ANDHRA KESARI UNIVERSITY

UNIVERSITY COLLEGE OF SCIENCE, ARTS, COMMERCE & LAW ONGOLE, PRAKASAM-523001, ANDHRA PRADESH

M.Sc. Mathematics

Revised syllabus: 2023-24

(Revised Scheme of Instruction and Examination, Syllabus etc.,with effect from the Academic Year 2023-24)

DEPARTMENT OF STATISTICS
ANDHRA KESARI UNIVERSITY :: ONGOLE

ANNEXURE - I

(Agenda item No.1, P.G.B.O.S. meeting dated 05-08-2023)

M.Sc. Statistics

SYLLABUS:: SEMESTER-I

W.E.F. 2023-2024 ADMITTED BATCH OF STUDENTS

(Ten Questions are to be set TWO on each of Units I-V with the choice of ONE question from each unit)

ANDHRA KESARI UNIVERSITY

Department of Mathematics

M.Sc., MATHEMATICS

Course Structure

Under Choice Based Credit System (CBCS), National Education Policy (NEP) - 2020
With effect from the Academic Year 2023-24

Credits at a glance

Credits in Each Semester					Total
Course Category	Semester – I	Semester – II	Semester-III	Semester -IV	
Core Courses	16	16	12	12	**56**
Electives	--	2	10	8	**20**
Foundation	4	4	--	--	**8**
Skill Development	4	4	4	-	**12**
Project Work	--	--	--	4	**4**
Total	**24**	**26**	**26**	**24**	**100**

SEMESTER - I

S.NO.	CODE	Course Name	Hours per Week	Credits	IA	EA	Total Marks	Components
1.	MAT101	Algebra	6	4	30	70	100	Core
2.	MAT102	Real Analysis	6	4	30	70	100	Core
3.	MAT103	Ordinary Differential Equations	6	4	30	70	100	Foundation
4.	MAT104	Discrete Mathematics	6	4	30	70	100	Core
5.	MAT105	Numerical Analysis	6	4	30	70	100	Core
6.	MAT1P	Numerical Methods by Python	6	4	30	70	100	Skill Development
Total				**24**	**180**	**420**	**600**	

SEMESTER – II

S.NO.	CODE	Course Name	Hours per Week	Credits	IA	EA	Total Marks	Components
1.	MAT201	Galois Theory	6	4	30	70	100	Core
2.	MAT202	Measure and Integration	6	4	30	70	100	Core
3.	MAT203	Partial Differential Equations	6	4	30	70	100	Core
4.	MAT204	Topology	6	4	30	70	100	Foundation
5.	MAT205	Complex Analysis	6	4	30	70	100	Core
6.	MAT2P	Differential Equations using MATLAB	6	4	30	70	100	Skill Development
7.	MAT2M	MOOCS		2				Open Elective
Total				**26**	**180**	**420**	**600**	

SEMESTER – III

S.NO.	CODE	Course Name	Hours per Week	Credits	IA	EA	Total Marks	Components
1.	MAT301	Functional Analysis	6	4	30	70	100	Core
2.	MAT302	Number Theory and Cryptography	6	4	30	70	100	Core
3.	MAT303	Classical Mechanics	6	4	30	70	100	Core
4.	MAT304	**ELECTIVE -I** A) Graph Theory B) Calculus of Variations	6	4	30	70	100	Elective
5.	MAT305	**ELECTIVE-II** A) Linear Algebra B) Algebraic Coding Theory	6	4	30	70	100	Elective
6.	MAT3P	Cryptography Algorithms by Mathematica	6	4	30	70	100	Skill Development
7.	MAT3M	MOOCS		2				Open Elective
Total				**26**	**180**	**420**	**600**	

ESTER – IV

S.NO.	CODE	Course Name	Hours per Week	Credits	IA	EA	Total Marks	Component
1.	MAT401	Operations Research	6	4	30	70	100	Core
2.	MAT402	Fluid Dynamics	6	4	30	70	100	Core
3.	MAT403	Mathematical Statistics	6	4	30	70	100	Core
4.	MAT404	**ELECTIVE-III** A) Banach Algebra B) Operator Theory	6	4	30	70	100	Elective
5.	MAT405	**ELECTIVE-IV** A) Fuzzy Theory and Logic B) Integral Equations	6	4	30	70	100	Elective
6.	MAT4PW	Project Work	6	4	30	70	100	Project Work
Total				**24**	**180**	**420**	**600**	

FIRST SEMESTER

MAT 101 ALGEBRA

UNIT –I:

Cyclic groups - Conjugacy and G-Sets, Permutation groups-Cyclic decomposition-Alternating Group An -Simplicity of An . (Section 4 of Chapter 4, Sections 4 of Chapter 5, Sections 1, 2 and 3 of chapters 7).

UNIT –II:

Structure Theory of Groups: Direct Products –Finitely generated abelian groups -Invariants of a finite abelian group –Sylow theorems –group of orders p2, pq.
(Section 1,2,3,4 and 5 of Chapter 8).

UNIT – III:

Ideals and Homomorphism's: Ideals – Homomorphism's –Sum and direct sum of ideals – Maximal and prime ideals – Nilpotent and nil ideals –Zorn's Lemma
(Chapter 10)

UNIT – IV:

Unique Factorization domains and Euclidean Domains: Unique factorization domains-Principal ideal domains-Euclidean domains, Polynomial rings over UFD.
(Chapter 11)

Scope and standard in the book **"Basic Abstract Algebra" by P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Cambridge University Press, Reprint 1997.**

References:

(1) Topics in Algebra, by I.N. Herstein
(2) Commutative algebra, by Zariski and Samuel Affiliated East-West Press.
(3) Abstract Algebra – Ronald. Solomon.

MAT 102: Real Analysis

UNIT –I:

The Riemann –Stieltijes Integral : Definition and Existence of the integral properties of theintegral, integration and Differentiation, Integration of vector valued function, Rectifiable curves.

UNIT – II:

Sequence and series of functions : Discussions of main problem, uniform convergence, uniform convergence and continuity, Uniform convergence and Integration, Uniform convergence and Differentiation, Equicontinuous families of functions, The stone –Weistrass theorem .

Scope and standard as in Chapters 6, sections 7.1 to 7.26 of chapter 7 of Walter Rudin"Principles of Mathematical Analysis" 3rd edition 1976, Nc. Graw hill International student edition.

UNIT – III:

Improper Integrals: Introduction, Integration of unbounded functions with finite limit of Integration, comparison tests for convergence at a □, infinite Range of Integration.

UNIT-IV:

Functions of Several Variables : Explicit and Implicit functions, Continuity, Partial derivations, differentiability, partial derivatives of higher order, differentials of higher order, function of functions, change of variables, Taylor's theorem, Extreme values, Maxima and Minima, functions of several variables.

Scope and standard as in chapters 11 and 15 of **Mathematical Anlaysis by " S.C. Malik 1994" Wiley Eastern limited**

Reference:

(1) Mathematical Analysis- A modern Approach to Advanced Calculus Narosa Book Distributors Pvt LTD- New Delhi

(2) Real Analysis - Golden Math Series By N.P. Bali.

MAT 103: ORDINARY DIFFERENTIAL EQUATIONS

UNIT –I:

Oscillation Theory and boundary value problems: Qualitative properties of solutions –The Sturm comparison theorem-Eigen values, Eigen functions and the vibrating string.

UNIT – II:

Power series solutions: Series solutions of first order equations –Second order linear equations-Ordinary points-Regular singular points- Gauss's hyper geometric equation.

UNIT – III:

Some special functions of Mathematical Physics :Legender polynomials – properties of Legendre polynomials –Bessel functions –The gamma function- Properties of Bessel functions.

UNIT-IV:

The existence and uniqueness of solutions : The method of successive approximations-Picard's theorem-systems. The second order linear equations.

Scope and standard as in sections 22 to 24 of Chapter 4 (excluding Appendix A), Sections 26 to 30 of Chapter 5, Sections 32 to 35 of Chapter 6 (Excluding Appendices) and sections 55 to 57 of Chapter 11 of **" Differential Equations with Applications and Historical notes" by George F. Simmons, (1992) Tata McGraw Hill Publications**

References: Advanced Differential Equations, M.D. Raisinghania , S. Chand Publications

MAT 104: DISCRETE MATHEMATICS

UNIT –I:

Normal Forms-Disjunctive-Conjunctive Principal Disjunctive, Principal Conjunctive Normal Forms –Ordering and Uniqueness of Normal Forms. The theory of Inference for the statement Calculus-Rules of inferences – Consistency of Premises-Automatic Theorem proving (Sections 1.3 and 1.4 of Chapter 1)

UNIT – II:

The predicate calculus-Inference Theory of the Predicate Calculus (Sections 1.5 and 1.6 of Chapter 1)

UNIT – III:

Lattices and Boolean Functions: Lattices as partially Ordered Sets-Lattices as Algebraic Systems – Boolean Algebra- (Sections 4.1, 4.2 and 4.3 of Chapter 4)

4)

UNIT-IV:

Boolean Functions- Minimization-Finite – State Machines-Basic (Section 4.3, 4.4, 4.5 of Chapter 4 and Section 5.1 of Chapter 5)

Scope and Standard as in the book **" Discrete Mathematical Structures With Applications To Computer Science" by Tremblay, J.P&Manohar, R-Published by McGraw-Hill International Edition -2018 Edition**

MAT 105: NUMERICAL METHODS

UNIT-I:

Solutions of Algebraic and Transcendental Equations: Introduction - Bisection method – Method of False position - Newton Raphson –method solutions of nonlinear equations –Method of iteration.

UNIT-II:

Interpolation: Introduction - Lagrange Interpolation - Newton Divided Differences - Finite Difference Operators - Interpolating Polynomials using finite differences- Gregory- Newton forward difference interpolation- Backward difference interpolation - Stirling and Bessel interpolation - Finite differences- newton's formulae for interpolation- central interpolation formulae –gauss central difference formulae-stilling formula- Bessel's formula – Lagrange's interpolation formula.

UNIT-III: Numerical Solution of ODE's: Introduction-Solution by Taylor's Method- Picard's Method of successive approximation-Euler Method-Runge-Kutta Methods-Predictor and Corrector Methods:

UNIT-IV: Numerical Solution of PDE's: Introduction-Laplace Equation-Finite Difference Approximations to derivatives-Solution of Laplace Equations

Text Book:

Scope and standard as in "**Introductory methods for Numerical Analysisby S.S. Sastry fourth edition**".

Reference Book:

1. An Introduction to Numerical Analysis by Kendall E. Atkinson.

2. Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar, R. K. Jain, NewAge International (p) Limited, Publishers, 5th Edition

MAT1P: Numerical Methods by Python

- Basics & fundamentals of Python Programming Language.
- Basic Programs using Python Programming Language.
- 15 Programs on Numerical Methods using Python Language.

SECOND SEMESTER

MAT 201: GALOIS THEORY

UNIT –I:

Algebraic Extensions of Fields: Irreducible polynomials and Eisenstein's Criterion-Adjunction of roots- Algebraic extensions- Algebraically closed fields.

UNIT – II:

Normal and Separable Extensions: Splitting fields- Normal extensions- Multiple roots- Finite fields- Separable extensions.

UNIT – III:

Galois Theory: Automorphic groups and fixed fields- Fundamental theorem of Galois Theory- Fundamental theorem of Algebra.

UNIT-IV:

Applications: Roots of unity and Cyclotomic polynomials- Polynomials solvable by radicals- Ruler and compass constructions.

Syllabus and Scope and Standard as in **"Basic Abstract Algebra" by P.. Bhattacharya, S.K. Jain and S.R. Nagpaul, Cambridge University Press, Reprint 1997**. Sections15.1, 15.2, 15.3 and 15.4 of chapter 15, Sections 16.1, 16.2, 16.3, 16.4and 16.5of chapter 16,Sections 17.1, 17.2 and 17.3 of chapter 17 and Sections 18.1, 18.3 and 18.5 of Chapter 18.

References:

1. Topics in Algebra by I.N. Herstein.
2. Field and Galois Theory-Howie. J.M

MAT 202: MEASURE AND INTEGRATION

UNIT –I :

Lebesgue Measure: Introduction, Outer measure, Measurable sets and Lebesgue measure, a non measurable set, Measurable functions, Little wood's three principles.

UNIT – II:

The Lebesgue Integral: The Riemann integral, the Lebesgue integral of a bounded function over a set of finite measure, the integral of a non negative function, the general Lebesgue integral , convergence in measure.

UNIT – III:

Differentiation and Integration: Differentiation of Monotone functions –Functions of bounded variations-Differentiation of an integral – Absolute continuity –Convex functions.

UNIT-IV:

The Classical Banach Spaces: The L^PSpaces, The MinKowski and Holder inequalities, Convergence and completeness, Approximation in L^P,Bounded linear functional on the L^PSpaces.

Syllabus and Scope and Standard as in **" Real Analysis" by H.L. Royden, Prentice Hall of India private limited, New Delhi,2001-Third edition**. Chapter 3, Chapter 4, Chapter 5, and Chapter 6.

Reference:

1. Principles of Mathematical Analysis, Third Edition by Walter Rudin.
2. A Real Analysis by H.L.ROYDEN, III ED., Peasion publishers.

MAT 203: PARTIAL DIFFERENTIAL EQUATIONS

UNIT –I:

Differential Equations in more than two variables: Methods of solutions of dx/P =dy/Q = dz/R-Orthogonal trajectories of a system of curves on surface-Pfaffian differential forms and equations in Three variables. (Sections 3, 4, 5 and of Chapter 1)

UNIT – II:

Partial Differential Equations of the First order: Partial Differential equations-Origins of first order partial differential equations-Cauchy's problems for first order equations-Linear equations of first order-Integral surfaces passing through a given curve –Surfaces orthogonal to a given system of surfaces-Charpit's method.(Sections 1,2,3, 4,5,6 and 10 of Chapter 2)

UNIT – III:

Partial Differential Equations of the Second order: The Origin of second order equations –Linear partial differential with constant coefficients-Equations with variable coefficients. (Sections 1, 4 and 5 of Chapter 3)

UNIT-IV:

Laplace's Equations : Elementary solution of Laplace's equation-Families of equipotential surfaces-Boundary value problems – Separation of variables.(Sections 2,3,4 and 5 of Chapter 4)

Scope and Standard as in **"Elements of Partial Differential Equations" by IAN Sneddon** Chapter 1: Section 1 to 6, Chapter 2: Sections 1,2,4,5,6,10 Chapter 3: Sections 1,4,5, chapter 4: Sections 2,3,4,5, Chapter 5: Sec2, Chapter 6: Section 3 and 4.

Reference:

1. Ordinary and Partial Differential Equations by M.D. Raisinghania.

MAT 204: TOPOLOGY

UNIT –I:

Metric spaces:-open sets-closed sets- convergence-completeness and Baire's theorem-Continuous mappings – Cauchy's Inequality and MinKowskisInequality- Euclidean and Unitary Spaces

UNIT – II:

Topological Spaces, definition & examples-open bases and open sub bases- compact spaces

UNIT – III:

Product of spaces-Trychonoff's theorem and loally compact spaces-compactness for Metric spaces.

UNIT-IV:

Separation $-T^1$ space and Hausdorff spaces –completely regular spaces and Normal spaces – Urysohn's lemma- Tietze extension theorem-Urysohn's imbedding theorem –Connected spaces.

Articles 9 to 13,16,17,18,21 to 29 and 31 of Chapters II, III, IV, V and VI of **Introduction to Topology and Modern Analysis" by G.F. Simmons of MC Graw Hill Publishing company, ltd**.

Reference:

1. 'Topology' by K.ChandraSekharaRao, Narosa Publications.
2. "Topology" by J.P. Chauhan, J.N. Sharma, Krishna Publications.
3. "General Topology" by M.G. Murdeshwar, new age International publications

MAT 205: COMPLEX ANALYSIS

UNIT –I:

Differentiation: Analytic Functions: Derivative Rules for Differentiating Complex Functions

UNIT – II:

Mobius Transformations: The Group Property of Mobius Transformations – The Circle – Preserving Property of Mobius Transformations-Fixed points of a Mobius Transformation- Invariance of Cross Ratio-Mapping of a circle onto a Circle –Symmetry Transformations.

UNIT – III:

Complex Integrals: Cauchy Integral Theorem: Rectifiable Curves-Complex Integrals-The Case of Smooth Curves-Cauchy's Integral Theorem-The Key Lemma proof of Cauchy's Integral Theorem-Application to the Evaluation of Definite Integrals Cauchy's Integral Theorem for a system of Contours. Cauchy's Integral Formula – Morera's Theorem – Cauchy's Inequalities.

UNIT-IV:

Power Series: The Cauchy-Hadamard Theorem – Taylor Series. The Uniqueness Theorem for Power series-Expansion of an Analytic Function in a power series – Liouvill'es Theorem. The Uniqueness Theorem for Analytic functions-A Points and Zeros-Weirstrass' Double Series Theorem-Substitution of One Power Series into Another- Division of Power series.

Scope and Standard as in Chapters 3,5,7,8 and 10 of **"Introductory Complex Analysis" by Richard A. Silverman Dover Publications, Inc. (1972). New York.**

References: 1 Complex Variables - . Schaum outline series, 2/E by Speigel

2. An Introductions to Complex Analysis, by C.L. Siegel: North Holland,

MAT2P: Differential Equations using MATLAB

- Basics & fundamentals of MATLAB.
- Basic Programs using MATLAB Programming Language.
- 15 Programs on Differential Equations using MATLAB.

THIRD SEMESTER

MAT 301: FUNCTIONAL ANALYSIS

UNIT –I :

The definitions and some examples –continuous –linear transformations-the Hahn-BanachTheorem.

UNIT – II:

Natural imbedding of N in N**-Open mapping theorem –Conjugate of an Operator.

UNIT – III:

Definition and Simple Properties –Orthogonal Complements- Orthonormal sets –Conjugatespaces-Adjoint of an Operator.

UNIT-IV:

Self adjoint operators –Normal and Unitary Operators-Projection –Spectral theorem.

Scope and Standard as in Sections 46 to 51 of Chapter 9, section 52 to 59 of chapter 10, section62 of chapter 11 of **"Introduction to Topological and Modern analysis by G.F. Simmons McGraw Hill Book Company**.

References:

1. "Foundations of Functional Analysis" by S. Ponnyusamy-Narosa Publications
2. "Text book of Functional Analysis – A Problem oriented Approach"by V.K. Krishnan-Prentice Halls of India Publishers

MAT 302: NUMBER THEORY AND CRYPTOGRAPHY

UNIT-I Some Topics in Elementary Number Theory, Time estimates for doing arithmetic, Divisibility and the Euclidean algorithm, Congruences, Some applications to factoring

UNIT II Finite Fields and Quadratic Residues, Finite fields, Quadratic residues and reciprocity

UNIT III Some simple cryptosystems, Enciphering matrices , Public Key, The idea of public key cryptography, RSA, Discrete log.

UNIT -IV: Elliptic Curves ,Basic facts, Elliptic curve cryptosystems, Elliptic curve primality test, Elliptic curve factorization,

TEXT BOOK: Neal Koblitz, A Course in Number Theory and Cryptography Second Edition

REFERENCE BOOKS:

1. Cryptography and Network security by William Stallings, Fourth edition, Pearson Education.
2. A course in Number theory and Cryptography by Neal. Koblitz, Springer-Verlag publications, New York, 1994.
3. Introduction to Cryptography, by Johnnes Buchmann, 2e, Springer-verlag, 2004.

MAT 303: CLASSICAL MECHANICS

UNIT –I :

D'Alembert's Principle and Lagrange's Equations: Some Definitions-Classification of Dynamical System-Some Examples of Constraints Virtual Displacement-Principle of Virtual Work –Generalised Force in Holonomic System-Mathematical Expression for the principle of Virtual work-D'Alember's principle-Lagrange's Equations for a Holonomic system-Velocity- dependent potential –Lagrange's Equations of Motion for conservative , Non-holonomic system- physcial Significance of 1 –Harmonic Oscillator.

UNIT – II:

Variational Principle and Lagrange's Equations:Variational Principle-Calculus of Variations- Hamilton Principle-Derivation of Hamilton's Principle from Lagrange's Equations-Derivation ofLagrange's Equations from Hamilton's Principle –Extension of Hamilton's Principle –Hamilton's Principle for Non-conservative, Non-holonomic System –Generlised Force in Dynamic system-Hamilton Principle for Conservative-Non holonomic System -Lagrange'sEquations for Non –conservative –Holonomic System –Cyclic or lgnorable Coordinates – Conservation Theorem-Conservation of Linear Momentum in Lagrangian Formulation- Conservation of Angular Momentum in Lagrangian Formulation –Conservation of AngularMomentum –Conservation of Energy in Lagrangian Formulation.

UNIT – III:

Hamilton's Equations of Motion: Derivation of Hamilton's Equations of Motion (using Lagrange's Equations)-Routh's Procedure-Equations of Motion-Derivation of Hamilton's Equations from Hamilton's Principle –Principle of Least Action-Distinction between Hamilton'sPrinciple and Principle of Least Action.

UNIT-IV:

Canonical Transformations: Canonical Coordinates and Canonical Transformations –The necessary and Sufficient Condition for a Transformation to be Canonical – Examples of Canonical Transformations-Properties of Canonical Transformulations-Infinitesimal Contact Transformation-Relation between Infinitesimal Contact Transformation and Poissson's Bracket-Hamilton Jacob Theory –Hamilton-Jacobi equations for Hamilton's Principle Function.

Syllabus and treatment as in the Book **" Classical Mechanics" by C.R. MONDAL PrenticeHall of India Private Limited, New Delhi, 110001,2001**, Chapter 1,2,4 and 5.

References: 1. Classical Mechanics by Goldstein Herbert, Charles P Poole, John safiko-Pearson India

2. Introduction to Classical Mechanics by Takwale R. Puranik P, Mc. GrawHillEducation

MAT 304 A: GRAPH THEORY

UNIT –I:

Graphs &Subgraphs: Graphs and simple Graphs-Isomorphism-Incidence and adjacency Matrices-Sub graphs-Vertex Degrees-Paths ad connection –Cyles-Shortest path-Problem-Sperner's Lemma

UNIT – II:

Trees: Trees-Edges and Bonds-Cut vertices, Cayley's Formula –Applications-Connected problem

UNIT – III:

Connectivity-Connectivity –Blocks-Application Construction of Reliable communicationsNetworks.

UNIT-IV:

Euler Tours and Hamiltonian Cycles: Euler Tours – Hamilton cycles Application – ChinesePostman Problem –Travelling Salesman Problem .

Scope and standard as in chapters 1 to 4 **" Graph Theory with application" J.A. Bondy and** U.S.R. Murthy, M.C. Millan Press

MAT 305 A: LINEAR ALGEBRA

UNIT –I:

Linear Equations: Systems of Linear Equations, Matrices and Elementary Row Operations, Row-Reduced Echelon Matrices.

UNIT –II:

Vector Spaces & linear transformations: Vector Spaces, Subspaces, Bases and Dimension, Ordered basis and coordinates. Linear transformations, Rank-NullityTheorem, The algebra of linear transformations, Isomorphism, Matrix representation of linear transformations, Linear Functionals, Annihilator, Double dual, Transpose of a linear transformation. Characteristic Values and Characteristic Vectors of lineartransformations.

UNIT –III:

Direct-sum decompositions:

Direct-sum decompositions –Invariant Direct sums. The primary decomposition theorem –cyclic subspaces and annihilators –cyclic decomposition, Rational and Jordan forms

UNIT –IV:

Bilinear Forms:

Bilinear Forms –Symmetric Bilinear Forms –Skew-Symmetric Bilinear Forms – GroupsPreserving Bilinear Forms.

Text books:

1. K. Hoffman, R. Kunze, Linear Algebra, Prentice Hall of India, (2015).

2. Gilbert Strang, Introduction to Linear Algebra, Wellesley-Cambridge Press,(2009).

MAT3P: Cryptography Algorithms by Mathematica

- Basics & fundamentals of Cryptography.
- Basic Programs using Mathematica
- 15 Programs on Cryptography using Mathematica.

FOURTH SEMESTER

MAT 401: OPERATIONS RESEARCH

UNIT-I

Linear Programming: Simplex Method: Introduction-Fundamental properties of solutions-Thecomputational procedure-Use of artificial variables.

(Sections 4.1 to 4.4 of the Chapter 4 in the Prescribed Text Book.)

UNIT-II

Duality in Linear Programing: Introduction-General Primal-Dual pair-Formulating a Dual problem-Prime-Dual Pair in matrix form-Duality theorems-Complementary slackness theorem-Duality and simplex method.

(Sections 5.1 to 5.7 of the Chapter 5 in the Prescribed Text Book.)

UNIT-III

Transportation Problem and Assignment Problem: Introduction-General transportation problem-The transportation table-Solution of a transportation problem-Finding an initial basic feasible solution-Test for optimality-Degeneracy in Transportation problem-Transportation Algorithm (MODI Method)- Introduction -Mathematical formulation of the problem-The Assignment method-Special cases in Assignment problem-A typical Assignment problem.(Sections 10.1 to 10.3 and 10.8 to 10.11 of the Chapter 10 in the Prescribed Text Book.) (Sections 11.1 to 11.5 of the Chapter 11 in the Prescribed Text Book.)

UNIT-IV

Games and Strategies: Introduction-Two-person zero-sum games-some basic terms-The maximin-minimax principle-Games without saddle points-Mixed strategies-Graphic solution of 2xn and mx2 games.

(Sections 17.1 to 17.6 of the Chapter 17 in the Prescribed Text Book.)

Prescribed Text Book: Operations Research, Kanti Swarup, P.K. Gupta and Man Mohan SultanChand & Sons, New Delhi, 2006.

Reference Books:

1. Operations Research, An Introduction: Hamdy A Taha, Maxwell Macmillan InternationalEdition, New York, 1992.

2. Operations Research Theory, methods and Applications, S.D. Sarma, kedarnath Ramnathpublications, 2008.

MAT 402: FLUID DYNAMICS

UNIT I:

Kinematics of Fluids in motion (Chapter 2).

UNIT-II

Equations of motion of a Fluid (Chapter 3)

UNIT: III

Some Three –Dimensional Flows (Chapter 4)

UNIT IV:

Some two –Dimensional Flows. (Sections 5.1 to 5.9 of Chapter 5)

Scope and standard as in the book **" Text Book of Fluid Dynamics" by F. Chorlton, C.B.S Publishers and Distributors ,** Delhi, 1985

References: 1. Foundations of Fluid Mechanics by S.W. Yuan – Prenctice Hall of India PVT Ltd, New Delhi.

MAT 403: MATHEMATICAL STATISTICS

UNIT –I:

The probability set function –Random variables –The probability density function –The distribution function-Mathematical expectations-Some special mathematical expectations –Chebyshev inequality. Conditional probability – Marginal and conditional distributions-The Correlation coefficient-Stochastic Independence.

UNIT – II: The Binomial, Poisson, Gamma, chi-square normal distribution. Distributions of functions of Random variables –Sampling theory- Transformation of Variables of Discrete type-Transformation of Variables of the continues type.

UNIT – III:

The t and F Distributions – Distribution of order statistics –The moment – generating functionTechnique-The Distribution of X and Limiting distribution – Stochastic convergence-Limiting moment generating function-The central limit theorem –Some theorems on Limiting Distribution.

UNIT-IV:

Point estimation-Measures of quality of estimations-confidence intervals for means-confidenceintervals for difference of Means-confidence intervals for variances.

A Sufficient statistics for a parameters- The Rao –Blackwell theorem-The Rao Cramer'sinequality.

Syllabus and Scope as in **" Introduction to Mathematical Statistics" by Robert V. Hogg Allen T. Craig, Macmillan publishing co., Inc., New York -1978,** section 1.4,1.5,1.6,1.7,1.9,1.10,1.11, of chapter 1, chapter 2, sections 3.1 to 3.4 of chapter 3, sections 4.1

to 4.4, 4.6 to 4.8 of chapter 4, chapter 5, sections 6.1 to 6.5 of chapter 6, section 10.1, 10.2

chapter 10, section 11.1 of chapter 11.

References :

1. Mathematical Statistics by J.N. Kapur, H.C. Saxena- S. Chand Publications

2. Introduction to Mathematical Statistics Robert V Hogg, Allencraig, Joseph WMekean , Pearson Publishers

MAT 404 A: BANACH ALGEBRA

UNIT –I :

Definition and some examples –Regular and Singular elements- Topological divisors of zeros.Spectrum –formula for the spectral radius –Radical and Semi-simplicity

UNIT – II:

Gelfand mapping – Applications of the formula r(x) = lim $\|x^n\|^{1/n}$ −Involutionsin Bnach algebras –GelfandNeumark Theorem.

UNIT – III:

Ideals in C (X) and Banach stone theorem –Stone $C^{\wedge}$ech compactification-CommutativeC^* algebras.Connectivity –Blocks-Application Construction of Reliable communications Networks.

UNIT-IV:

Fixed points theorems and some applications to analysis –Boolean algebras, Boolean Rings, andStone's theorem.

Text Book : Scope and Standard as in Sections 64 to 66of Chapter 12, Sections 67 to 69 of chapter 12, sections 70 to 73 of Chapter 13, sections 74 to 76 of chapter 14, one an d three ofAppendices of **" Introduction to Topology and Modern analysis" by G.F. Simmons McGraw Hill book Company**

Reference Books:

(1) W. Arveson, introduction to C algebras, springs-Verlay 1976

(2) KehezhuAn introduction to Operator Algebras, CRC Press Inc. 1993

MAT 405 A: FUZZY THEORY AND LOGIC

UNIT –I :

Fuzzy Sets : An overview –Basic Types and Concepts-Characteristics and significance of the Paradigm-Properties of –Cuts-Representation of Fuzzy sets-Extension Principle for Fuzzy Sets.

UNIT – II:

Operations on Fuzzy Sets: Types of Operations –Fuzzy complements –t-norms-conormsCombinations of operations-Aggregation of Operations-Fuzzy Arithmetic –Fuzzy NumbersLinguistic Variables-Arithmetic Operations on Intervals-Arithmetic Operations on Fuzzy Numbers-Lattice of Fuzzy Numbers –Fuzzy Equations.

UNIT – III:

Fuzzy Relations : Crisp versus Fuzzy Relations –Projections and Cylindric Extensions-Binary Fuzzy Relations-Binary Relations on a Single Set-Fuzzy Compatibility Relations –Fuzzy Ordering Relations – Fuzzy Morphisms-Sup –i Compositions of Fuzzy Relations –inf-wi Compositions of Fuzzy Relations – Fuzzy Relation Equations –General Discussion –Problem partifining-Solution Method-Fuzzy Relation Equations Based on sup-i Compositions Fuzzy Relation Equations Based on inf –wi Compositions –Approximate Solutions –The use of Neural networks.

UNIT-IV

Possibility Theory –Fuzzy Measures-Evidence Theory –Possibility Theory-Fuzzy sets and possibility Theory Versus-Probability Theory-Fuzzy logic –Classical Logic-Multivalued Logics Fuzzy propositions – Fuzzy Quantifiers –Linguistic Hedges-Inference from Conditional Fuzzy Propositions – Inference from quantified propositions.

Scope and standard as in chapters 1 to 8 " Fuzzy sets and Fuzzy logic Theory and Applications" by George J. Klir/ Bo Yuan, PH, 2001.

References : 1. Introduction to Fuzzy sets and Fuzzy Logic –M. Ganesh –Phi Learning Pvt Ltd. 2. Fuzzy logic with Engineering Applications , Timothy J. Ross Wieley students Edition.

M.Sc. DEGREE EXAMINATION, Month ----------, Year -------Paper Code:

Semester ----------, Mathematics

Paper No. ---------- Name of the Subject ----------

(with effect from 2023-2024 admitted batch)

Time: 3 hrs **Maximum marks: 70 Marks**

(No additional sheet will be supplied)

Part – A

Answer any five (5) questions.

Each question carries Six (6) marks.

Each answer should not exceed One (1) Page. **(5 × 6 = 30)**

1. a. Unit -I
   b. Unit -I
   c. Unit -II
   d. Unit -II
   e. Unit -III
   f. Unit -III
   g. Unit -IV
   h. Unit -IV

Part – B

Answer all questions.

Each question carries Ten (10) marks.

Each answer should not exceed Five (5) Pages. **(4 × 10 = 40)**

2. Unit -I

OR

3. Unit -I

4. Unit -II

OR

5. Unit -II

6. Unit -III

OR

7. Unit -III

8. Unit -IV

OR

9. Unit -IV