SEMESTER – I ALGEBRA – I - PMT701

Objectives

To introduce the concepts and to develop working knowledge on class equation, solvability of groups, finite abelian groups, linear transformations, real quadratic forms

Unit-I **[18 HRS]**

Another counting principle [Chapters: 2.5, 2.8, and 2.11].

Chapter 2: Sections 2.11 [Omit Lemma 2.1,2.5]

Unit-II **[18 HRS]**

Sylow's Theorem

Chapter 2:12

Unit-III **[18 HRS]**

Direct Products, Finite Abelian groups, Modules.

Chapters: 2.13, 2.14, 4.5

Unit-IV

Canonical Forms: Triangular forms, Nilpotent Transformations, A Decomposition of V, Jordan form

Chapter: 6.4, 6.5, 6.6 **[18 HRS]**

Unit-V

Rational Canonical Form, Trace and Transpose, **Chapter: 6.7, 6.8,**

Text Book

1. I.N. Herstein. Topics in *Algebra* [II Edition] Wiley Eastern Limited; New Delhi; 1975.

Reference Books

1. MArtin, *Algebra,* Prentice Hall of India, 1991.
2. P.B.Bhattacharya, S.K.Jain, and S.R.NagpauI, *Basic Abstract Algebra [II Edition]* Cambridge University Press, 1997. [Indian Edition]
3. I.SIuther and I.B.S.Passi, *Algebra,* Vol. 1 -Groups[1996]; Vol. II Rings, Narosa Publishing House , New Delhi, 1999
4. D.S.MaIik7 J.N. Mordeson and M.K.Sen, *Fundamental of Abstract Aigebra,* McGraw Hill [International Edition], New York. 3997.
5. N.Jacobson, *Basic Algebra,* Vol. I & II W.H.Freeman; also published by Hindustan Publishing Company, New Delhi, 1980.

SEMESTER – I REAL ANALYSIS - PMT702S

Unit-I : Functions Of Bounded Variation: Introduction - Properties of monotonic functions - Functions of bounded variation - Total variation - Additive property of total variation - Total variation on [a, x] as a function of x - Functions of bounded variation expressed as the difference of two increasing functions - Continuous functions of bounded variation. **Chapter - 6: Sections 6.1 to 6.8** [18 HRS]

Unit-II : The Riemann - Stieltjes Integral: Introduction - Notation - The definition of the Riemann - Stieltjes integral -Linear Properties - Integration by parts- Change of variable in a Riemann -Stieftjes integral - Reduction to a Riemann Integral - Euler's summation formula - Monotonically increasing integrators, Upper and lower integrals -Additive and linearity properties of upper and lower integrals - Riemann's condition - Comparison theorems. **Chapter - 7; Sections 7.1 to 7.14** [18 HRS]

Unit-III: The Riemann-Stieltjes Integral: Integrators of bounded variation-Sufficient conditions for the existence of Riemann-Stieltjes integrals-Necessary conditions for the existence of Riemann-Stieitjes integrals- Mean value theorems for Riemann - Stieltjes integrals - The integrals as a function of the interval - Second fundamental theorem of integral calculus-Change of variable in a Riemann integral-Second Mean Value Theorem for Riemann integral. **Chapter - 7: 7.15 to 7.22** [18 HRS]

Unit -IV : Infinite Series : Infinite Series : Absolute and conditional convergence - Dirichlet's test and Abel's test - Rearrangement of series - Riemann's theorem on conditionally convergent series.
Double sequences - Double'series - Rearrangement theorem for double series - A sufficient condition for equality of iterated series - Multiplication of series - Cesaro summability.
Chapter - 8 Sections 8.8, 8.15, 8.17, 8.18, 8.20, 8.21 to 8.26 [18 HRS]

Unit-V: Sequences of Functions: Point-wise convergence of sequences of functions - Examples of sequences of real - valued functions - Definition of uniform convergence - Uniform convergence and continuity - The Cauchy condition for uniform convergence - Uniform convergence of infinite series of functions -Uniform convergence and Riemann - Stieltjes integration - Non-uniform Convergence and Term-by-term Integration - Uniform convergence and differentiation - Sufficient condition for uniform convergence of a series -Mean convergence. **Chapter - 9 Sec 9.1 to 96, 9.8,99, 910,911, 9.13**[18 HRS]

Text Book

Tom M.ApostoI *: Mathematical Analysis*, 2nd Edition, Addison-Wesley Publishing Company Inc. New York, 1974.

Reference Books

1. Bartle, R.G. *Real Analysis*, John Wiley and Sons Inc./1976.
2. Rudin,W, Principles of Mathematical Analysis, 3rd Edition. McGraw Hill Company, New York, 1976.

SEMESTER – I ORDINARY DIFFERENTIAL EQUATIONS - PMT703

Unit-I:

Linear differential equations of higher order: Linear independence-Equations with constant coefficients-Equations with variable coefficients. **Chapter-2[2.4,2.5,2.6]** [18 HRS]

Unit-II: Linear differential equations of higher order: Wronskian-Method of variation of parameters- Method of Laplace Transforms. **Chapter-2[2.7,2.8,2.10]** [18 HRS]

Unit-III: **System of Linear Differential Equations :** System of first order equations-existence and uniqueness theorem- Fundamental matrix. **Chapter-4[4.2, 4.4,4.5]** [18 HRS]

Unit-IV: System of Linear Differential Equations: Non-Homogeneous Linear Systems-Linear systems with constant coefficients. **Chapter-4[4.6, 4.7,]** [18 HRS]

Unit-V: **Existence and Uniqueness of solutions :** Lipschit condition and Gronwall inequality-Successive approximations-Picard's theorem-Fixed point Method. **Chapter-5[5.2, 5.3,5.4,5.9]** [18 HRS]

Text Book:

Contents and Treatment as in "Ordinary Differential Equation" by S.G.Deo , V.Lakshmikantham and V.Raghavendra. Tata McGraw Hill , Second Edition Publishing company limited.

Books for Reference:

1. Ordinary Differential Equation by D.Somasundaram, Narosa Publishing House
2. Advanced Differential Equations by M.D. Raisinghania , S.Chand & Company Ltd.
3. A course in Ordinary Differential Equations by B.Rai, D.P.Choudhury aand H.I.Freedman, Narosa Publishing House, New Dehi,2002.
4. Differential Equations with applications and Historical notes by George F.Simmons, Tata McGraw Hill, New Delhi,1974.
5. Ordinary Differential Equations by W.T.Reid , John Wiley and Sons, New York, 1971.

SEMESTER – I CLASSICAL MECHANICS - PMT704S

Objectives

To study mechanical systems under generalized coordinate systems, virtual work, energy and momentum, to study mechanics developed by Newton, Langrange, Hamilton Jacobi and Theory of Relativity due to Einstein.

Unit-I: Mechanical Systems

The Mechanical system - Generalised coordinates - Constraints - Virtual work - Energy and Momentum

Chapter 1: Sections 1.1 to 1.5 [18 HRS]

Unit-II: Lagrange's Equations

Derivation of Lagrange's equations- Examples - Integrals of motion.

Chapter 2: Sections 21 to 23[Omit Section 24] [18 HRS]

Un1t-III; Hamilton's Equations

Hamilton's Principle - Hamilton's Equation - Other variational principle.

Chapter 4: Sections 4.1 to 43[Omit section 4.4] [18 HRS]

Unit-IV: Hamilton-Jacobi Theory

Hamilton Principle function - Hamilton-Jacobi Equation – Separability

Chapter 5: Sections 51 to 5.3 [18 HRS]

Unit-V: Canonical Transformation

Differential forms and generating functions - Special Transformations -Lagrange and Poisson brackets.

Chapter 6: Sections 6.1, 6.2 and 63 [omit sections 6.4, 6.5 and 6.6] [18 HRS]

Text Book

1.D. Greenwood, Classical Dynamics, Prentice Hall of India, New Delhi, 1985.

Reference Books

1.H.Goldstein, Classical Mechanics, [2nd Edition] Narosa Publishing House; New Delhi.

2.N.CRane and P.S.C.Joag, Classical Mechanics, Tata McGraw Hill, 1991.

3. J.L.Synge and B.A.Griffth, Principies of Mechanics [3rd Edition] McGraw Hill Book Co., New York, 1970.

SEMESTER – I MATHEMATICAL PROGRAMMING - EPMT705T

Unit-I: Integer Linear Programming: Types of Integer Linear Programming Problems - Concept of Cutting Plane -Gomory's AN Integer Cutting Plane Method - Gomory's mixed Integer Cutting Plane method - Branch and Bound Method. - Zero-One Integer Programming.

Unit-II: Classical Optimization Methods: Dynamic Programming: Characteristics of Dynamic Programming Problem -Developing Optimal Decision Policy - Dynamic Programming Under Certainty - DP approach to solve LPP.

Unit-III: Non-linear Programming Methods: Examples of NLPP - General NLPP - Graphical solution - Quadratic Programming - Wolfe's modified Simplex Methods - Beale's Method.

Unit-IV : Theory Of Simplex Method
Canonical and Standard form of LP - Slack and Surplus Variables -Reduction of any Feasible solution to a Basic Feasible solution - Alternative Optimal solution - Unbounded solution - Optimaiity conditions - Some complications and their resolutions - Degeneracy and its resolution.

Unit-V: Revised Simplex Method
Standard forms for Revised simplex Method - Computational procedure for Standard form I - comparison of simplex method and Revised simplex Method.

Text Book:
J.K.Sharma, Operations Research , Macmillan [India] New Delhi 2001
Unit 1 – Chapte 7 - Sec:7.1 to 7.7
Unit 2 – Chapter 22- Sec: 22.1 to 22.5
Unit 3 - chapter 24 Sec: 24.1 to 24.4
Unit 4- chapter 25 Sec: 25.1 to 25.8
Unit 5 – chapter 26 Sec: 26.1 to 26.4

Reference Books:

1. Hamdy A. Tana, *Operations Research*, [seventh edition] Prentice - Hall of India Private Limited, New Delhi, 1997.
2. F.S. Hillier & J.Lieberman I*ntroduction to Operation Research* [7th Edition] Tata-McGraw Hill company, New Delhi, 2001.
3. 3. Beightler. C, D.Phillips, B. Wilde *foundations of Optimization* [2nd Edition] Prentice Hall Pvt Ltd., New York, 1979

4.S.S. Rao - *Optimization Theory and Applications,* Wiley Eastern Ltd. New Delhi. 1990

SEMESTER – II ALGEBRA –II - PMT806S

Unit-I

Extension fields (Finite extension, algebraic extension and algebraic number).

Chapter 5: Section 5.1 [18 HRS]

Unit-II

Roots of Polynomials (Reminder theorem, Factor theorem and isomorphism between F[x] and F'[t]).**Chapter 5: Sections 5.3** [18 HRS]

Unit-III

More about roots-Elements of Galois theory,

Chapter 5: Section 5.5 and 5.6.[Omit theorem5.6.3] [18 HRS]

Unit-IV

Solvability by radicals - Wedderburn's theorem on finite division rings.

Section 5.7 [omit Lemma 5.7.1, Lemma 5.7.2 and Theorem 5.7.1]

Chapter 7: Sections 7.2 [Only Theorem 7.2.1] [18 HRS]

Unit-V

Integral Quaternions and the Four - Square theorem-Division Algebra

Chapter 7: Section 7.3 (omit theorem 7.3.1)[Lemma 7.4.1, 7.4.2&7.4.5 only].

[18 HRS]

Text Book

I.N. Herstein. Topics in Aigebra [II Edition] Wiley Eastern Limited, New Delhi, 1975.

Reference Books.

1. MArtin, Aigebra, Prentice Hall of India, 1991.
2. B.Bhattacharya, S.KJain, and S.R.NagpauI, Basic Abstract Aigebra [11 Edition] Cambridge University Press, 1997. [Indian Edition]
3. I.S.Luther and LB.S.Passi, Aigebra, Vol. 1 - 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 Aigebrar McGraw Hill [International Edition], New York. 1997.
5. N.Jacobson, Basic Algebra, Vol. 1 SE II Hindustan Publishing Company,New Delhi.

SEMESTER – II MEASURE THEORY - PMT807

Objective.

1.To generalize the concept of integration using measures.

2.To develop the concept of analysis in abstract situations.

Unit 1-Lebesgue Measure

Outer measure –Definition &properties –Lebesgue measure-measurable sets-properties-non-measurable-set-measurable functions-Little wood's three principle.

(chapter 3 sec.1-6) [18 HRS]

Unit 2-Lebesgue Integral

Lebesgue Integral of simple function bounded measurable function –of a non negative function-Fatou's lemma-monotone convergence therorem-General Lebesgue integral –Lebesgue convergence in measure.

(chapter 4 sec 1-5) [18 HRS]

Unit 3-Differentiation and Integration

Differetiation of monotone functions Vitali's lemma-Integral of derivative-Functions of bounded variation Differentiation of an integral –absolute continuity –convex functions-Jensen's inequality.

(chapter 5 sec 1-5) [18 HRS]

Unit 4-General measure and Integration

Measure spaces –Measurable functions –Integration-Signed measure –Hahn decomposition theorem.

(chapter 11 sec 1-6) [18 HRS]

Unit 5-Measure and outer measure

Outer measure Measurability –extension theorem-product measures Fubini's theorem-Tonnelli's theorem.

(chapter 12 sec 1,2 and 4) [18 HRS]

Text Book

1. Real Analysis –H.L.Royden –Prentice Hall of India 2001 edition.

Reference Books

1. De Barra.G.Measure and Integration –Wiley Eastern Limited 1991 edition

2.Walter Rudin-Real and Complex analysis.

SEMESTER – II NUMERICAL ANALYSIS - PMT808S

Objectives

This courses introduces a numerical methods for hands-on experience on computers.

Unit –I

Nonlinear equation: Fixed –point iteration method and its convergence- Bisection method- regular – Falsi method – secant method – convergence of secant/Regular-Falsi method – Newton- Raphson method and its convergence- convergence when roots are repeated.

Unit-II

Numerical differentiation: Differentiation by Newton's FD formula and BD formula.

Numerical integration: Methodology for numerical integration –Rectangular rule – Trapezoidal rule – Simpson's rule – Weddle rule.

Unit-III:

Splines and their applications:A piece – wise polynomial – spline approximation – uniqueness of cubic spline – construction of cubic spline.

Unit-IV :

Minimal property of splines –Application to differential equation – Cubic spline parametric form – Chebyshev approximation by principles of least squares .

Unit-V :

Partial differential equation:

Some standard forms – Boundary conditions – Finite difference approximations for derivatives – Methods for solving parabolic equation – Explicit method – fully implicit scheme – Crank – Nicolson's (C-N) scheme – derivative boundary.

TEXT BOOKS:

Elements of Numerical Analysis by Radhey S. Gupta

Macmillan India Ltd.

REFERENCE BOOK:

1.Elementary Numerical Analysis by Samuel D. Conte and Carl de Boor, McGraw Hill.1981

2.Introductory Methods of Numerical Methods by S. S. Sastry, Prentice – Hall India , 1994.

SEMESTER – II FLUID DYNAMICS - PMT809T

UNIT –I KINEMATICS OF FLUIDS IN MOTION: Real fluids and Ideal fluids- Velocity of a fluid at a point, Stream lines, path lines, steady and unsteady flows- Velocity potential – The vorticity vector – Local and particle rates of changes – Equations of continuity- Worked examples- Acceleration of a fluid – Conditions at a rigid boundary. Chapter 2. Sections 2.1 to 2.10

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 inviscid immiscible fluids – Euler's equation of motion – Discussion of the case of steady motion under conservative body forces. Chapter 3 Sections 3.1 to 3.7

UNIT –III SOME THREE DIMENSIONAL FLOWS: Introduction – Sources, Sinks, and doublets rigid infinite plane – Axis symmetric flows.

Chapter 4 Sections 4.1, 4.2, 4.3,

UNIT – IV: SOME TWO DIMENSIONAL FLOWS: Meaning of two dimensional flow – Use of Cyclindrical polar coordinate – The stream function – The complex potential for two dimensional, irrotational incompressible flow- Complex velocity potentials for standard two dimensional flows- Some worked examples- Two dimensional Image systems- The Milne Thompson circle Theorem. Chapter 5 Sections 5.1 to 5.8

UNIT – V : VISCOUS FLOWS: Stress components in a real fluid – Relations between Cartesian components of stress – Translational motion of fluid elements- The rate of strain quadric and principal stresses- some further properties of the rate of strain quadric – Stress analysis in fluid motion- Relation between stress and rate of strain – The coefficient of viscosity and Laminar flow – The Navier – Stokes equations of motion of a Viscous fluid.

Chapter 8 Sections 8.1 to 8.9

Recommended Text

F. Chorlton, Text Book of Fluid dynamics, CBS publications. 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. B.S.Massey, J.W.Smith and A.J.W.Smith, Mechanics of Fluids, Taylor and Francis, New York, 2005.
4. P.Orlandi, Fluid Flow Phenomena, Kluwer, New York, 2002
5. T. Petrila, Basics of Fluid Mechanics and Introduction to Computational Fluid Dynamics, Springer, Berlin , 2004.

SEMESTER – II OPERATION RESEARCH - EPMT810T

Objectives:
The course aims to introduce PERT, CPM, deterministic and probabilistic inventory systems, queues, replacement, maintenance problems and simulation problems.

UNIT-I: PROJECT MANAGEMENT : PERT AND CPM
Basic Difference between PERT and CPM – Steps in PERT/CPM Techniques- PERT/CPM Network Components and Precedence Relationships – Critical Path Analysis – Probability in PERT Analysis – Project time-cost Trade Off – Updating the Project – Resource Allocation.

UNIT - II : DETERMINISTIC INVENTORY CONTROL MODELS
Meaning of inventory Control – Functional Classification – Advantage of Carrying Inventory – Features of Inventory System – Inventory Model building – Deterministic Inventory Model with no Shortage – Deterministic Inventory with Shortages.

UNIT-III: QUEUES THEORY
Essential Features of Queueing System – Operating Characteristic of Queueing System – Probabilistic Distribution in Queueing Systems – Classification of Queueing Models – Solution of Queuing Models – Probability Distribution of Arrivals and Departures

UNIT-IV: REPLACEMENT AND MAINTANANCE MODELS
Failure Mechanism of Items – Replacement of Items Deteriorates with Time – Replacement of Items that fail completely – other Replacement Problems.

UNIT- V: SIMULATION
Introduction – Steps of Simulation Process – Advantages and Disadvantages of Simulation – Monte Carlo Simulation – Random Number Generation – Simulation Inventory Problems – Queuing Problems – PERT Problems.

TEXT BOOK: JK. Sharma, Operations Research, MacMillan India, New Delhi, 2001.
Unit 1- Chapter 13 : Sec. 13.1 to 13.9
Unit 2 - Chapter 14: Sec. 14.1 to 14.8
Unit 3 -.Chapter 16: Sec. 16.1 to 16.7
Unit 4 - Chapter 17: Sec. 17.1 to 17.5
Unit 5 - Chapter 19: 19.1to 19.11, 19.13

REFERENCE BOOKS

1. Kanti Swarup, P.K. Gupta, Man Mohan - *Operations Research*, Sultan Chand & Sons, New Delhi.
2. F.S. Hillier and J.Lieberman - *Introduction to Operations Research* [8th Edition], Tata McGraw Hill Publishing Company, New Delhi,2006.
3. Beightler. C, D.Phillips, B. Wilde, *Foundations of Optimization* [2nd Edition] Prentice Hall Pvt Ltd., New York, 1979.

Gross, D and C.M.Harris, *Fundamentals of Qeueing Theory*, [3rd Edition], Wiley and Sons, New York, 1998.

SEMESTER – III COMPLEX ANALYSIS-I PMT911

Objectives: The course aims to introduce the concepts of Analytic Functions Linear Transformations , Conformal Mappings , Complex Integration, Cauchy's Integral Formula, Calculus of Residues and Evaluation of Definite Integrals.Harmonic Functions.

UNIT-I Conformality: Arcs and closed curves, Analytic Functions in Regions, Conformal Mapping, Length and Area.Linear Transformations:The Linear Group,The Cross Ratio, Symmetry, Oriented Circles, Families of Circles. [18 HRS]

UNIT-II Elementary Conformal Mappings: The Use of Level Curves,A Survey of Elementary Mappings, Elementary Riemann Surfaces. Complex Integration: Fundemental Theorems:Line Integrals, Rectifiable Arcs, Line Integrals as Functions of Arcs, Cauchy's Theorem for a Rectangle, Cauchy's theorem in a Disk. [18 HRS]

UNIT-IIICauchy'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, Taylor's Theorem, Zeros And Poles,The Local Mapping, The Maximum Principle. [18 HRS]

UNIT-IV

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, Locally Exact Differentials, Multiply Connected Regions.

The Calculus of Residues:The Residue Theorem, The Argument Principle. [18 HRS]

UNIT-V

Evaluation of Definite Integrals.Harmonic Functions:Definition and Basic Properties,The Mean-value Property,Poisson's Formula,Schwarz's Theorem,The Reflection Principle. [18 HRS]

Text Book : COMPLEX ANALYSIS by Lars V.Ahlfors (Third Edition)

CHAPTER 3: 2.1 to 4.3

CHAPTER 4: 1.1 to 6.5

Reference books:

1. H.A Presly, "Introduction to Complex Analysis", Clarendon Press, Oxford,1990.
2. J.B.Conway, " Functions of one complex variables, Springer- Verlag, International student edition, Naroser Publishing Co. 1978.
3. E.Hille, Analytic function theory, Gonm & Co., 1959.
4. M.Heins, " Comples function Theory, Academic Press, New York, 1968.

SEMESTER – III TOPOLOGY PMT912

Objectives:

The course aims to introduce the concepts of Metric spaces, Topological spaces, Separation axioms, Compact spaces and Connected spaces.

UNIT I: METRIC SPACES: Definition- Euclidean metric- discrete metric-topology generated by metric-complete metricspace-Cantor intersection theorem-First and Second category subsets-Baire category theorem-CONTINUITY: Definition-uniformly continuous function-extension of a function-contractoin-Banach fixed point theorem. [18 HRS]

UNIT II: TOPOLOGICAL SPACES: Definition.- Discrete, indiscrete,metrizable,cofinite metrics-Base-subbase for a topology-local base-neighbourhood base-I and II countable spaces-separable-Lindelof theorem-cover-open cover-closed cover-subcover-Lindelof's space-subspace topology-open mapping-homeomorphism-projection mapping-product topology. [18 HRS]

UNIT III:SEPARATION AXIOMS: T_0, T_1, T_2 spaces-uniqueness of limit theorem-regular space-T_3 space-Urysohn's lemma-Tietze extension theorem- Urysohn's metrization theorem. [18 HRS]

UNIT IV:COMPACT SPACES: Defn. – Heine-Borel theorem- Bolzano Weirstrass property-sequentially compact- countably compact-Lebesgue number. LOCALLY COMPACT SPACES: Defn. – one point compactification- Baire category theorem. [18 HRS]

UNIT V:CONNECTED SPACES: Defn. –Intermediate value theorem-components- chain. CONNECTIVITY: Path wise connected- arc wise connected-locally path wise connected-sum [18 HRS]

Text Book

Sheldon W. Davis - "TOPOLOGY", Tata McGraw Hill Edition 2006, New Delhi. Chapters: 2, 3,4, 5, 6, 7, 8, 9 and 10.

REFERENCE BOOKS:

1. James R. Munkers- "TOPOLOGY A FIRST COURSE" Second edition, Prentice Hall of India Ltd, New Delhi.

2. Seymour Lipschitz- " GENERAL TOPOLOGY", Schaum's outline series McGraw Hill Book company.

3. M.L.Khanna- "TOPOLOGY", Jayaprakashnath & co, Meerut, India.

4. B.C.Chattargee, S.Ganguly, M.R.Athikari- " A TEXT BOOK OF TOPOLOGY", Asian Books Private limited, New Delhi.

SEMESTER – III APPLIED ABSTRACT ALGEBRA PMT913

Objectives :

The course aims to introduce the concepts of Lattices, Applications of lattices, Finite fields, Polynomials and Coding theory.

Unit-I **LATTICES:** Properties of lattices: Lattice definitions- distributive lattice. Boolean Algebras: Basic properties-Boolean polynomials, ideals, minimal forms of Boolean polynomials. **Chapter 1: 1 to 6** [18 HRS]

Unit-II **APPLICATIONS OF LATTICES**

Switching circuits, Basic definitions, applications **Chapter 2: 7 to 9** [18 HRS]

Unit-III **FINITE FIELDS**

Finite Fields and Polynomials - Finite Fields **Chapter 3: 13 Only** [18 HRS]

Unit-IV **POLYNOMIALS:**

Irreducible polynomial over finite fields. **Chapter 3: 14 Only** [18 HRS]

Unit-V **CODING THEORY**

Linear codes-Cyclic codes **Chapter 4: 17,18** [18 HRS]

TEXT BOOK:

Applied Abstract Algebra-by Rudolf Lidl and Guntur Pilz, Springer- Verlag New York 1998.

Reference Books:

1. Modern Applied Algebra, by- Garrett Birkhoff & Thomas C. Bartee, CBS PUBLISHERS & DISTRIBUTORS
2. I.N. Herstein. Topics in *Algebra* [II Edition] John Wiley & Sons Publications 2002.John
3. John B. Fraleigh, A first Course in Abstract Algebra, Norosa Publication Home, New Delhi, 1996.

SEMESTER – III STOCHASTIC PROCESSES PMT914S

OBJECTIVE:
To introduce the basic concepts of Stochastic Processes.

UNIT – I
Definition of Stochastic Processes – Classification of Stochastic Process according to Time parameter space and State space – Examples of Stochastic Process.

UNIT – II
Markov Chains – Definition and examples – Higher transition probabilities – Chapman-Kolmogrov equation – Classification of States – Limiting behavior (Concept and applications only) – Examples of Markov Chains.

UNIT – III
Poisson process: Poisson process, pure birth process, Yule Furry process and Birth and Death process – Simple examples. Branching process – Properties – Generating function of Branching process – Probability of Extinction.

UNIT – IV
Simple Queuing models (M/M/1: N/FIFO and M/M/1: ∞/FIFO queuing systems) – Steady state solutions – Simple problems.

UNIT –V
Renewal process: Definition – renewal process in discrete time – relation between F(S) and P(S) – renewal interval – delayed recurrent event – renewal process in continuous time – renewal function and renewal density – renewal equation – stopping time – elementary renewal theorem.

Text Books:
1. "Stochastic Process" (1982), Medhi. J., Wiley Eastern Limited, New Delhi.
2. "Stochastic Process" (1983), Ross. S. M., John Wiley & Sons, Inc., New York.

Reference Books:
1. "Stochastic Process" (1965), Prabhu. N. U., Macmillan, New York.
2. "Introduction to Stochastic Processes", (1975),Cinlar. E., John Wiley & Sons, London.
3. "A first course in Stochastic Processes" (1975), Karlin. S. and Taylor. H. M., Academic Press, New York.
4. "A second course in Stochastic Processes" (1981), Karlin. S. and Taylor. H. M., Academic Press, New York.
5. "An Introduction to Stochastic Processes", (1979),Kannan. D., North Holland, New York.

SEMESTER – III FUZZY SUBSETS AND ITS APPLICATION EPMT915

OBJECTIVES:

This course aims to offer fuzzy graphs ,fuzzy relation ,fuzzy logic and fuzzy composition.

UNIT –I FUNDAMENTAL NOTION

Introduction –Review of the notion of membership-Concept of fuzzy subsets-Dominance relation-Simple operation- Set of fuzzy subsets for E and M finite-Properties of fuzzy subsets –Product and algebraic sum of two fuzzy subsets-problems.Chapters1:1 to 9 [18 HRS]

UNIT –II FUZZY GRAPHS

Introduction – Fuzzy graphs –Fuzzy relation -Composition of Fuzzy relation –Fuzzy subsets induced induced by the mapping –Conditioned fuzzy subsets-Properties of fuzzy binary relation-Transitive closure – Paths in finite Fuzzy graphs-Problems . Chapters2:10 to 18 [18 HRS]

UNIT-III FUZZY RELATION

Fuzzy Preorder relation –Similitude- Similitude sub relation –Anti symmetry –Fuzzy order relation – Anti-symmetry relations without loops-Ordinal relations- Ordinal functions- Dissimilitude –Resemblance –Properties of Similitude and Resemblance –Properties of Fuzzy perfect order relation –Problems. Chapters2:19 to 29 [18 HRS]

UNIT-IV FUZZY LOGIC

Introduction –Characteristic functions of a fuzzy subsets-Fuzzy variables –Polynomial forms –Analysis of function of Fuzzy variables –Method of marinos –Logical structure.Chapters3:31 to35(Omit 33)[18 Hour]

UNIT-V APPLICATIONS.

Introduction – Engineering – Medical– Economics – Soft Computers [18 HRS]

Chapters5:[“Fuzzy sets and Fuzzy Logic Theory and Applications”] – George . J.Klir

Text Books:

1. A. Kaufman, Introduction to the theory of Fuzzy subsets, Vol I, Acadamic Press, New York, 1975. (For unit – I to unit IV)
2. George J. Klir and Bo Yuan, Fuzzy sets and Fuzzy Logic Theory and Applications, Prentice Hall India, New Delhi, 2001. (Unit – V Only)

Reference book:

1. H. J. Zimmermann, Fuzzy set Theory and its Applications, Allied Publications, Chennai, 1996.

SEMESTER – III HUMAN RIGHTS - ECHR901S

Unit I

Definition of human rights-nature content-characterizes of human rights-classification of human rights-historical development of human rights-reasons for human rights studies today

Unit II

International human rights norms-humanitarian law-declaration covenants-international covenant on economic, social and cultural rights,international convenants on civil and political rights-optional protocol to the international covenant on civil and political rights-human rights treaties,enforcement of human rights law ,universal jurisdiction.

Unit III

International bodies-the united nation organization ,human rights council,other treaty bodies-amesty international –helsinki declaration –regional human rights-africa,America,asia,Europe&oceania.

Unit IV

Contemporary issues on human rights-human right violations-children's rights-women's rights-scheduled caste-minority rights –bonded lalour and wages, torture and death.

Unit v

Human rights and the Indian constitution, fundamental rights in Indian constitution – directive principles of state policy-fundamental duties.

Various commission; National Human Rights Commission- National commission for Women-Women's Rights in India-Consumers protection Act-Rights to information Act- Public Litigation Act and Rights to Education Act.

Reference Books;

1. Human rights in developing society-Sankar Sen
2. Teaching of human rights-Sergio Baradat Swaronjali Ghosh

SEMESTER – IV COMPLEX ANALYSIS-II PMT1016

UNIT-I

Power Series Expansions: Weierstrass's Theorem,The Taylor Series,The Laurent Series.Partial Fractions and Factorization:Partial Fractions,Infinite Products,Canonical Products,The Gamma Function [18 HRS]

UNIT-II

Entire Functions: Jensen's Formula, Hadamard's Theorem. The Riemann Zeta Function:The Product Development, Extension of $\zeta(s)$ to the Whole Plane,The Functional Equation,The Zeros of the Zeta Function. [18 HRS]

UNIT-III

Normal Families: Equicontinuity,Normalitiy and Compactness,Arzela's Theorem,Families of Analytic Functions,The Classical Definition.The Riemann Mapping Theorem, Boundary Behavier, Use of the Reflection Principle. [18 HRS]

UNIT-IV

Conformal Mapping of Polygons: The Behavior at an Angle, The Schwarz-Christoffel formula, Mapping on a Rectangle.A Closer Look at Harmonic Functions:Functions with the Mean-Value Property, Harnack's Principle.Simply Periodic Functions:Representation by Exponentials, The Fourier Development, Functions of Finite Order. [18 HRS]

UNIT-V

Doubly Periodic Functions: The Period Module, Unimodular Transformations,The Canonical Basis,General Properties of Elliptic Functions.The Weierstrass Theory:The Weierstass ρ-function,The Functions $\zeta(z)$ and $\sigma(z)$,The Differential Equation. [18 HRS]

Text Book: COMPLEX ANALYSIS by Lars V.Ahlfors (Third Edition)

CHAPTER 5:1.1 to 5.5(omit2.5)

CHAPTER 6: 1.1 to 3.2(omit1.4&2.4)

CHAPTER 7: 1.1 to 3.3

Reference books:

1. H.A Presfly, "Introduction to Complex Analysis", Clarendon Press, Oxford,1990.
1. J.B.Conway, " Functions of one comples variables, Springer- Verlag, International student edition, Naroser Publishing Co. 1978.
2. E.Hille, Analytic function theory, Gonm & Co., 1959.
3. M.Heins, " Comples function Theory, Academic Press, New York, 1968.

SEMESTER – IV FUNCTIONAL ANALYSIS PMT1017

OBJECTIVES

The course aims to introduce the concepts of Banach spaces, Hilbert spaces, normal and unitary operators, Finite dimensional spectral theory and General preliminaries on Banach algebras.

UNIT I

BANACH SPACES: Definition - examples-continuous linear transformations-The Hahn-Banach theorem-the natural embedding of N^* in to N^{**} - open mapping theorem-conjugate of an operator. **Chapter 9:46 to 51** [18 HRS]

UNIT II

HILBERT SPACES: Definition – examples-simple properties-orthogonal complements-orthonormal sets **Chapter 10:52,53,54** [18 HRS]

UNIT III

HILBERTSPACES (CONTD): conjugate space H^* -ad joint of an operator-self adjoint operators-normal and unitary operators- Projections. **Chapter 10:55 to 59** [18 HRS]

UNIT IV

FINITE DIMENSIONAL SPECTRAL THEORY: Matrices-Determinants and the spectrum of an operator- The spectral theorem-A survey of the situation. **Chapter 11:12, 64 to 69** [18 HRS]

UNIT V

GENERAL PRELIMINARIES ON BANACH ALGEBRAS: Definition – examples-regular and singular elements- Topological divisors of zero- The spectrum- The formula for spectral radius- The radical and semi-simplicity. **Chapter 12:64 to 69** [18 HRS]

Text Book: G.F. SIMMONS , " Introduction to TOPOLOGY AND MODERN ANALYSIS", Mc Graw Hill International Edition, New York 1963.

REFERENCE BOOKS:

1. Walter Rudin , "Functional analysis", Tata Mc Graw Hill Publishing company, New Delhi1973
2. M.L.Khanna- "Functional analysis", Jayaprakashnath & co, Meerut, India1988.
3. G.Bachman & L.Narici, "Functional analysis" Academic Press, New York1966.
4. S. Ponnusamy, "Foundations of Functional Analysis", Narosa Publishing House, New Delhi.

SEMESTER – IV DIFFERENTIAL GEOMETRY PMT1018S

OBJECTIVES:

This course introduces space curves and their intrinsic properties of a surface and geodesics. Further the non-intrinsic properties of surface and the differential geometry of surfaces are explored.

UNIT – I: SPACE CURVES: Definition of space curve - Arc length – Tangent, normal and binormal – Curvature and torsion – Contact between curves and surfaces – Involutes and evolutes. Intrinsic equations – Fundamental existence theorem for space curves – Helices.

Chapter I: Sections 1 to 9. [18 HRS]

UNIT- II: INTRINSIC PROPERTIES OF A SURFACE: Definition of a surface – curves on a surface - Surface of revolution – Helicoids – Metric – Direction coefficients – Family of curves – Isometric correspondence – Intrinsic properties. **Chapter II: Sections 1 to 9** [18 HRS]

UNIT - III: GEODESICS: Geodesics – Canonical geodesic equations – Normal property of geodesics – Geodesic parallels – Geodesics curvature – Gauss Bonnet theorem – Surface of constant curvature.

Chapter II: Sections10 to 18 **[**18 HRS]

UNIT – IV: NON - INTRINSIC PROPERTIES OF A SURFACE: The second fundamental form – Principal curvature – Lines of curvature – Developable – Developable associated with space curves and with curves on surface.

Chapter III: Sections 1 to 6 [18 HRS]

UNIT – V: DIFFERENTIAL GEOMETRY OF SURFACES: Fundamental equations of Surface theory – Fundamental existence theorem for surfaces – Compact surfaces whose points are umblics – Hilbert's lemma – Compact surface of constant curvature – Complete surfaces- characterization of complete surfaces \

Chapter III: Sections 9, 11, Chapter IV: Sections 1 to 6 [18 HRS]

Text Book: T.J. Wilmore, An Introduction of Differential Geometry, Oxford University Press,(17th Impression) New Delhi 2002. (Indian Print)

Referrence Books:

1. Wilhelm Klingender, A course in Differential Geometry, Graduate Texts in Mathematics, Springer-verlag 1978.
2. J.A. Thorpe, Elementary topics in Differential Geometry, under – graduate Texts in Mathematics, Springer-verlag 1978.
3. M. L. Khanna, Differential Geometry, Jai Prakash Nath & Co., Meerut City
4. Mittal, Agarwal, Differential Geometry, Krishna Prakashan Media (P) Ltd. Meerut City
5. Nirmala Prakash, Differential Geometry, Tata McGraw – Hill Publishing company Ltd, New Delhi.

SEMESTER – IV PARTIAL DIFFERENTIAL EQUATIONS PMT1019S

Unit – 1: Partial Differential Equations of First order

Formation of Partial differential Equation - Solution of Partial Differential Equations of First order - Integral Surfaces passing through a given curve - The Cauchy Problem for First Order Equations - Compatible System of First Order Equation - Charpit's Method - Fundamental Concepts – Introduction - Classification of Second Order PDE - Canonical Forms - Adjoint Operators - Riemann's Method

Unit – 2: Elliptic Differential Equations

Occurrence of the Laplace and Poisson Equation – Boundary Value Problem (BVPs) – Separation of Variables – Dirichlet Problem for a rectangle – Interior Dirichlet Problem for a circle – Exterior Dirichlet Problem for a circle – Miscellaneous Examples

Unit – 3: Parabolic Differential Equations

Occurrence of Diffusion Equation – Boundary Condition – Elementary solution for the Diffusion Equation – Dirac Delta Function – Separation of Variable method - Miscellaneous Examples

Unit – 4: Hyperbolic Differential Equations

Occurrence of Wave Equations – Derivation of One dimensional Wave Equation – Solution of One dimensional Wave Equation by Canonical Reduction – The Initial value Problem; D' Alembert's Solution – Vibrating String – Variable Separable Solution – Forced Vibrations – Solution of Non-homogeneous Equation – Boundary and Initial Value Problem for Two-dimensional Wave

Unit – 5: Hyperbolic Differential Equations – Periodic Solution

Periodic Solution of One-dimensional Wave Equation in Cylindrical Coordinates – Miscellaneous Examples

Text Book:

K. Sankara Rao, Introduction to Partial Differential Equations, Prentice Hall of India, New Delhi, 2007.

References:

1. J. N. Sharma and Kehar Singh, Partial Differential Equations for Engineers and Scientists – Narosa Publishing House, New Delhi, 2000.
2. M. D. Raisinghania Advanced Differential Equations, S. Chand & Company Ltd, New Delhi, 2001.
3. Robert C. McOwen, Partial Differential Equations, Pearson Education, 2004.

SEMESTER – IV GRAPH THEORY EPM1020

UNIT-I GRAPHS & SUBGRAPHS

Paths&Connection-cycles.

Application: The Shortest Path Problem-Sparner's lemma.

Sections 1.6, 1.7, 1.8,1.9

UNIT-II TREES & CONNECTIVITY

Trees-cut edges and bonds-cut vertices-Cayles's formula.

Application: The connector Problem

Connectivity: Connectivity-Blocks

Applications: Constructions of Reliable communication networks.

Sections – 2.1, 2.2, 2.3, 2.4, 2.5, 3.1, 3.2, 3.3

UNIT-III EULER TOURS & HAMILTONIAN CYCLES

Euler Tours & Hamiltonian Cycles

Application: The Chinese postman Problem –The travelling sales man problem.

Sections – 4.1, 4.2,4.3,4.4

UNIT-IV EDGE COLOURINGS & INDEPENDENT SETS

Edge chromatic number-vizings theorem, Independent sets-Ramsey's theorem.

Application: The time tabling Problem.

Sections – 6.1, 6.2, 6.3, 7.1, 7.2,

UNIT-V VERTEX COLOURINGS

Chromatic number-Brooke's theorem-Hajose' conjuncture-chromatic polynomials.

Applications: A Storage problem,

Plane & Planar graphs-Dual graphs-Kuratowski's theorem.

Sections – 8.1, 8.2, 8.3, 8.4, 8.6, 9.1, 9.2, 9.5

TEXT BOOK:

1. Bondy J.A& Murthy U.S.R, Graph theory and its applications.

REFERENCE BOOKS:

1. R. Balakrishanan & K.Ranganathan, A Text book of graph theory, Springer 2000.

2. F.Harary, Graph theory-Addison Wesley, 1969.