B.R.A.BIHAR UNIVERSITY, MUZAFFARPUR

COURSE OF STUDY

M.A/M.Sc, MATHEMATICS

SEMESTER- I, II, III & IV

CHOICE BASED CREDIT SYSTEM (CBCS)

(To be effective from 2018-2019)

26/3/19
University Professor &
Head of the Deptt. of Mathematics
B.R.A.B.U., Muzaffarpur

Syllabus of M.A/M.Sc (Mathematics) Semester II

PAPER V (MAT CC 05)

General Advanced Mathematics

Integral Transforms:

Unit I : Laplace transform, Definition of t^n, e^{at}, Sinhat, Coshat, Sinat, Cos at, Convolution theorem, Application of Linear differential equations with constant coefficients. Fourier transform, Fourier Integral theorem, Fourier sine and cosine transforms.

Fuzzy Set Theory:

Unit II: Fuzzy Sets Versus Crisp sets, Basic definitions, types, properties and representations of Fuzzy sets, Convex Fuzzy sets, Basics operation on Fuzzy set, α- Cuts, Decompositions theorem, Complements, t- norm and t-conorms, Exten - sion principles and Simple applications of Fuzzy sets.

Graph Theory

Unit III : Definition of graphs, paths, circuits and subgraphs, induced subgraphs, degree of a vertex, connectivity, planar graphs and their properties, Trees and simple applications of graphs.

Number Theory

Unit IV : Divisibility Theory in the Integers: Division Algorithm, the Greatest Common Division. The Euclidean Algorithm, The Diophantine Equations ax + by = c, Fundamental Theorem of Arithmetic.

References:

1. Kolman, Bushi and Ross:- Discrete Mathematical Structure.
2. Pundir And Pundir:- Fuzzy Sets & their Application,
3. G.J.Klir & B. Yuan :- Fuzzy sets.
4. Graph Theory: F. Harare, Addison Wesley.
5. A. Baker, A concise introduction to the Theory of Numbers.

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PAPER VI (MAT CC 06)

Complex Analysis

Complex Analysis

Unit 1 : Algebra of complex numbers, the complex plane, polynomials, power series, transcendental functions such as exponential, trigonometric and hyperbolic functions. Analytic functions, Cauchy-Riemann equations.

Unit 2 : Contour integral, Cauchy's theorem, Cauchy's integral formula, Liouville's theorem.

Unit 3 : Taylor's theorem, Maximum modulus Principle, Schwarz's Lemma, Laurent Series, Isolated singularities, Meromorphic function, Mittag-Leffler's theorem The argument principle, Rouche's theorem, power series.

Unit 4 : Residues, Cauchy's residue theorem, Evaluation of integral, Branches of many valued functions with special reference to argz, logz and Z^n, Bilinear transformations, their properties and classifications, definition and examples of conformal mappings. Mobius Transformations.

References :

1. J.B. Conway :-Functions of one Complex Variables,
2. L.V. Ahlfors :- Complex Analysis

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PAPER VII (MAT CC-07)

Differential and Integral Equations

Differential and Integral Equations

Unit 1 : Initial Value problem and the equivalent integral equation, n order equation in d dimension as a first order system. Concepts of local existance, existance in the large and uniqueness of solution with examples.

Unit 2 : Integral Equations and their classifications. Eigen values and eigen functions. Fredholm Integral equations of Second Kind, Iterative Scheme and method of successive approximations.

Unit 3 : Ascoli- Arzela theorem, a theorem on convergence of solutions of a family of Initial value problems. Picard- Lindelof theorem, Peano's existance theorem Corollaries, Kamke's convergence theorem.

Unit 4 : Gronwall's inequality, maximal and minimal solution, Differential inequalities, Uniqueness theorem, Nagumo's and Osgood's criteria, successive approximations.

References :

1. P. Hartman :- Ordinary Differential Equation
2. S.G.Mikhlin :- Linear Integral Equations.
3. R.P.Kanwal :- Linear Integral Equations, Theory and Techniques.

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PAPER VIII (MAT CC-08)

Measure Theory

Measure Theory

Unit 1 : Lebesgue outer measure, Measurable sets Measuribility, Measurable functions, Borel and Lebesque measurability, non- measurable sets.

Unit 2 : Integration of non-negative functions, the general integral, Integration of series, Riemann and Lebesgue integrals.

Unit 3 : The Four Derivatives, function of bounded variation, Lebesgue differentiation Theorems, Differentiation and Integration.

Unit 4 : Measure and outer measure, extension of measures,uniqueness of extension, Completion of a measure, measurable spaces, Integration with respect to a measure.

Unit 5 : The L^P-spaces, convex functions, Jensen inequality Holder's and Minkowski's Inequalities, completeness of L^P-spaces, convergence in measure, Almost uniform Convergence.

References:

1. G.de Barra :- Measure Theory and Integration
2. P.K. Jain and V.P Gupta :- Lebesque Measure and Integration
3. I.K. Rana :- An Introduction to Measure and Integration
4. P.R. Halmos- Measure Theory.

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PAPER IX (MAT CC-09)

Topology

Unit 1 : Definition and examples of topological spaces, closed sets, dense subsets, Neighbourhood, interior, exterior, boundary and accumulation points. Derived Sets, Bases and subbases. Subspaces and Relative topology.

Unit 2 : Continuous functions and homeomorphism, characterisation of continuity in Terms of open sets, closed sets, basic open sets, sub- basic open sets and closure. First and second countable topological spaces Lindelof's theorem, separable Spaces, second countability and separability.

Unit 3 : Separation axioms T_0, T_1 *and* T_2 and their basicsproperties, compactness, Continuous function and compact sets, basic properties of compactness and Finite intersection property.

Unit 4 : Connectedness, continuous function and connected sets characterization of Connectedness in terms of a discrete two point space connectedness on real line.

Unit 5 : Regular and Normal spaces T3 and T4 spaces, characterisations and basic properties, Urysohn's lemma and Tietze extension Tehorems.

References:

1. G.F. Simmons :- Introduction to Topology and Modern Analysis
2. K.K.Jha :- Functional Analysis, Advanced General Topology
3. Futton:- Algebraic Topology First Course

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PAPER X (MAT CC-10)

Number Theory

Number Theory

Unit 1 : Divisibility, G.C.D. and L.C.M., Primes, Fermat numbers, congruences and residues, theorems of Euler, Format and Wilson, solutions of congruences, linear congruences, Chinese remainder theorem.

Unit 2 : Arithmetical functions $\varphi(n)$, $\mu(n)$ and $d(n)$ and $\sigma(n)$, Moebius inversion formula, congruences of higher degree, congruences of prime power modulli and prime modulus, power residue.

Unit 3 : Quadratic residue, Legendre symbols, lemma of Guass and reciprocity law, Jacobi symbols, Farey series, rational approximation, Hurwitz theorem, irrational numbers, irrationality of e and π, Representation of the real numbers by decimals.

Unit 4 : Finite continued fractions, simple continued fractions, infinite simple continued fractions, periodic continued fractions, approximation by convergence, best possible approximation, Pell's equations, Lagrange four sphere theorem.

References:

1. Theory of Numbers, G.H. Hardy and E M Wright, Oxford Science Publications, 2003.
2. Introduction to the Theory of Numbers, I Niven and H S Zuckerman, John Wiley & Sons, 1960.
3. Elementary Number Theory, D M Burton, Tata McGraw Hill Publishing House, 2006.
4. Higher Arithmetic, H. Davenport, Cambridge University Press, 1999.
5. Introduction to Analytic Number Theory, T.M. Apostal, Narosa Publishing House.