P.G. 3rd SEMESTER SYLLABUS
DEPARTMENT OF MATHEMATICS
COTTON UNIVERSITY

PAPER : MTH901C

FUNCTIONAL ANALYSIS

(Credits: 4+1+0=5)

(64 lectures)

Unit -I

Normed linear space and its properties, Banach space, Lp space; Holder's inequality, Minkowski's inequality; convergence and completeness; Riesz-Fischer theorem, bounded linear functional on Lp spaces, Riesz representation theorem. [10Lectures]

Unit -II

General Banach spaces – definition and examples; continuous linear transformations between normed linear spaces; Hahn-Banach theorem and its consequences. [10Lectures]

Unit -III

Embedding of a normed linear space in its second conjugate space; strong and weak topologies; open mapping theorem; closed graph theorem; uniform boundedness theorem; conjugate of an operator. [10Lectures]

Unit -IV

Inner product space and its properties, Hilbert's space, orthogonal complements, orthonormal set, Bessel's inequalities, complete orthonormal sets, Gram-Schmidt orthogonalization process, self adjoint operators. [10Lectures]

Unit -V

Normal and Unitary operators, projections, spectrum of an operator, spectral theorem for a normal operator on a finite dimensional Hilbert space. [8Lectures]

Books Recommended

1. H. L. Royden, Real Analysis (4th edition) , Macmillan Publishing co. inc, New York, 1999.

2. G. F. Simmons, Introduction to Topology and Modern Analysis (4th edition), McGraw Hill Education, 2004.

Books for Reference

1. W. Rudin, Functional Analysis , McGraw Hill Education, 2017

2. B. V. Limaye, Functional Analysis, Willy Eastern Ltd., 1991.

3. C.Goffman and G. Pedrick, First course in Functional Analysis, Prentice-Hall of India Pvt. Ltd, New Delhi, 1974.

P.G. 3rd SEMESTER SYLLABUS
DEPARTMENT OF MATHEMATICS
COTTON UNIVERSITY

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PAPER : MTH902C

TENSOR AND HYDRODYNAMICS

(Credits: 4+1+0=5)

(64 lectures)

TENSOR

Unit -I

Transformation laws of covariant and contravariant tensors, Mixed tensor, Rank of tensors, symmetric and anti-symmetric tensors and related theorems, Algebraic operations on tensors, contraction, Inner and outer product of tensors, Quotient law, group property of tensors, Christoffel's brackets of 1st first and second kinds, their properties, Riemannian metric Definitions of metric tensors, Transformation laws of Christoffel brackets. [14Lectures]

Unit -II

Covariant derivatives of tensors A_i , A^i, A_{ij}, A^{ij} and A^i_j , Generalizations, Covariant derivatives of metric tensors and scalar invariant function, Application in problems. Angle between two vectors, Curl, grad, divergence of vectors. Laplacian in tensor form. [10Lectures]

HYDRODYNAMICS

Unit -III

Classification of fluids, the continuum model, Eulerian and Lagrangian approach of description. Differentiation following fluid motion. Irrotational flow, vorticity vector, Streamlines, pathlines, streak lines of the particles.

Conservation of mass leading to equation of continuity. (Euler's form.) Conservation of momentum and its mathematical formulation: Euler's form. Conservation of energy and its mathematical formulation. Lagrange's hydrodynamical equations. Integration of Euler's equations of motion. Bernoulli's equation, steady motion under conservative body force. [14Lectures]

Unit -IV

Theory of irrotational motion: Flow and circulation, Stokes theorem, Kelvin's circulation theorem, Kelvin's minimum energy theorem, potential theorems.

Stream function, Some two-dimensional irrotational flows, incompressible fluids. Complex potential. Sources, sinks, doublets, complex potential due to source. [10Lectures]

Books Recommendeds:

1.F.Chorlton, Textbook of Fluid Dynamics, CBS Publishers, Delhi,2004

2. L.M.Milne-Thomson: Theoretical Hydrodynamics(5th ed. edition), Dover Publications, 2013

3. C. E. Weatherburn: An Introduction to Riemannian Geometry and Tensor Calculus, Cambridge University Press, 2008

Reference Books:

1. A. N. Das, Vector Analysis- Introduction to Tensor Analysis, U.N. Dhur and Sons Pvt. Ltd., 1932

2. P.K. Kundu and I.M. Cohen, Fluid Mechanics, Academic Press, 2005.

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PAPER : MTH903C

GRAPH THEORY AND CALCULUS OF VARIATION

(Credits: 4+1+0=5)

(64 lectures)

GRAPH THEORY

Unit-I

Graphs: Vertices of graphs, walks and connectedness, degrees, operations on graphs, blocks, cut-points, bridges and blocks, block graphs and cut-point graphs.

Trees: Elementary properties of trees, centers and centroids, block-cut point trees, independent cycles and co cycles. [10Lectures]

Unit-II

Connectivity and traversability: Connectivity and line connectivity, Menger's theorems, Eulerian graph, Hamiltonian graphs. [7Lectures]

Unit-III

Planarity and Coloring: Planar graphs, outer planar graphs, Kuratowski's theorem, dual graphs, chromatic number, five color theorem. [7Lectures]

CALCULUS OF VARIATION

Unit -IV

Calculus of Variation with one independent variable :Basic ideas of calculus of variation, Euler's equation with fixed boundary of the functional

$$I[y(x)] = \int_a^b f(x, y, y')dx$$

containing only the first order derivative of the only dependent variable with respect to one independent variable. Variational problems with functionals having higher order derivatives of the only dependent variable, applications. [10Lectures]

Unit -V

Calculus of Variation with several independent variables: Variational problems with functionals dependent on functions of several independent variables having first order derivatives. Variational problems in parametric form, variational problems with subsidiary condition (simple case only), Isoperimetric problems, Applications. [10Lectures]

Books Recommended

1.F. Harary, Graph theory, Narosa Publishing House, New Delhi, 1988.

2.A.S. Gupta, Calculus of variation with Applications ,Prentice Hall of India (1999)

Books for Reference

1. R. Balakrishnan and K. Renganathan, A textbook of Graph theory, Springer, 2000

2. B. Bollobas, Modern Graph Theory, Springer, 2002

3. G. Chartrand, L. Lesniak, Graphs & digraphs(Fourth edition), Chapman & Hall/CRC, 2005.

4. R. J. Wilson, Introduction to Graph Theory (5th Edition), Prentice Hall, 2010

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SPECIAL 1:

PAPER : MTH904S

RING THEORY

(Credits: 4+1+0=5)

(64 lectures)

Unit - I

Basic concepts of rings, modules, operations on ideals and sub-modules; matrix rings, polynomial rings; direct products of rings; fields and division rings; idempotent and nilpotent elements in a ring.

[10 Lectures]

Unit - II

Isomorphism theorems; exact sequences; the group of homomorphisms and its properties relative to exact sequences. [10 Lectures]

Unit - III

Direct sums and direct products of modules, external and internal direct sums, direct summands; Zorn's lemma, every vector space has a basis; free modules and projective modules; torsion free and torsion modules over commutative domains; exact sequences and projectivity. [16 Lectures]

Unit - IV

Injective modules, injectivity and divisibility over domains; exact sequences and injectivity;
Baer's theorem and its elementary applications; simple modules, semi-simple modules (as per Bourbaki); Schur's lemma. [16 Lectures]

Unit - V

Equivalent conditions for semisimple modules; Wedderburn structure theorem (only statement); characterization of semisimple rings via projective and injective modules. [12 Lectures]

Books Recommended

1. I. S. Luthar and I.B.S. Passi, Algebra, Vol. 2: Rings, Narosa Publishing House, New Delhi, 1999.
2. I. T. Adamson, Elementary Rings and Modules, Oliver and Boyd, Edinburgh, 1995.
3. N. Jacobson, Basic Algebra II (3rd edition), Hindustan Publishing Corporation, New Delhi, 2002.
4. J. J. Rotman, Notes on Homological Algebra, Van nostrand, 1990.

Books for Reference

1. S. Lang, Algebra(Second Edition), Addison-Wesley, Massachusetts, 1984.
2. D.S.Dummit and R.M.Foote , Abstract Algebra(3rd Edition), Wiley,2011

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PAPER : MTH905S

FIELDS AND GALOIS THEORY

(Credits: 4+1+0=5)

(64 lectures)

Unit-I

Fields and their extensions, automorphism, normal extension, separable and inseparable extensions, the fundamental theorem of Galois theory, [26 Lectures]

Unit-II

Finite field, cyclotomic extension, norm and trace, cyclic extension, [26Lectures]

Unit-III

Discriminant, polynomials of degree 3 and 4, solvability by radicals. [12Lectures]

Books Recommended

1. P.Morandi, Field and Galois theory, Springer-Verlag, 1996

Books for Reference

1. P.M. Cohn, Basic Algebra,Springer International Edition, 2003.

2. I. Stewart, Galois Theory, Chapman and Hall, 1973

3. E. Artin, Galois Theory, Dover Publications,1997

4. D.S.Dummit and R.M.Foote , Abstract Algebra(3rd Edition), Wiley,2011

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PAPER : MTH906S

ALGEBRAIC TOPOLOGY

(Credits: 4+1+0=5)

(64 lectures)

Unit – I

Homotopy of paths, fundamental group of a topological space, fundamental group functor, homotopy of maps of topological spaces; homotopy equivalence; contractible and simply connected spaces; fundamental group of S^1, $S^1 \times S^1$ etc.; degree of maps of S^1. [12Lectures]

Unit – II

Calculation of fundamental groups of n ($n > 1$) using Van Kampen's theorem (special case); fundamental group of a topological group; Brouwer's fixed point theorem; fundamental theorem of algebra; vector fields, Frobenius theorem on eigenvalues of 3 x 3 matrices. [14Lectures]

Unit – III

Covering spaces, unique lifting theorem, path-lifting theorem, covering homotopy theorem, applications; criterion of lifting of maps in terms of fundamental groups; universal coverings and its existence; special cases of manifolds and topological groups. [14Lectures]

Unit – IV

Simplicial and singular homology, reduced homology, Eilenberg-Steenrod axioms (without proof), relation between Π1 and H1; relative homology. [14 Lectures]

Unit – V

Calculations of homology of S^n; Brouwer's fixed point theorem for $f : E^n \to E^n$ ($n > 2$) and its applications to spheres and vector fields; Meyer-Vietoris sequence and its application. [10Lectures]

Books Recommended

1. J. R. Munkres, Topology, a first course , Prentice-Hall of India Ltd., New Delhi, 2000.

2.M. J. Greenberg and J. R. Harper, Algebraic topology, a first course (2nd edition), Addison-Wesley Publishing co., 1997.

3.A. Hatcher, Algebraic Topology , Cambridge University Press, 2002.

Books for Reference

1.E. H. Spanier, Algebraic Topology (2nd edition) , Springer-Verlag, New York, 2000.

2.J. J. Rotman, An Introduction to Algebraic Topology, Graduate Text in Mathematics, No. 119, Springer, New york, 2004.

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PAPER : MTH907S

SPACE DYNAMICS

(Credits: 4+1+0=5)
(64 lectures)

Unit-I

Basic formulae of spherical triangle – The Two Body problem.The motion of the centre of mass, the relative motion, Kepler's equation, Solution by Hamilton- Jacobi Theory. The determination of Orbits: Laplace and Gauss methods [16Lectures]

Unit-II

The Three Body problem General Three Body problem, Restricted Three Body problem, Jacobi integral, Curves of zero velocity, stationary solutions of three body problem and its stability. The n-body problem: The motion of the centre of mass, classical integrals. [16Lectures]

Unit- III

Perturbation: Osculating orbit, perturbing forces, Secular and Periodic perturbations, Lagrange's planetary equations in terms of perturbing forces. Motion of the moon – The perturbing forces, Perturbation of Keplerian elements of the moon by the sun. [16Lectures]

Unit- IV

Flight Mechanics: Rocket performance in a vacuum, vertically ascending paths. Gravity twin trajectories, Multistage rocket in vacuum. Definitions pertinent to a single stage rocket, performance, limitations of a single stage rockets. Definitions pertinent to a multi-stage rockets, analysis of a multi-stage rockets neglecting gravity, analysis of multi-stage rockets including gravity. [16 Lectures]

Books Recommended

1. J.M.A. Danby, Fundamentals of Celestial Mechanics, The Macmillan Company, 1962.

2. E.Finlay-Freuhdlich, Celestial Mechanics , The Macmillan Company, 1958.

3. R. Deutsch,Orbital Dynamics of Space Vehicles, Prentice Hall Inc., New Jersey, 1963.

Reference books

1. T.E. Stern, An Introduction to Celestial Mechanics , Intersciences Publishers Inc,1960

2. A. Miele,Flight Mechanics Vol-I, Theory of Flight paths, Addison Wiley Publishing Company Inc.,1962

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PAPER : MTH908S

THEORY OF RELATIVITY

(Credits: 4+1+0=5)

(64 lectures)

Unit-I

The special theory of relativity: Inertial frames of reference; postulates of the special theory of relativity; Lorentz transformations; length contraction; time dilation; variation of mass; composition of velocities; relativistic mechanics; world events, world regions and light cone; Minkowski space-time; equivalence of mass and energy. [10Lectures]

Unit-II

Geodesics, Derivation of the equation of geodesics, Geodesic co-ordinates, intrinsic derivatives, First Curvature, Parallel transport, parallel vectors. Related theorems of intrinsic derivatives and parallel displacement. Riemann Christoffel Curvature tensors and their properties, Riciitensor, Bianchi identities, Einstein tensor Divergence of Einstein tensor, Condition of Flat Space, Riemann Curvature,

[16Lectures]

Unit –III

Energy-momentum tensors: the action principle; the electromagnetic theory; energy-momentum tensors (general); energy-momentum tensors (special cases); conservation laws. [10Lectures]

Unit-IV

General Theory of Relativity: introduction; principle of covariance; principle of equivalence; derivation of Einstein's equation; Newtonian approximation of Einstein's equations. [10Lectures]

Unit –V

Solution of Einstein's equation and crucial tests of general relativity: Schwarzschild solution; particle and photon orbits in Schwarzschild space-time; gravitational red shift; planetary motion; bending of light; radar echo delay. Einstein 's and de-Sitter models. [10Lectures]

Unit –VI

Cosmology: Robertson-Walker metric and solution in unstatic model, dynamical consequences and geometrical models. [8Lectures]

Books Recommended

1. R.K. Pathria, The Theory of Relativity (2nd edition),Hindustan Publishing co.Delhi, 1994.

2. J.V. Narlikar, General Relativity & Cosmology (2nd edition) ,Macmillan co. of India Limited, 1988.

3. C. E. Weatherburn: An Introduction to Riemannian Geometry and Tensor Calculus, Cambridge University Press, 2008

Reference books:

1. S. K. Srivastava and K. P. Sinha, Aspects of Gravitational Interactions, Nova Science Publishers Inc. Commack, New York, 1998.

2. W. Rindler, Essential Relativity , Springer-Verlag, 1977.

3. R.M. Wald,.General Relativity, University of Chicago Press, 1984.

4. R. Reshnick, Special theory of relativity, Wiley India Pvt. Ltd.,2010

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PAPER : MTH909S

ADVANCED GROUP THEORY

(Credits: 4+1+0=5)

(64 lectures)

Unit – I

Normal series, composition series Zessenhaus lemma, Schreier's refinement theorem, Jordan-Holder theorem. Solvable groups, derived series, supersolvable groups, minimal normal subgroup, Hall's theorem, Hall subgroup, 26 p-complements, central series, nilpotent groups, Schur's theorem, Fitting subgroup, Jacobi identity, Three subgroup lemma, Frattini subgroup, Burnside basis theorem. [28 Lectures]

Unit – II

Fitting's lemma, Krull-Schmidt theorem, extension of a group, semidirect products, Schur-Zassenhaus lemma, Burnside normal complement theorem and its consequences. [18 Lectures]

Unit – III

Free group, generators and relations, Fundamental groups of complexes, Tietze's theorem, Covering complexes, Coset enumeration. Free products, Kurosh theorem, free product with amalgamation.

[18 Lectures]

Books Recommended

1. J. J. Rotman. An introduction to the theory of groups, Springer-Verlag, New York, 1995.

Books for Reference

1. M. Suzuki, Group theory-I, Springer-Verlag, Berlin, 1982.

2. D. J. S. Robinson, A course in the theory of groups, Springer-Verlag, New York, 1996.

3. J. S. Rose, A course on group theory, Dover Publication, New york, 1994.

4. T. W. Hungerford, Algebra, Springer-Verlag, New York, 1981.

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PAPER : MTH910S

INTRODUCTION TO LIE ALGEBRA

(Credits: 4+1+0=5)

(64 lectures)

Unit – I

Lie algebras and Lie algebra homomorphisms (definition and examples), solvable and nilpotent Lie algebra, Engel's theorem [14Lectures]

Unit – II

Semisimple Lie algebras - Lie's theorem, Cartan's criterion, Jordan-Chevalley decomposition, Killing form, complete reducibility of representations, Weyl's theorem, irreducible representations of the Lie algebra SL(2), weights and maximal vectors, root space decomposition [28 Lectures]

Unit – III

Root systems - definition and examples, simple roots and the Weyl group, Cartan matrix of a root system, Dynkin diagrams, classification theorem. [22 Lectures]

Books Recommended

1. J. E. Humphreys, Introduction to Lie Algebras and Representation theory, Graduate texts in Mathematics, Springer, 1972.

Books for Reference

1. W. Fulton and J. Harris, Representation theory - A First Course, Graduate texts in Mathematics, Springer, 1991.

2. K. Erdmann and M. Wildon, Introduction to Lie Algebras,Springer India Pvt Ltd ,2009.

3. B.C. Hall, Lie Groups, Lie Algebras, and Representations, An Elementary Introduction, Graduate Texts in Mathematics, Springer, 2010.

4. N. Jacobson, Lie Algebras, Courier Dover Publications, 1979.

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P.G. 3rd SEMESTER SYLLABUS
DEPARTMENT OF MATHEMATICS
COTTON UNIVERSITY

Open Elective - 1

PAPER : MTH911P

CONTINUUM MECHANICS

(Credits: 4+1+0=5)

(64 lectures)

Unit-I

Analysis of Stress: The continuum concept, homogeneity, isotropy, mass density, Cauchy's stress principle, stress tensor, equations of equilibrium, stress quadric of Cauchy, Principal stresses, stress invariants, deviator and spherical stress tensors. [12Lectures]

Unit-II

Analysis of Strain: Lagrangian and Eularian descriptions, deformation tensors, finite strain tensor, small deformation theory, linear strain tensors and physical interpretation, stress ratio and finite strain interpretation, strain quadric of Cauchy, Principal strains, strain invariants, spherical and deviator strain components, equations of compatibility. [12Lectures]

Unit-III

Motion: Material derivatives, path lines and stream lines, rate of deformation and vorticity with their physical interpretation, Material derivatives of volume, surface and line elements, Volume surface and line integrals, fundamental laws of continuum mechanics. [12Lectures]

Unit-IV

Fluids: Viscous stress tensor, Barotropic flow, Stokesian fluids, Newtonian fluids, Navier Stokesequations, irrotational flow, perfect fluids, Bemouli's equation, circulation. [12Lectures]

Books Recommended:

1. G.E.Mase, Continuum Mechanics ,McGraw-Hill Education, 1969

2. F. Chorlton, Textbook of Fluid Dynamics, CBS Publishers, Delhi,2004

Books for Reference

1. R. Chatterjee, Mathematical Theory of Continuum Mechanics ,Narosa Publishing House, New Delhi, 2015

2. G.K. Batchelor,An Introdution to Fluid Mechanics, Foundation Books, New Delhi,2005

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PAPER : MTH912P

OPERATION RESEARCH

(Credits: 4+1+0=5)

(64 lectures)

Unit-I

Linear Programming Problem: Introduction: Nature and Features of Operations Research (O.R)- Convex set-Polyhedral Convex . Set-Linear Programming (L.P)-Mathematical Formulation of the Problem- Graphical SolutionMethod-Some Exceptional Cases-General Linear Programming Problem (General L.P.P) – Slack and Surplus Variables-Reformulation of the General L.P.P.- Simplex Method- Matrix Notation- Duality (Statement only of Property without Proof)- Initial Simplex Tableau- Pivot-Calculating the new Simplex Tableau Terminal Simplex Tableau- Algorithm of the Simplex Method. [12Lectures]

Unit-II

Markov Analysis: Introduction: Probability Vectors-Stochastic Matrices – Regular Stochastic Matrices-Fixed Points of Square Matrices- Relationships between Fixed Points and Regular Stochastic Matrices-Markov Processes- State Transition Matrix-Transition Diagram-Brand Switching Analysis- Construction of State Transition Matrices—n-step Transition Probabilities- Stationary Distribution of Regular Markov Changes- Steady State (Equilibrium) Conditions- Markov Analysis Algorithm. [12Lectures]

Unit-III

Games and Strategies: Introduction: Two- person Zero-sum games-Pay-off Matrix – some basic terms-the Maximum – Minimal Principle-Theorem on Maximum and Minimal Values of the GameSaddle Point and Value of the Game-Rule for determining a Saddle Point-Games without Saddle Points-Mixed Strategies-Graphic solution of 2 x n and m x 2 games- Dominance Property- General rule for Dominance-Modified Dominance Property. [12Lectures]

Unit-IV

Inventory Control: Introduction: The Inventory Decisions- Costs Associated with Inventories-Factors affecting Inventory Control- Economic Order Quantity (EOQ) – Deterministic Inventory Problems with no Shortages- Case 1: The fundamental EOQ problem; Characteristics and Corollary. Case 2: EOQ Problem with Several Production Runs of Unequal Length. Case 3: EOQ Problem with Finite
Replenishment (Production); Characteristics- Deterministic Inventory Problems with Shortages
Case 1: EOQ Problem with Instantaneous Production and Variable Order Cycle Time; Characteristics. Case 2: EOQ Problem with Instantaneous Production of Fixed Order Cycle. Case 3: EOQ Problem with Finite Replenishment (Production); Characteristics. [12Lectures]

Books Recommended

1. K. Swarup, P.K. Gupta and M.Mohan, Operations Research(Ninth Edition) , Sultan Chand & Sons, New Delhi, 2002

Books for Reference

1. F.S.Hillier and G.J.Lieberman,Operations Research(Second Edition),Holden-Day Inc, San Fransisco, USA. 1974

2. H.A. Taha.,Operation Research – An Introduction(Sixth Edition), Prentice-Hall of India Pvt. Ltd., New Delhi, 2002

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PAPER : MTH913P

APPLICATION OF MATHEMATICS IN FINANCE

(Credits: 4+1+0=5)

(64 lectures)

Unit-I

Financial Management - An overview; Nature and Scope of Financial Management; Goals of Financial Management and main decisions of financial management; Difference between risk, speculation and gambling. [8Lectures]

Unit-II

Time value of Money - Interest rate and discount rate; Present value and future valuediscrete case as well as continuous compounding case; Annuities and its kinds. [10Lectures]

Unit-III

Meaning of return; Return as Internal Rate of Return (IRR); Numerical Methods like Newton Raphson Method to calculate IRR; Measurement of returns under uncertainty situations. [10Lectures]

Unit-IV

Meaning of risk; Difference between risk and uncertainty; Types of risk; Measurements of risk.

Calculation of security and Portfolio Risk and Return-Markowitz Model; Sharpe's Single index Model; Systematic Risk and Unsystematic Risk. [10Lectures]

Unit-V

Taylor series and Bond Valuation; Calculation of Duration and Convexity of bonds.

Financial Derivatives — Futures, Forward, Swaps and Options; Call and Put Option; Call and Put Parity Theorem; Pricing of contingent claims through Arbitrage and Arbitrage Theorem. [10Lectures]

Books Recommended

1. A. Damodaran, Corporate Finance - Theory and Practice, Wiley ,2007

2. J.C. Hull and S.Basu , Options, Futures, and Other Derivatives, Pearson, 2016

3. S.M. Ross, An Introduction to Mathematical Finance, Cambridge University Press,2011

4. M. S. Dorfman, Introduction to Risk Management and Insurance, **:** Prentice Hall India, 2009.

5. C.D. Daykin, T Pentikainen and M. Pesonen, Practical Risk Theory tor Actuaries, Chapman & Hall,1993

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PAPER : MTH914P

OPTIMIZATION TECHNIQUE

(Credits: 4+1+0=5)

(64 lectures)

Unit-I

Mathematical foundations and basic definitions: concepts from linear algebra, geometry, and multivariable calculus. Linear optimization: formulation and geometrical ideas of linear programming problems, simplex method, revised simplex method, duality, sensitivity analysis, transportation and assignment problems.

[24Lectures]

Unit-II

Nonlinear optimization: basic theory, method of Lagrange multipliers, Karush-Kuhn-Tucker theory. Numerical optimization techniques: line search methods, gradient methods, Newton's method, conjugate direction methods, quasi-Newton methods, projected gradient methods, penalty methods.

[24Lectures]

Books Recommended

1. N. S. Kambo, Mathematical Programming Techniques, East West Press, 1997.

2. E.K.P. Chong and S.H. Zak, An Introduction to Optimization, 2nd Ed., Wiley, 2010.

Books for Reference

1. R. Fletcher, Practical Methods of Optimization, 2nd Ed., John Wiley, 2009.

2. D. G. Luenberger and Y. Ye, Linear and Nonlinear Programming, 3rd Ed., Springer India, 2010.

3. M. S. Bazarra, J.J. Jarvis, and H.D. Sherali, Linear Programming and Network Flows,.Wiley India, 2008

4. U. Faigle, W. Kern, and G. Still, Algorithmic Principles of Mathematical Programming, Kluwe, 2002.

5. D.P. Bertsekas, Nonlinear Programming, 2nd Ed., Athena Scientific, 1999.

6. M. S. Bazarra, H.D. Sherali, and C. M. Shetty, Nonlinear Programming: Theory and Algorithms(2nd Edn.),Wiley India, 2004

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P.G. 3rd SEMESTER SYLLABUS
DEPARTMENT OF MATHEMATICS
COTTON UNIVERSITY

PAPER : MTH915P

MATHEMATICAL MODELLING

(Credits: 4+1+0=5)

(64 lectures)

Unit-I

Background of Mathematical Modelling, need and Techniques. Classification and its characteristics. [7Lectures]

Unit-II

Autonomous System, Nonautonomous System, Sylvester criterion. [6Lectures]

Unit-III

Liapunov's Theorems, Stability by Liapunov's Direct Method. Krasovskii's method [7Lectures]

Unit-IV

Construction of Liapunov function for linear system with constant coefficients. [7Lectures]

Unit-V

Test for stability based on first approximations, Two-dimensional nonlinear system and linearization technique. [7Lectures]

Unit-VI

Limit sets and Limit cycles, Extent of Asymptotic Stability, Lienard Equation. [7Lectures]

Unit-VII

Stability, Perturbation Theorems, Poincare's Linearization Theorem, Bifurcation and Chaos. [7Lectures]

Books Recommended

1. P. Glendinning,Stability, Instability and Chaos ,Cambridge University Press, 1994

2. T. Yoshizawa, The Stability Theory by Liapunov's Second Method ,Mathematical Society of Japan, Tokyo, 1966

Books for Reference

1. W. Hahn, Stability of Motion ,Springer Verlag, Berlin, 1967

2. J. L.Salle and S.Lefschetz, Stability by Liapunov's Direct Mehtod ,Academic Press, New York, 1961)

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