13: 978-8121924986

2. Arun Sharma, “How to Prepare for Quantitative Aptitude for the CAT”, Mcgraw Hill Education, 6 th Edition, ISBN-13: 9789339205126

3. Abhijit Guha, “Quantitative Aptitude for Competitive Examinations”, Mcgraw Hill Education, 5th Edition, ISBN-13: 9789351343554 4. R.V Praveen, “Quantitative Aptitude and Reasoning”, PHI, 2nd Edition (2013), ISBN- 978-81-203- 4777-9

Websites

1. http://www.indiabix.com
2. http://www.geeksforgeeks.com
3. http://www.examveda.com
4. http://www.javatpoint.com
5. http://www.aptitudeschool.com

SOFT SKILLS-3

ANALYTICAL REASONING

Unit – I: Series – AP, GP, HP, Mixed progression, Set Theory, Conditional Probability, Areas and Volumes – intermediate & advanced, Geometry, Trigonometry, Stocks and Shares, Race and Games.

Unit – II: Data interpretation – Data tables, pie charts, bar charts, line graphs, mixed diagrams, Analogy, Classification, Series completion - Number Series, Letter Series, Coding & Decoding.

Unit – III: Blood relations, Symbol based statement conclusion, Cubes and Dices, Directions Sense Test, Visual reasoning – figure formation, pattern perceptions, mirror images, water images, paper cutting

Unit – IV: Analytical Reasoning, Syllogism, Puzzle test, Critical reasoning, Seating arrangements and cases, Alphabetical quibble, Number, Ranking and Sequence test

Unit – V: Deductive logic, Rule detection, Cause and effect, Statement and course of action, Statement and assumptions, Statement and arguments, Statement and conclusions.

Reference Books

1. R.S. Aggarwal, “Quantitative Aptitude for Competitive Examinations”, S Chand Publisher, 20th edition (2013), ISBN-13: 978-8121924986

2. Arun Sharma, “How to Prepare for Quantitative Aptitude for the CAT”, Mcgraw Hill Education, 6 th Edition, ISBN-13: 9789339205126

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Websites

1. http://www.indiabix.com

2. http://www.geeksforgeeks.com

3. http://www.examveda.com

4. http://www.javatpoint.com

5. http://www.aptitudeschool.com

SOFT SKILLS-4

PERSONALITY DEVELOPMENT

UNIT I Introduction to Personality Development The concept of personality - Dimensions of personality – Theories of Freud & Erickson-Significance of personality development. The concept of success and failure: What is success? - Hurdles in achieving success - Overcoming hurdles - Factors responsible for success – What is failure - Causes of failure. SWOT analysis.

UNIT II Attitude & Motivation Attitude - Concept - Significance - Factors affecting attitudes - Positive attitude – Advantages – Negative attitude- Disadvantages - Ways to develop positive attitude - Differences between personalities having positive and negative attitude. Concept of motivation - Significance – Internal and external motives - Importance of self- motivation- Factors leading to de-motivation

UNIT III Self-esteem Term self-esteem - Symptoms - Advantages - Do's and Don'ts to develop positive self-esteem – Low self esteem - Symptoms - Personality having low self esteem - Positive and negative self esteem. Interpersonal Relationships – Defining the difference between aggressive, submissive and assertive behaviours - Lateral thinking.

UNIT IV Other Aspects of Personality Development Body language - Problem-solving - Conflict and Stress Management - Decision-making skills - Leadership and qualities of a successful leader – Character building -Team-work – Time management - Work ethics –Good manners and etiquette.

UNIT V Employability Quotient Resume building- The art of participating in Group Discussion – Facing the Personal (HR & Technical) Interview -Frequently Asked Questions - Psychometric Analysis - Mock Interview Sessions.

Text Books:

1. Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill.

2. Stephen P. Robbins and Timothy A. Judge(2014), Organizational Behavior 16th Edition: Prentice Hall. Reference Books:

1. Andrews, Sudhir. How to Succeed at Interviews. 21st (rep.) New Delhi.Tata McGraw-Hill 1988.

2. Heller, Robert.Effective leadership. Essential Manager series. Dk Publishing, 2002

3. Hindle, Tim. Reducing Stress. Essential Manager series. Dk Publishing, 2003

4. Lucas, Stephen. Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill. 2001

5. Mile, D.J Power of positive thinking. Delhi. Rohan Book Company, (2004).

6. Pravesh Kumar. All about Self- Motivation. New Delhi. Goodwill Publishing House. 2005.

7. Smith, B . Body Language. Delhi: Rohan Book Company. 2000

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<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">ADVANCED STATISTICS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">I</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">5</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">Unit – 1
Probability and Theoretical Distributions
Probability –Definition - addition theorem -Multiplication theorem-conditional probability -Baye's theorem– simple problems
Theoretical Distributions- Binomial ,Poisson and Normal distributions-simple problems.</td></tr>
<tr><td colspan="6">Unit – 2
Statistical Inference-Testing of Hypothesis for large samples Testing of hypothesis- procedure-two types of error- one and two tailed tests - standard error - large sample — test for specified proportion –tes for difference between proportions-test for specified mean –test fo difference of mean of two samples.</td></tr>
<tr><td colspan="6">Unit – 3
Testing of Hypothesis for Small samples
Small samples: t-test: specified mean, equality of two means- paired t-test, F-test -equality of variances- Chi square test - independence of attributes and goodness of fit.</td></tr>
<tr><td colspan="6">Unit – 4
Analysis of Variance and Decision Theory
Analysis of variance-one way and two-way classification- Pay off table-Maximin principle - Minimax principle - Baye’s Principle-Decision tree Analysis</td></tr>
<tr><td colspan="6">Unit – 5
Correlation and Regression
Correlation-types of Correlation-Karl Pearson’s Coefficient of correlation - Rank correlation Coefficient-Regression - Regression equations- partial and multiple correlation (upto three variables)-partial and multiple regressions (upto three variables).</td></tr>
<tr><td colspan="2">Reference Books</td><td colspan="6">1. S.P. Gupta, Statistical Methods, Sultan Chand, 2005.
2. P.R. Vittal, Quantitative Techniques, Margham Publications.</td></tr>
<tr><td colspan="2">e-Resources:</td><td colspan="6">http://nptel.ac.in</td></tr>
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<tr><td colspan="2">Title of the Course</td><td colspan="6">RESOURCE MANAGEMENT TECHNIQUE</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">II</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">5</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">Unit – 1
Transportation model- Balanced and Unbalanced Transportation problems-Initial basic feasible solution - North west corner rule , the row minima ,column minima, least cost method and Vogel’s approximation methods — Optimum solution — Modi method.
Chapter 7 -7.1 to 7.5</td></tr>
<tr><td colspan="6">Unit – 2
Assignment Problem- Balanced and Unbalanced — Minimization and Maximization - restricted assignment problem - travelling salesman problem . Sequencing problem: - Processing of n jobs through 2 machines- Processing of n jobs through 3 machines- Processing each of n jobs through m machines - Processing 2 jobs through m machines.
Chapter 8 : 8.1 to 8.8
Chapter 14: 14.1 to 14.7</td></tr>
<tr><td colspan="6">Unit – 3
Game Theory- Pure & Mixed Strategies - Dominance-Graphical method.
Chapter 16: 16.1 to 16.7</td></tr>
<tr><td colspan="6">Unit – 4
Replacement Model1-Model-Replacement of an item whose maintenance cost increases with time and money value is not changed.
Model 2-Replacement of an item whose maintenance cost increases with time and money value is changes with time.
Model 3 - Replacement of items due to sudden Failure - Model 4-Staff replacement.(without proof)
Chapter 11: 11.1 to 11.4</td></tr>
<tr><td colspan="6">Unit – 5
PERT and CPM – Project Network diagram – Critical Path (Crashing Excluded)– PERT computations.
Chapter 15 : 15.1 to 15.6</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="6">Sundaresan, Ganapathy Subramanian, Resource Management Technique –A.R.Publications</td></tr>
<tr><td colspan="2">Reference Books</td><td colspan="6">P.R.Vittal & V. Malini, Operations Research, Margham Publications.2007</td></tr>
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