NEW/REVISED SYLLABUS FOR
M. Phil./Pre Ph. D
(Academic Flexibility)
(Introduced from June 2011 onwards)

(i) Paper - I
(ii) Title of Paper: Research Methodology
(iii) Specific Objectives: The students will be exposed to the general information
(iv) A brief note: - (Notations and concepts are taken from books given in basic reading; this should be taken in account for examination point of view).

Unit I : Optimization techniques. Extrema of real valued functions of serval variables, extremum problems with side conditions, Kuhn – Tucker conditions. (15)

Unit II: Introduction to Latex. Writing Mathematical expressions. Mathematical software- Scilab (Free to air)

Unit III: Meaning of research, Objectives, Motivations, Type of research, Significance, Literature review, purpose, and process of literature review, analysis of an article, search engine, defining the research problem, Technique involved in defining a problem. (15)

Unit IV: Formation of research problem, accuracy of definition, objectives of research, how to state a theorem, how to prove a theorem, preparation of research article and thesis, research proposals. (15)

Reference Books:

1. Research methodology: Methods and Techniques C. R. Kothari New ase international 2005
2. Introduction to research, Tynes Hillway Houghton Wiffin Company.
3. A Primer of Mathematical writing, Stever G, Krantz Universities Press Hyderabad 1998
4. Mathematica S. Technical Manual.
5. Mathematical Analysis: T. M. Apostol, Narssa Publishing House.
6. Mathematical Programing: Kambo, Naroda Publishing House
7. Operation Research by S. D. Sharma, Kedar Nath , Ram Nath.

M. Phil. / Ph. D. Course Work
(Introduced from June 2011 onwards)

i) Paper : II
ii) Title of Paper : Recent Trends in Pure Mathematics
iii) Specific Objectives: The students will be exposed to some of the important branches in pure Mathematics.
(iv) UNITS:

UNIT-I Definition and examples of categories, Some basic categorical concepts, Functors and natural transformations, Equivalence of categories, Products and co-products, The horn functors. Representable functors. (No of Lectures 15)

UNIT-II Universal Algebra**,** Ω-algebras, Subalgebras and products , Homomorphisms and congruences, The lattice of congruences. Subdirect products, Direct and inverse limits, Ultraproducts. (No of Lectures 15)

UNIT-III Rings with chain conditions; Noetherian and Artian rings, Hilbert basis theorem; Levitsky theorem, weddeburn theorem; semisimple Artian and Noetherian rings; Primary decomposition of ideals in Noetherian rings, Cohen's theorem, Nokayama rings, Local rings and Krull intersection theorem. Normed Banach algebras, analytic properties of functions, regular points and the Spectrum, Compactness of the Spectrum, Spectral radius. (No of Lectures 15)

UNIT-IV (Prerequisites: Superstructures, Formal Language, Interpretations, Nonstandard Models, The Three Fundamental Principles, Elementary Embeddings and the Transfer Principle, The Standard Definition Principle, The Internal Definition Principle, Existence of External Sets).
Nonstandard Ultrapower Models, Ultrafilters, Ultrapowers, Embedding in a Superstructure. Nonstandard Real Analysis, Hyperreal Numbers, Hyperreal and Hypernatural Numbers, Interpretation of the Standard Part Homomorphism, The Permanence Principle and finite Sets, Calculus: Sequences, sets and functions, Functionals. (No of Lectures 15)

V) Recommended Reading:

a) Basic Reading:

1) Basic Algebra II, second edition, Nathan Jacobson, W. H. Freeman and company, New York **(For Unit I and II)**
2) David M. Burton: First course in rings and ideals, Addison-Wesley Publ. Comp. 1970 **(For Unit III)**
3) Bacchman and Narici: Functional Analysis, Academic Press, New York, 1966. **(For Unit III)**
4) Nonstandard Analysis, Martin Väth, Birkhäuser Verlag, 2007 **(For Unit IV)**

b) Additional Reading

c) References

i) Books: -

ii) Periodicals / Journals: -

NEW/REVISED SYLLABUS FOR

M. Phil./ Ph. D. Course Work
(Introduced from June 2011 onwards)

i) **Paper** **: II**
ii) Title of Paper **: Recent Trends in Applied Mathematics**
iii) Specific Objectives **: The student will be exposed to some of the important branches variation principles, partial differential equations and Special functions.**

UNITS:

UNIT: I Functionals dependent on functions of several independent variables, variation problem in parametric form, variational problems leading to an integral and differential equations. Geodesic on a given surface $G(x,y,z)=0.$ Euler-Lagrange's condition for the extremization of different curves viz., $v=v(u),\ u=u(t), v=v(t)$ on the surface $x=x(u,v), y=y(u,v), z=z(u,v).$ Geodesic on the surface obtained by revolving the curve $y=f(x)$ about x- axis. Canonical equations and variational principles, The Hamilton- Jacobi equations, Clairaut Theorem. (No of Lectures 15)

UNIT: II Variational problems with moving boundaries. Moving boundaries in implicit form, functional in parametric form. Variational problems with moving boundary for a functional dependent on two functions. Extremization of the functional dependent on function of two independent variables. Determination of the surface $z=z(x,y)$ for which the area $\iint_R \left(1+z_x^2+z_y^2\right)^{\frac{1}{2}} dxdy$ is minimum. Ritz Method and Galerkin Method for boundary value problem. (No of Lectures 15)

UNIT: III Solution of diffusion equations with various boundary conditions, Solution of diffusion equations in cylindrical coordinates, Solution of diffusion equations in spherical coordinates. Vibrating string, Energy of a string. Boundary and initial value problems for two dimensional wave equations – Method of eigen function. Periodic solution of one dimensional wave equation in cylindrical coordinates, Periodic solution of one dimensional wave equation in spherical polar coordinates, Two dimensional wave equation, vibration of circular membrane. Uniqueness of the solution for the wave equation. (No of Lectures 15)

UNIT: IV Special Functions: The Gamma function, the Euler's constant γ, the Euler's product for $\Gamma(z)$. The Euler's integral for $\Gamma(z)$. The factorial function, The Legendre's duplication formula, Gauss multiplication theorem. Hypergeometric function ${}_2F_1(a,b,c;z)$ and evaluation of ${}_2F_1(a,b,c;z)$. The contiguous function relations. The hypergeometric differential equation. Simple transformations, Kummer's theorem.
(No of Lectures 15)

(v) Recommended Reading:

a. Basic Reading:

i) R. Weinstock: Calculus of Variations with Applications to Physics and Engineering. McGraw Hill Book Comp. (1952).
ii) A. S. Gupta: Calculus of Variation with Applications, Prentice Hall of India (1997).
iii) I. M. Gelfand and S. V. Fomin: Calculus of Variations, Prentice Hall of Inc (1963).
iv) E. D. Rainwille: Special Functions, MacMillan (1967)
v) I. N. Sneddon: Special Functions of Mathematical Physics and Chemistry, Oliver and Boyd (1961)
vi) N. N. Lebedev: Special Functions and their Applications, Prentice Hall of Inc (1965).
vii) K. Sankara Rao: Introduction to Partial Differerntial Equations, Prentice Hall of India, New Delhi, 2005

b) Additional Reading: --

c) References

i) Books: -

ii) Periodicals / Journals: -

NEW/REVISED SYLLABUS FOR

M. Phil. / Ph.D. Course Work
(Introduced from June 2011 onwards)

(i) Paper : III
(ii) Title of Paper: Atomistic and Multiplicative Lattices
(iii) Specific Objectives: In this course student will be acquainted with concepts of Atomistic and multiplicative lattices

(iv) UNITS:

UNIT I :

Lattices, modular lattices, distributive lattices, Boolen Algebra product of lattices. (No of Lectures 15)

UNIT II:

Symmetric Lattice and basic Propeties of lattices:Modularity in Lattices Semi-orthogonality in lattices, orthogonality in lattices in Symmetric Lattices, Distributivity and the Center of a Lattice,ceter of Complete Lattices, Perspectivity and projectivity in Lattices. (No of Lectures 15)

UNIT III:

Atomistic Lattices and the Covering Property:The Covering Property in Atomistic Lattices, Atomistic Lattices with the Covering Property, Finite-Modular AC-Lattices, Distribuvity and Perspecctivity in Atomistic Lattices, Perspecctivity in AC- Lattices, Completion by cuts. (No of Lectures 15)

UNIT IV:

Multiplicative Lattices :Definition Principal , Quotients Lattices, Noetherian Lattices (No of Lectures 15)

V) Recommended Reading

a) Basic Reading:

1: Theory of Symmetric Lattices, F.Maeda and S. Maeda,Spriinger-Verlag,1970
2: Theory of Lattices and pro. Of Lattices Graters
3: Abstrol theory of by R.P Dilwaorth Pacific Jorunal vol.

b) Additional Readings: -

c) References

i) Books: -
ii) Periodicals / Journals: -

NEW/REVISED SYLLABUS FOR
M. Phil. / Ph.D. Course Work
(Introduced from June 2011 onwards)

(i) Paper - M. Phil. Paper III
ii) Title of Paper: Generalized Integral Transformations
(iii) Specific Objectives: The objective of the paper is to introduce Frechet spaces and different spaces of distributions, or Generalized functions. In this course students will be acquainted with Laplace, Mellin and finite integral transforms on spaces of distributions and applications
(iv) UNITS:

Unit I:
Multinormed Spaces, Countable-Union Spaces, Duals of Countably Multinormed Spaces, Duals of Countable-Union Spaces, operators and Adjoint Operators, The Spaces $D(I)$, and Their Duals; Distributions, The Space $E(I)$ and Its Dual; Distributions of compact , Support, Generalized Functions (No of Lectures 15)

Unit II: The Testing-Function Spaces $L_{a,b}$ and $L(w,z)$ and Their Duals, The two-sided Laplace Transformation, Operation- Transform Formulas, Inversion and Uniqueness An Operational Calculus, convolution, the Laplace Transformation of Convolution, The Cauchy Problem for the Wave equation in One-Dimensional Space. (No of Lectures 15)

Unit III: The testing function spaces $M_{a,b}$ and $M(w,z)$ and their duals, the Mellin transformation, operation transform formulae, Operational Calculus for Euler differential equations. (No of Lectures 15)

Unit IV: The Testing-Function Spaces A, Generalized Functions Space A', Orthonormal Series Expansions and Generalized Integral Transformations, Characterizations of the Generalized Functions in A' and their Transforms, An Operational Calculus for the operator R. (No of Lectures 15)

(v) Recommended Reading :

a) Basic Reading:- Zemanian A.H.: Generalized Integral Transformations, John-Wiley & Sons(1968).
b) Additional Reading: Pathak R.S.: Course in Distribution Theory & Applications, Narosa (2001).
c) References

i) Books:
1) Al-Gwaiz M.A., Theory of Distributions, Marcel-Dekker (1992).
2) Kanwal R.P., Generalized Functions; Theory & Techniques, Academic Press (1983).
3) Keshavan S.: Topics in Functional Analysis & Applications, Wiley Eastern

ii) Periodicals / Journals: -

NEW/REVISED SYLLABUS FOR
M. Phil. / Ph.D. Course Work
(Introduced from June 2011 onwards)

(i) Paper - III

(ii) Title of paper - Trellis Theory

(iii) Specific Objectives - In this course student will be acquainted with concepts of Trellis theory.

(iv) UNITS:

UNIT -I :

- Pseudo-ordered Sets
- Trellises
  Complete Trellises (No of Lectures 15)
-
- UNIT-II :
- Transitive and Associative Elements
- Distributive Elements
  Standard Elements (No of Lectures 15)
- UNIT-III :
  Modular Trellises (No of Lectures 15)
- UNIT-IV :
- Boolean Lattices
- Mappings
- Ideals
  Trellis Groups (No of Lectures 15)

(v) Recommended Readings:

a) Basic Reading :

1. Skala H.L., Trellis theory, American Mathematical Society, Providence, R. I., 1972.

b) Additional Reading : -

c) References :

i) Books:

1. Gratzer G.: Lattice Theory – First Concepts and Distributive Lattices.
2. Birkhoff G.: Lattice Theory, (American Mathematical Society, Providence, Rhose Island, (1967) Colloquium Publications, 25.

ii) Periodicals / Journals: -

NEW/REVISED SYLLABUS FOR
M. Phil. / Ph.D. Course Work
(Introduced from June 2011 onwards)

(i) Paper - III
(ii) Title of paper - Commutative Algebra
(iii) Specific Objectives: In this course student will be acquainted with concepts of Commutative Algebra.
(iv) UNITS:

Unit – I : Minimal Prime and Primary Ideals : Examples and properties of Minimal, Prime and Primary Ideals. The nil radical of an ideal and its properties, semiprime ideals. The associated prime ideal of a primary ideal, Problems. (No of Lectures 15)

Unit – II: Minimal prime ideals of a ring.Certain Radicals of a Ring : Jacobson Radical, The definition of the idempotents of R/I can be raised or lifted into R and its properties, Primary rings, Problems. (No of Lectures 15)

Unit – III: Quasiregular element and its properties, Prime radicals, Modular ideals, Jradial of a ring. Boolean rings, Regular rings, Stone representation theorem. Direct sumof Rings, Problems. (No of Lectures 15)

Unit – IV: Birkhoff theorem , Rings with Chain conditions: Equivalence of three conditions of a ring with a.c.c., Hilbert Basis Theorem, Levitsky Theorem, Wedderburn Theorem, Problems. (No of Lectures 15)

(v) Recommended Reading:

a) Basic Reading:

1. Barton David M. : A first course in Rings and Ideals Addison Wesley Publishing Company 1970.
2. Oscar Zoriskiand P. Samuel : Commutative Algebra, Vol.I, Affilioted East Press Pvt. Ltd., New Delhi.

b) Additional Readings: -

c) References:

i) Books:

1. M.Atiyah and I.C. McDonald : Commutative Algebra.
2. Motsumura : Commutative Algebra.

ii) Periodicals / Journals: -

NEW/REVISED SYLLABUS FOR
M. Phil. / Ph.D. Course Work
(Introduced from June 2011 onwards)

(i) Paper : III
(ii) Title of paper : Theory of Near Rings
(iii) Specific Objectives: In this course student will be acquainted with concepts of Near Rings.
(iv) UNITS:

Unit – I : Definition and properties of N – groups and substructures Homomorphism and Ideals. Annihilators. Near Rings of quotients. Products and direct products. Embedding in M(Γ). (No of Lectures 15)

Unit – II: Chain conditions. Prime ideals, semi-prime ideals, Nil and Nilpotent ideals. Idempotent elements. (No of Lectures 15)

Unit – III: Distributively generated Near Rings. Construction of distributively generated Near Rings. Distributively generated Near Rings with finiteness conditions. Polynomial Near Rings. (No of Lectures 15)

Unit – IV: Near fields. Conditions to be a Near field. The additive group of a Near field. The center and Kernel of a Near field. Dikson Near fields. (No of Lectures 15)

(v) Recommended Reading:

a) Basic Reading

1. Guntur Pilz: Near Rings, North Holland Publishing Company, Revised Edition 1983.

b) Additional Readings: -
c) References :
i) Books: -
ii) Periodicals / Journals: -

NEW/REVISED SYLLABUS FOR
M. Phil. / Ph.D. Course Work
(Introduced from June 2011 onwards)

(i) Paper - III
(ii) Title of Paper: Topics in General Relativity
(iii) Specific Objectives: Students will be exposed to some Mathematical techniques to understand the nature and to solve the real world problems.

(iv) UNITS :

Unit: I

Killing vector fields, Isometry. Necessary and sufficient conditions for isometry. Homogeneity and isometry. Maximally symmetric space-time. Einstein space. The action principle, the energy momentum tensor. The stress energy momentum tensor for perfect fluid, electromagnetic field. Einstein's field equations from action principle and its Newtonian approximation. Flat space and empty space. Local conservation laws associated with perfect fluid distribution. (No of Lectures 15)

Unit: II

Schwarzschild space-time. Spherical symmetry. Einstein field equations under spherical symmetry. Schwarzschild exterior solution. Isotropic co-ordinates. Retarded time. Isotropic form of Schwarzschild exterior solution. Tetrad Formalism, Covariant differentiation, Ricci's rotation coefficients, Cartan's equations of Structure, Bianchi identities, Lie derivative, Calculation of connection 1-forms and curvature 2-forms for Vaidya's metric, Godel metric and spherically symmetric space times.

(No of Lectures 15)

Unit: III

Geometry of the expanding universe, space of constant curvature, space of negative curvature, Einstein Universe, De Sitter Universe. A non isotropic model. Properties of Einstein and De Sitter Universe The linearized field equations. The Weyl solution to linearized field equations. Associated Weyl solutions. Structure of the linearized equations. Static spherically symmetric solution of linearized field equations.

(No of Lectures 15)

Unit: IV

Four velocity of the fluid. Decomposition of the 4 velocity of a fluid u_i in terms of acceleration, rotation, shear and expansion. Isentropic flow. Raychaudhari equation. Geodesic flow with shear and expansion, Equation of motion, stress energy tensor of a mass less scalar field and perfect fluid. Maxwell equations, Generalization of Maxwell's equations. Invariance of Maxwell's equations under conformal transformations.

(No of Lectures 15)

(v) Recommended Reading:

a) Basic Reading :

1. R. Adler, M. Bazin and M. Schiffer: Introduction to General Relativity, McGraw-Hill Book Com. (1975).
2. J.V. Narlikar: Lectures on General Relativity and Cosmology. The Mac Millan com.(1978).
3. A. P. Lightman, W. H. Press, R. H. Price and S. A. Teukolsky: Problem Book in Relativity and Gravitation, Princeton University Press, (1975).

b) Additional Readings:

c) References :

i) Books: -

ii) Periodicals / Journals: -

NEW/REVISED SYLLABUS FOR
M. Phil. / Ph.D. Course Work
(Introduced from June 2011 onwards)

(i) Paper: III
(ii) Title of paper: Theory of Choice
(iii) Specific Objectives: Introduction to choice mathematically.
(iv) UNITS:

Unit I Preliminaries: The concept of choice, Examples of choice problems in economics. Ordering relation, Mapping and Correspondences, Maximal elements and greatest elements, Utility functions. The axioms of preference model, Revealed preference, Favorability and revealed favorability, The logical significance of the preference model. (No of Lectures 15)

Unit II: A choice function model, The connection between the choice function model and the preference model, some implications of the choice function model. (No of Lectures 15)

Unit III: Introduction, sets in real Euclidean space, c.u.p. sets, Theorem on c.u.p. sets, Properties of real valued functions (No of Lectures 15)

Unit IV: The axioms of the consumer preference model, the utility function, the demand function and its connection with choice function, preference sets, Duality in consumer choice theory, Preordering of the price space and the dual utility function, Demand functions, price functions and revealed preference relations. (No of Lectures 15)

(V) Recommended Reading:

a) **Basic Reading**:
Axiomatic Choice Models, H. N. Weddepohl, Rotterdam University Press, Netherlands 1970

b) **Additional Reading**: Social Choice and Individual values Edn. 2, Arrow K. J., John Willey and Son's, New York- 1963

c) **References**:

i) Books:
Handbook of Mathematical Economics- vol.1, Arrow K. J. and Intriligator, Amsterdam, north-Holland 1981

i) Periodicals / Journals: -

NEW/REVISED SYLLABUS FOR
M. Phil. / Ph.D. Course Work
(Introduced from June 2011 onwards)

(i) Paper: III
(ii) Title of paper: Theory of Fuzzy Computation
(iii) Specific Objectives: Insight in to fuzzy computation and problem extraction for research.
(v) UNITS:

Unit I: Max-min automata, General formulation of automata, Classes of automata, Behavior of Max-min automata, Equivalence and homomorphism of max-min automata.
(No of Lectures 15)

Unit II: Reduction of max-min automata, Definite max-min automata, Reduction of max-min machines, Equivalences, Irreducibility and minimality, Determinism and non-determinism of max-min automata. (No of Lectures 15)

Unit III: Max-product machines, Equivalences, Irreducibility and minimality, Max-product grammars and languages, Weak regular max-product grammars and languages.
(No of Lectures 15)

Unit IV: Fuzzy languages, Types of grammars, Fuzzy context-free grammars, Context-free max-product grammars, Context-free fuzzy languages, Meaning of context-free languages.
(No of Lectures 15)

(V) Recommended Reading:

a) **Basic Reading**:
Fuzzy Automata and Languages: Theory and Applications, J. N. Mordeson and D. S. Malik, Champan and Hall / CRS Press, New York 2002.

b) Additional Reading:
Fuzzy Relational Calculus: Theory, Applications and Softwares, Ketty P. and Yordan K., World Scientific, New Jersey, 2004.

c) References:

i) Books :
Introduction to Automata Theory, Languages and Computation, Hopcroft J. E and Ullman J. D., Narosa Publishing House, New Delhi 1993.

ii) Periodicals / Journals: -

NEW/REVISED SYLLABUS FOR

M. Phil./Pre Ph.D. in Mathematics

(Introduced from June 2011 onwards)

(i) Paper - III

ii) Title of Paper: **Lattices Theory**

(iii)Specific Objectives: In this course student will be acquainted with concepts of Lattices Theory

(iv) UNITS:

Unit :1

Types of lattices:- Posets, Isomorphism , Graded Poset, Lattices, Lattices Algebra, Distributivity, Semimodularity, Boolean Lattices, Boolean Algebra, Quasi-ordering, Lattice Postulates, Semi lattices, Morphisms and ideals, Congruence Relations, Modularity, Brouwerian Lattices. (No of Lectures 15)

Unit: 2

Complete Lattice:- Closure Operation , Ideal Lattices , Fix point Theorem, Topological closure , Infinite Distributivity , Lattices with Unique Complements, Complete Brouwerian Lattices , Theorem of Glivenko. (No of Lectures 15)

Unit: 3

Application of Lattice Theory to Algebra :- Modules; Group with Operators ,Permutable congruence , Direct decompositions, Kurosh-Ore Theorem , Theorem of Ore , Subgroup Lattices, Modular Subgroup Lattices. (No of Lectures 15)

Unit: 4

Application of Lattice Theory to General Topology :- Properties of the lattices of all open sets and lattices of all closed sets of given topological space , T1 – lattices , Bases and Sub bases ; Compactness , Alexander and Tychonoff Theorem , Wallman Theorem , Metric lattices , Valuation on lattice , Distribution valuation . (No of Lectures 15)

Recommended Reading:

a) Basic Reading:

1) Gratzer G :Lattice Theory – First concepts and Distributivity lattices.

2) Birkhoff G : Lattice Theory , (American Mathematical Society,Providence, Rhose Island) Colloquium Publications , Volume 25.

b) Additional Reading: -

c) References: -

i) Books: -

ii) Periodicals / Journals: -

NEW/REVISED SYLLABUS FOR
M. Phil./Ph.D. Course Work
(Introduced from June 2011 onwards)

(i) Paper : III
(ii) Title of Paper : Topics in Geometric Function Theory
(iii) Specific Objectives: In this course student will be acquainted with concepts of Geometric Function Theory. This is a branch of Complex Analysis with sustained interest for several years.

(iv) UNITS:

UNIT: I

Schwarz's Lemma, Montel's Theorem, Green's Theorem on Harmonic functions, Univalent functions, Koebe Functions, Area theorem, Growth and distortion theorems.
(No of Lectures 15)

UNIT: II

Brief history of D'Branges theorem, Littlewood's theorem, Convex, starlike functions, Alexander's theorem, Close to convex functions, Noshiro-Warchawski's theorem, Kaplan's theorem. (No of Lectures 15)

UNIT III

Spirallike functions, Radius of starlikeness, convexity and close to convexity, Differential subordination, Hypergeometric functions, Ruscheweyh derivative operator, convolution (Hadamard product). (No of Lectures 15)

UNIT IV

Extreme points, Herglotz' representation, meromorphic univalent functions, Harmonic univalent functions, Fractional derivatives, coefficient inequalities, closure property.
(No of Lectures 15)

Reference Reading:

a) Basic Reading:

1. P.L.Duren: Univalent Functions, Springer-Verlag, New York, Berlin, Heidelberg,1983
2. S. S. Miller and P. T. Mokano: Differential Subordinations, Mercel Dekkar, Inc., New York, Basel, Hong-Kong.

b) Additional Readings: -

c) References:

i) Books: -

ii) Periodicals / Journals : -

NEW/REVISED SYLLABUS FOR
M. Phil./ Ph. D. Course Work
(Introduced from June 2011 onwards)

i) **Paper : III**
ii) Title of Paper : Fluid Dynamics
(iii) Specific Objectives:
(iv) A brief note: - (Notations and concepts are taken from books given in basic reading; this should be taken in account for examination point of view).
(v) UNITS:

Unit- I :- INDRODUTION AND PHYSICAL PROPERTIES OF FLUD

Concepts of fluids, types of fluid, continuum hypothesis, Physical properties of fluid: Density, specific weight, Specific volume, Pressure, Viscosity and surface tension, Compressibility and Bulk modulus, vapour pressure and examples. (No of Lectures 15)

UNIT- II :- KINEMATICS OF FLUID

Basic concepts, Eulerian and Lagrangian methods for description fluid motion, steady and unsteady motion, stream line motion and turbulent motion, uniform and non-uniform motion rotational and irrotational motion , stream line, path line, streak line, velocity potential , stream function, vorticity vector, Equation of continuity, equation of continuity by Eulerian and Lagragian methods, equation of continuity in different co-ordinates, Velocity and acceleration of fluid particle. (No of Lectures 15)

UNIT- III:- EQUATION OF MOTION

Euler's equation motion, pressure equation, Bernoulli's , equation Cauchy's integrals. Equation for impulsive action, example. Flows and circulation, Kelvin's Circulation theorem, Helmholtzs Vorticity equation. (No of Lectures 15)

UNIT –IV :-MAGNETTHOHYDRODYNAMICS

Nature of Magnetohy drodynamics, Maxwell's electromagnetic field equations: Medium at rest, Maxwell's electromagnetic field equations: Medium at motion , the equations of motion of a conducting fluid, rate of flow of charge, simplification of electromagnetic field equations. Electromagnetic waves. (No of Lectures 15)

(v) Recommended Reading:
a) Basic Reading:
1. A textbook of Fluid Dynamics by F.Chorlton. CBS publishers & Distributors, Delhi.
2. Fluid Dynamics by Dr .J. K. Goyal & K. P. Gupta, Pragati Prakashan.

b) Additional Readings: -
c) References:
i) Books:
1. A textbook of Fluid Dynamics by R. k. Rajput, S. Chand & Company LMD. Ram Nagar, New Delhi.
2. Fluid Dynamics by A. K. Jain, Khanna Pub. ,Delhi.
3. Streeter, McGraw-Hill International Co. Auckland.
4. Fluid Dynamics by White.
5. Fluid Dynamics by Arora.

ii) Periodicals / Journals : -

NEW/REVISED SYLLABUS FOR

M. Phil./ Ph.D. Course Work

(Introduced from June 2011 onwards)

(i) Paper: **III**

(ii) Title of Paper: **Fuzzy Measures and Integrals**

(iii) Specific Objectives: In this course student will be acquainted with concepts of Fuzzy Relations, Fuzzy Logic, Fuzzy Measures and Fuzzy Integrals.

(iv) UNITS:

UNIT I: FUZZY RELATIONS:

Projections and cylindrical Extensions Binary Fuzzy Relations on single set, Fuzzy equivalence relations, Fuzzy Compatibility Relations, Fuzzy ordering Relations Fuzzy morphisms SUP-I compositions and inf-wi compositions .fuzzy Relation Equation :Problem Partitioning, solution methods, Fuzzy relational equations based on sup-I and inf-wi compositions, Approximate solutions . (No of Lectures 15)

UNIT II: FUZZY LOGIC:

Fuzzy propositions. Fuzzy Quantifiers, Linguistic Hedges, Inference from conditional fuzzy propositions, Qualified and quantified propositions. Approximate Reasoning:- Fuzzy expert systems, Fuzzy implications, selection of Fuzzy implications, Multi-conditional Approximate Reasoning, Role of fuzzy relational equations, Interval valued Approximate Reasoning. (No of Lectures 15)

UNIT-III: FUZZY MEASURES:

Fuzzy measures, Evidence theory, possibility theory, Fuzzy sets and possibility theory, possibility theory verses probability theory Uncertainty based Information:- Information and Uncertainty, Non specificity, of crisp sets and fuzzy sets fuzzyness of fuzzy sets, uncertainty in Evidence theory, uncertainty measures, of uncertainty. (No of Lectures 15)

UNIT-IV:

Fuzzy measures as Non additive measures, Sugeno integrals and its properties, Choquet integral, Fuzzy integrals as an aggregation oprators. Applications to multicriteria Decision Making. Choquetn expted utility model, The Choquet integral in multiattribute decision making. (No of Lectures 15)

(v) Recommended Reading:

a) Basic Reading:

1: George J Klir, Bp yuan, Fuzzy sets and Fuzzy Logic. Theory and applications, Prentice-Hall of India. Pvd .Ltd.(2000)

2: M.Grabish, Sugeno, and Murofushi Fuzzy Measures and Integrals: theory and Applications PHI, 1999, India.

3: H.J.Zimmerermann, fuzzy set Theory and its Applications, Kluwer, 1984.

b) Additional Reading: -

c) References:

i) Books: -

ii) Periodicals / Journals: -

NEW/REVISED SYLLABUS FOR

M. Phil./ Ph.D. Course Work

(Introduced from June 2011 onwards)

(i) Paper : III

(ii) Title of Paper : Numerical Analysis III

(iii) Specific Objectives : --

(iv) UNITS:

UNIT I: Boundary value problems, shooting method, derivative boundary conditions, characteristic value problems, Alternating direction implicit method, irregular regions and nonrectangular grids. (No of Lectures 15)

UNIT II: Finite difference approximations to partial derivatives, the local truncation error, consistency and inconsistency of numerical method, convergence and analysis of approximations, Stability, Von Neumann analysis, The global rounding error.

(No of Lectures 15)

UNIT III: Parabolic partial differential equations, solution techniques for parabolic equation in one dimension, parabolic equations in two and three dimensions, finite difference methods , finite element methods for parabolic partial differential equations.

(No of Lectures 15)

UNIT IV: Hyperbolic partial differential equations, solution techniques, equations in two and three dimensions, finite element methods in hyperbolic partial differential equations.

(No of Lectures 15)

(v) Recommended Reading:

a) Basic Reading:

Gerald and Wheatley: Applied numerical analysis, sixth Edition, Pearson Education 2002

b) Additional Readings: -

c) References:

i) Books:

1) M. K. Jain: Numerical solutions of differential equations. Wiley Estern Ltd 1991.

2) G. D. Smth: Numerical Solution of Partial Differential Equations Finite Difference Methods, Third Edition, Oxford University Press.

ii) Periodicals / Journals: -

NEW/REVISED SYLLABUS FOR
M. Phil./Ph. D. Course Work
(Introduced from June 2011 onwards)

(i) Paper : III
(ii) Title of Paper : Group Analysis of Differential Equations
(iii) Specific Objectives : --

(iv) UNITS:

UNIT I:

One parameter transformation groups, local lie group, tangent vector field, Lie Equation, examples, correspondence of groups and vector fields, criterion of invariance, examples of invariants. (No of Lectures 15)

UNIT II:

Groups admitted by Differential equations, Fundamental definitions, Action on solutions, full group, Lie algebra of operators, commentators, action of mappings, algebraic properties, structural tensor, isomorphism criterion (No of Lectures 15)

UNIT III:

Full Lie group of concrete system of equations, system of first order equations, general solution analysis, structure of full Lie algebra, Higher order equations.
(No of Lectures 15)

UNIT IV:

Structural constants, homomorphism, sub algebras, Factor algebra, the radical, Levi theorem (statement only), Associated Lie algebra, algebra of differentiation, inner automorphism, Killing's form, Structural properties, Optimal sub algebraic systems, Maltsev-Harish-Chandra theorem (statement only), examples. (No of Lectures 15)

(v) Recommended Reading:

a) Basic Reading:

L.V.Osiannikov, Group analysis of differential equations Academic pres 1982.

b) Additional Readings: -

c) References:

i) Books:

1) P.J.Olver, Applications of Lie groups to differential equations, Springer Verlag, New York, 1986.
2) G.W. Bluman and J.D.Cole, Similarity methods for differential equations, Springer Verlag NY 1974.

ii) Periodicals / Journals: -

P **NEW/REVISED SYLLABUS FOR**
M.Phil./Pre Ph.D. in Mathematics (Academic Flexibility)
(Introduced from June 2011 onwards)

(i) Paper - M.Phil. Paper III
ii) Title of Paper: Mathematical Modeling
(iii) Specific Objectives: The objective of the paper is to aquatint the students applications of difference and differential equations and different mathematical models.

(iv) A brief note: - (Notations and concepts are taken from books given in basic reading; this should be taken in account for examination point of view).

Unit 1: Application of first order differential equations

1.1 Growth and decay
1.2 Dynamics of Tumour Growth
1.3 Biological Growth
1.4 A problem in Epidemiology

Unit 2: Setting up first-order Differential equations from word problems

Unit 3: Difference and Differential Equation Population Growth Models

Unit4: Single Species Population Models.

Unit5: A model for the Detection of Diabetes.

Unit6: Combat Models:
6.1 Three Lanchester Combat Models.
6.2 Conventional Combat : The square Law.
6.3 Guerrilla Combat: The linear law.

Reference Books:
1) Mathematical modeling: J.N.Kapur.
New Ageinternational (P) Limited, Publishers, Reprint 2003.
2) Differential Equations and There Applications: Zafar Ahsan, Second Edition.
Prentice-Hill of India. New Delhi-1100001.
3) Differential equation Models : Martin Braun,Courteny S Coleman ,Donald A Drew, Vol.1 Springer – Verlag.