

B.Sc.(HONOURS): PART-I

Semester: I

SUBJECT: MATHEMATICS

PAPER: HONOURS-II/SUBSIDIARY (A)

Session 2019-2020

TITLE: CALCULUS

SYLLABUS

Differential Calculus:

Successive differentiation. Expansion of functions (Leibnitz theorem. Maclaurin and Taylor series expansions). Tangent and Normals, Asymptotes in Cartesian coordinates, intersection of curve and its asymptotes, asymptotes in polar coordinates.

Curvature, radius of curvature for Cartesian curves, parametric curves, polar curves. Newton's method. Radius of curvature for pedal curves. Tangential polar equations. Centre of curvature. Circle of curvature. Chord of curvature, evolutes. Tests for concavity and convexity. Points of inflexion. Multiple points. Cusps, nodes & conjugate points..Tracing of curves in Cartesian, parametric and polar co-ordinates.

Integral Calculus:

Area of curves, Length of the curve, Volumes and surfaces of solids of revolutions, Multiple integrals (Double and Triple integrals, Dirichlets integrals, Change of order of integration in double integrals), Beta and Gama functions , Applications of integration(Centre of Gravity, Centre of Pressure, Moment of inertia).

Recommended Book:

1. Gorakh Prasad, Differential Calculus, Pothishasla Pvt. Ltd., Allahabad.
2. Gorakh Prasad, Integral Calculus, Pothishala Pvt. Ltd., Allahabad.

Reference Books:

- R.G.Bartle and D.R.Sherbert, Introduction to Real Analysis, John Wiley & Sons(2003).
- S C Malik and Savita Arora ;Mathematical analysis, New Age International(P) Limited, Publishers,New Delhi, Fifth edition, 2017
- Shanti Narayan, Differential and Integral Calculus, S. Chand & Company, Osmania University.
- Murray R. Spiegel, Theory and Problems of Advanced Calculus, Schaun's Outline Series, Schaum Publishing Co., New York.
- N. Piskunov, Differential and integral Calculus, Peace Publishers, Moscow.
- Gabriel Klambauer, Mathematical Analysis Marcel Dekkar, Inc. New York, 1975.

ASHI
10/15/2019
Mohu

10/10/19
Amf

10/5/19
SP

Institute for Excellence in Higher Education (IEHE), Bhopal

S-162 (B) (N-08)

B.Sc.(HONOURS): PART-I

Semester: I

SUBJECT: MATHEMATICS

PAPER: HONOURS-II/SUBSIDIARY (B)

Session 2019-2020

TITLE: ALGEBRA & TRIGONOMETRY

SYLLABUS

Algebra:

Matrices: Symmetric, Skew symmetric, Hermitian and skew-Hermitian matrices. Elementary Operations on matrices. Rank of a matrices. Inverse of a matrix. Linear dependence and independence of rows and columns of matrices. Row rank and column rank of a matrix. Eigen values, eigenvectors and the characteristic equation of a matrix. Minimal polynomial of a matrix. Cayley Hamilton theorem and its use in finding the inverse of a matrix. Applications of matrices to a system of linear (both homogeneous and non-homogeneous) equations. Theorems on consistency of a system of linear equations. Unitary and Orthogonal Matrices, positive definite matrices, Quadratic forms.

Theory of Equations: Relations between the roots and coefficients of general polynomial equation in one variable. Solutions of polynomial equations having conditions on roots. Common roots and multiple roots. Transformation of equations. Nature of the roots of an equation, Descarte's rule of signs. Symmetric functions of roots, Solutions of cubic equations (Cardon's method).

Trigonometry:

De Moivre's theorem and it's applications, Direct and Inverse Circular and Hyperbolic functions. Logarithm of complex quantities. Gregory's series

Books Recommended:

1. H. S. Hall and S.R. Knight, Higher Algebra, H.M. Publications 1994.
2. Shanti Narayan , A Text Books of Matrices, S. Chand Publications.
3. Chandrika Prasad, Text Book on Algebra and Theory of Equations, Pothishala Private Ltd., Allahabad.
4. S. L. Loney, Plane Trigonometry Part – II, Macmillan and Company, London.
5. R. S. Verma and K.S. Shukla, Text Book on Trigonometry, Pothishala Pvt. Ltd. Allahabad.

Handwritten signatures and dates:
10/5/2019
ASH
10/05
10.5
10/5
10/5

B.Sc.(HONOURS) : PART-I

Semester: II

SUBJECT: MATHEMATICS

PAPER: HONOURS-I

Session 2019-2020

TITLE: Introduction to MATLAB

SYLLABUS

MATLAB - Overview: MATLAB's Power of Computational Mathematics, Features of MATLAB, Uses of MATLAB. Understanding the MATLAB Environment. MATLAB - Basic Syntax: Use of Semicolon (;) in MATLAB, Adding Comments, Commonly used Operators and Special Characters, Special Variables and Constants, Naming Variables, Saving Your Work. MATLAB - Variables: Multiple Assignments, Long Assignments, The format Command, Creating Vectors, Creating Matrices.

MATLAB - Commands: Commands for Managing a Session, Commands for Working with the System, Input and Output Commands, Vector, Matrix and Array Commands, Plotting Commands. MATLAB - M-Files: The M Files, Creating and Running Script File, MATLAB - Data Types: Data Types Available in MATLAB, Data Type Conversion, Determination of Data Types. MATLAB - Operators: Arithmetic Operators, Relational Operators, Logical Operators, Bitwise Operations, Set Operations.

MATLAB - Decision Making. MATLAB - Loop Types: Loop Control Statements. MATLAB - Vectors: Row Vectors, Column Vectors, Referencing the Elements of a Vector, Vector Operations. MATLAB - Matrix: Referencing the Elements of a Matrix, Deleting a Row or a Column in a Matrix, Matrix Operations. MATLAB - Arrays: Special Arrays in MATLAB, A Magic Square, Multidimensional Arrays, Array Functions, Sorting Arrays, Cell Array, Accessing Data in Cell Arrays.

MATLAB - Colon Notation. MATLAB - Numbers: Conversion to Various Numeric Data Types, Smallest and Largest Integers, Smallest and Largest Floating Point Numbers. MATLAB - Strings: Rectangular Character Array, Combining Strings into a Cell Array, String Functions in MATLAB. MATLAB - Functions: The eval function, Inline functions, Anonymous Functions, Primary and Sub-Functions, Nested Functions, Private Functions, Global Variables.

Books Recommended:

1. Rudra Pratap, Getting Started With MATLAB, Oxford University Press, Indian Edition
2. Brian R. Hunt, A Guide to MATLAB, Cambridge University Press
3. Amos Gilat, MATLAB-An Introduction with applications, The Ohio State University
4. Dr. Shailendra Jain, Modeling and Simulation Using MATLAB- SIMULINK

Handwritten signatures and dates:
10/11/2019
Ashi
Mishra
Anil
10/11/2019
H. P. S. 10.5.
IEHE
58

Semester: II

PAPER: HONOURS-I

Session 2019-2020

TITLE: Introduction to MATLAB

1. Using basic command for arithmetic operation, exponential and logarithmic operations.
2. Creating M-file.
3. Creating own directory in MATLAB.
4. Creating exponentially decaying sine plot.
5. Create 3x3 matrices with zeros and ones. Create a 3x3 identity matrix.
6. Add columns and rows to matrix and setting it to equal to different columns and rows of matrix.
7. Create a random matrix and find its transpose.
8. Perform matrix and array exponentiation, finding the determinant and inverse of a matrix.
9. Writing a script file in MATLAB.
10. Create a function file to compute the factorial n, for any integer n using “for” loop

~~K~~
~~10/5/2019~~

~~Ashi~~
Mohan

~~L~~
~~10/05~~

~~H.P. Parley~~
~~10-11-19~~

~~P.E.~~ sp

Mohan

B.Sc.(HONOURS) : PART-I

Semester: II

SUBJECT: MATHEMATICS

PAPER: HONOURS-II/SUBSIDIARY(A)

Session 2019-2020

TITLE: ORDINARY DIFFERENTIAL EQUATION

SYLLABUS

Geometrical meaning of a differential equation. Exact differential equations, integrating factors. First order higher degree equations solvable for x, y, p Lagrange's equations, Clairaut's equations. Equation reducible to Clairaut's form.

Singular solutions. Orthogonal trajectories in Cartesian coordinates and polar coordinates. Self orthogonal family of curves.

Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations. Equations reducible to homogeneous linear ordinary differential equations.

Linear differential equations of second order: Reduction to normal form. Transformation of the equation by changing the dependent variable/ the independent variable. Solution by operators of non-homogeneous linear differential equations. Reduction of order of a differential equation.

Method of variations of parameters. Method of undetermined coefficients. Ordinary simultaneous differential equations. Solution of simultaneous differential equations involving operators x (d/dx) or t (d/dt) etc. Simultaneous equation of the form $dx/P = dy/Q = dz/R$. Total differential equations.

Condition for $Pdx + Qdy + Rdz = 0$ to be exact. General method of solving $Pdx + Qdy + Rdz = 0$ by taking one variable constant. Method of auxiliary equations.

Books Recommended:

1. D.A. Murray, Introductory Course in Differential Equations. Orient Longman (India). 1967
2. A. R. Forsyth, A Treatise on Differential Equations, Macmillan and Co. Ltd. London.
3. E. A. Codington, Introduction to Differential Equations.
4. S. L. Ross, Differential Equations, John Wiley & Sons.
5. B. Rai & D.P. Chaudhary, Ordinary Differential Equations; Narosa, Publishing House Pvt. Ltd.
6. H.T.H. Piaggio, Elementary Treatise on Differential Equations, PHI, 1961.

Handwritten signatures and dates:
10/5/19
A Sh.
10/05
10/5/19
10/5/19
10/5/19

Institute for Excellence in Higher Education (IEHE), Bhopal

S-262 (B) (N-09)

B.Sc.(HONOURS) : PART-I

Semester: II

SUBJECT: MATHEMATICS PAPER: HONOURS-II/SUBSIDIARY (B)

Session 2019-2020

TITLE: GEOMETRY AND VECTOR CALCULUS

SYLLABUS

GEOMETRY:

General equation of second degree. Tracing of conics. Tangent at any point to the conic, chord of contact, pole of line to the conic. Polar equation of a conic, tangent and normal to the conic.

Plane section of a sphere. Sphere through a given circle. Intersection of two spheres, radical plane of two spheres.

Cones. Right circular cone, enveloping cone and reciprocal cone.

Cylinder: Right circular cylinder and enveloping cylinder.

VECTOR CALCULUS:

Scalar and vector product of three vectors, product of four vectors. Reciprocal vectors.

Vector differentiation. Scalar Valued point functions, vector valued point functions, derivative along a curve, directional derivatives.

Gradient of a scalar point function, geometrical interpretation of grad Φ , character of gradient as a point function. Divergence and curl of vector point function, Characters of Divergence and Curl as point function, examples. Gradient, divergence and curl of sums and product and their related vector identities.

Laplacian operator. Vector integration; Line integral, Surface integral, Volume integral.

Books Recommended:

1. R. J. T. Bell, Elementary Treatise on Coördinary Geometry of Three Dimensions, MacMillan India Ltd. 1994.
2. P. K. Jain and Khalil Ahmad, A Textbook of Analytical Geometry of Two Dimensions, Wiley Eastern Ltd. 1999.
3. Murrar R. Spiegel, Theory and Problems of Advanced Calculus, Schaum Publishing Company, New York.
4. Murrar R. Spiegel, Vector Analysis, Schaum Publishing Company, New York.
5. N. Saran and S.N. Nigam, Introduction to Vector Analysis, Pothishala Pvt. Ltd., Allahabad.
6. Shanti Narayna, A Text Book of Vector Calculus. S. Chand & Co., New Delhi.
7. S. L. Loney, The elements of coordinate Geometry, Part-I.

Handwritten signatures and dates:
10/5/2020
Ashi
Shanti Narayna
10/05
10/5
10/5
10/5

Semester: III

PAPER: HONOURS-I

TITLE: MATLAB ADVANCED

MATLAB - Graphics: Drawing Bar Charts, Drawing Contours, Three Dimensional Plots, 3-D Plots: View, Rotate view, Mesh and surface plots. MATLAB - Simulink: Using Simulink, Building Models

1. Rudra Pratap, Getting Started with MATLAB, Oxford University Press.
2. Amos Gilat, MATLAB-An Introduction with Applications.
3. Brian R.Hunt, A Guide to MATLAB, Cambridge University Press.
4. Rao V. Dukkupati, MATLAB An Introduction with Applications, New Age International (P) Limited, Publishers.

~~S~~
~~10/27/2019~~

~~ASm~~

Mosley

Rohrer

pt os

Hick

JSParkly
10-5?

T E U i . g

Semester: III

PAPER: HONOURS-I

TITLE: MATLAB ADVANCED

1. Use built-in basic fitting to do a linear fit.
2. Use built-in basic fitting to do a quadratic and cubic fit.
3. Do exponentially curve fit in linear scale plot and semi-log scale plot.
4. Use different methods of interpolation i.e. nearest, cubic, linear, spline to do 1-D and 2-D interpolation.
5. Using built-in ODE solvers to solve first order ODE.
6. Using built-in ODE solvers to solve second order ODE.
7. Use built-in function to solve transcendental equation.
8. Use built-in function to find all the roots of a polynomial equation.
9. Use of different graphic tools in 2-D and 3-D plots.
10. Use of built-in function to generate overlay plots.

9
10/8/2019

Ashu

Murthy

Hiraj

K.P. Parley
10.5

T. E. V.

Mahesh

SYLLABUS

Limits: ϵ - δ definition of the limit of a function, Left hand and right hand limits, Theorems on limits, Sequential approach of limit, Cauchy's criterion for finite limit. **Continuous functions:** Continuity at a point, Continuity in an interval, discontinuous functions, theorems on Continuity, Continuous functions on closed intervals, uniform continuity.

Derivatives: Derivability at a point, Derivability in an interval, Derivability and continuity. Increasing and decreasing functions, Sign of derivatives, Darboux's theorem, Rolle's theorem, Interpretation of Rolle's theorem, Lagranges's mean value theorem, deductions and geometrical interpretation of it, Cauchy's mean value theorem.

Higher order derivatives: Taylor's theorem (Remainder form), Maclaurin's theorem (Remainder form), Generalized mean value theorem, Taylor's infinite series and power series expansions, Maclaurin's infinite series. **Maxima, Minima and Indeterminate forms:** Extreme values, Investigation of the points of maximum and minimum values, Indeterminate forms $0/0$, ∞/∞ , $0 \times \infty$, $\infty - \infty$, 0^0 , 1^∞ , and ∞^0 .

Functions of several variables: Explicit and implicit functions, Explicit function of two variables, Neighbourhood of a point, Limit point, Limit of a function, Algebra of limits, Repeated limits, Continuity of function of two variables, Partial derivatives, Mean value theorem, Differentiability, Algebra of differentiable functions, Partial derivatives of higher order, Change in the order of partial derivation, Young's theorem, Schwarz's theorem, Differentials of higher order, Function of functions, Differentials of higher order of a function of functions, Derivation of composite functions (The chain rule), Change of variables, Taylor's theorem for two variables, Extreme values (Maxima and minima) of function of two variables, Function of several variables, Extreme values (Maxima and minima) of function of n variables.

Implicit Functions: Existence theorem for two variables, Existence theorem for n variables, derivatives of Implicit Functions, Jacobians, Stationary values under subsidiary conditions, Lagrange's undetermined multipliers, Lagrange's method of multipliers.

Recommended Book:

1. R.G. Bartle and D.R. Sherbert, Introduction to Real Analysis, John Wiley & Sons (2003).
2. S C Malik and Savita Arora ; Mathematical analysis, New Age International (P) Limited, Publishers, New Delhi, Fifth edition 2017 .

Reference Books:

- R. R. Goldberg, Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970
- Gorakh Prasad, Differential Calculus, Pothishala Pvt. Ltd., Allahabad. 1997
- Shanti Narayan, A Course in Mathematical Analysis, S. Chand and company, New Delhi
- Murray, R. Spiegel, Theory and Problems of Advanced Calculus, Schaum Publishing co., New York

Handwritten signatures and dates:
Narayan, 10/12/2019, Ash, Mohan, 10/12, KP Arora, 10.5, SP

Semester: III

PAPER: HONOURS-II/SUBSIDIARY(B)

TITLE: Numerical Methods

Solution of Algebraic and Transcendental equations: Bisection method, Regula-Falsi method, Secant method, Newton-Raphson's method. Newton's iterative method for finding pth root of a number. Order of convergence of above methods.

Interpolation: Finite Differences operators and their relations. Finding the missing terms and effect of error in a difference tabular values, Interpolation with equal intervals: Newton's forward and Newton's backward interpolation formulae. Interpolation with unequal intervals: Newton's divided difference, Lagrange's Interpolation formulae, Hermite Formula.

Central Differences: Gauss forward and Gauss's backward interpolation formulae, Sterling, Bessel Formula.

Numerical Differentiation: Derivative of a function using interpolation formulae as studied in the above parts.

Numerical Integration: Newton-Cote's Quadrature formula, Trapezoidal rule, Simpson's one third and three-eighth rule, Chebychev formula, Gauss Quadrature formula.

Simultaneous linear algebraic equations: Gauss-elimination method, Gauss-Jordan method, Triangularization method (LU decomposition method). Crout's method, Cholesky Decomposition method. Iterative method, Jacobi's method, Gauss-Seidal's method, Relaxation method.

Numerical solution of ordinary differential equations: Single step methods-Picard's method. Taylor's series method, Euler's method, Runge-Kutta Methods. Multiple step methods; Predictor-corrector method, Modified Euler's method, Milne-Simpson's method.

Eigen Value Problems: Power method, Jacobi's method, Given's method, House-Holder's method, QR method, Lanczos method.

1. Babu Ram, Numerical Methods, Pearson Publication.
2. R. S. Gupta, Elements of Numerical Analysis, Macmillan's India 2010.
3. M. K. Jain, S. R. K. Iyengar, R.K. Jain, Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996
4. M. K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999.
5. C. E. Froberg, Introduction to Numerical Analysis (2nd Edition).
6. Melvin J. Maaron, Numerical Analysis-A Practical Approach, Macmillan Publishing Co., Inc., New York.
7. E. Balagurusamy: Numerical Methods, Tata McGraw-Hill Publication, 2014.

~~Mohamed~~ 10/15/2009
~~10/15/2009~~
 Motor
 10/15
 Trip
 10/15
 Trip
 10/15

B.Sc.(HONOURS) : PART-II

Semester: IV

SUBJECT: MATHEMATICS

PAPER: HONOURS-I

Session 2019-2020

TITLE: INTEGRAL TRANSFORM

SYLLABUS

Laplace Transforms:

Existence theorem for Laplace transforms, Linearity property of the Laplace transforms, Existence of Laplace transforms, Shifting theorems, Change of scale property, Laplace transforms of derivatives, Laplace transforms of integrals, Multiplication and division by 't', Periodic function.

Inverse Laplace transforms:

Linearity property, Shifting theorems, Change of scale property, Inverse Laplace transforms of derivatives, Inverse Laplace transforms of integrals, Multiplication and division by powers of p, convolution theorem, Heaviside expansion theorem.

Application of Laplace transform:

Solution of ordinary differential equations with constant coefficients, Solution of ordinary differential equations with variable coefficients.

Fourier transforms:

Linearity property, Shifting, Change of scale property, Modulation, Convolution theorem, Fourier Transform of Derivatives, Relations between Fourier transform and Laplace transform, Parseval's identity for Fourier transforms, Solution of differential Equations using Fourier Transforms.

Books Recommended:

1. I. N. Sneddon, the use of integral transform, McGraw Hill, 1972.
2. Murray R. Spiegel, Laplace transform, Schaum's Series.

Handwritten signatures and dates:
10/5/2019
Ashu
Moots
18/05
K. P. Singh
10.5.19
R. S. Singh
SP

Semester: IV

PAPER: HONORS-II/Subsidiary(A)

Session 2019-2020

TITLE: STATICS & DYNAMICS

SYLLABUS

STATICS

Composition and resolution of forces. Parallel forces. Moments and Couples. Analytical conditions of equilibrium of coplanar forces. Common Catenary. Forces in three dimensions. Poinso's central axis, wrenches, null lines & null planes.

DYNAMICS

Velocity and acceleration along radial, transverse, tangential and normal directions.
Relative velocity and acceleration. Simple harmonic motion.
Elastic strings. Motion on smooth and rough plane curves. Motion in Resisting Medium.

Books Recommended:

1. S. L. Loney, Statics, Macmillan Company, London.
2. R. S. Verma, A Text Book on Statics, Pothishala Pvt. Ltd., Allahabad.
3. S. L. Loney, An Elementary Treatise on the Dynamics of a Particle and a Rigid Bodies, Cambridge University Press, 1956.
4. F. Chorlton, Dynamics, CBS Publishers, New Delhi.
5. A. S. Ramsey, Dynamics Part-1 & 2, CBS Publisher & Distributors.



 10/5/2019
 Ashu



 10/10/8
 Mohan



 10/5/1
 Ashu



 10/5/1
 Ashu



 10/5/1
 Ashu

Institute for Excellence in Higher Education (IEHE), Bhopal

S-462(B) (R-17)

B.A/B.Sc.(HONOURS) : PART-II

Semester: IV

SUBJECT: MATHEMATICS

PAPER: HONOURS-II/SUBSIDIARY (B)

Session 2019-2020

TITLE: PARTIAL DIFFERENTIAL EQUATIONS

SYLLABUS

Partial differential equations:

Formation of Partial differential equations, order and degree of Partial differential equations, Linear and Non-Linear Partial differential equations of the first order. Different types of solutions of Partial differential equations - Complete solution, singular solution, General solution,

Lagrange's linear partial differential equations and its solution., standard forms-I, II, III, IV of partial differential equations. Charpit's general method of solution of Partial differential equations.

Linear partial differential equations of second and higher orders - solution of Linear partial differential equations of second order by inspection method, by reduction to canonical forms.

Classification of Linear partial differential equations, Homogeneous and non-homogeneous equations with constant co-efficients- Finding C.F. and P.I. and solutions. Partial differential equation with variable coefficients reducible to equations with constant coefficients, their complimentary functions and particular Integrals, Monge's Method

Fourier Series:

Piecewise Continuous functions, The basic Fourier series. The basic cosine series, The basic sine series,

Boundary value problems (solution by separable of variables method & Fourier Series):

Derivation and solution of one dimensional Heat conduction equation and solution of problems based on it. Derivation and solution of one dimensional wave equation and solution of problems based on it.

Books Recommended:

1. D. A. Murray: Introductory Course on Differential Equations, Orient Longman, (India), 1967
2. Erwin Kreyszing: Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999
3. A. R. Forsyth: A Treatise on Differential Equations, Macmillan and Co. Ltd.
4. I. N. Sneddon: Elements of Partial Differential Equations, McGraw Hill Book Company, 1988
5. Frank Ayres: Theory and Problems of Differential Equations, McGraw Hill Book Company, 1972
6. R. V. Churchill, J. W. Brown: Fourier Series and boundary value problems, McGraw Hill International edition, 1987.
7. J. W. Brown, R. V. Churchill: Fourier Series and boundary value problems, Tata McGraw Hill Edition, 2008.

Handwritten signatures and dates:
Mahesh 10/12/19
Ashi
Mishra
10/05
10/15/19
SP

Semester: V

PAPER: Honors-I

TITLE: ADVANCED MECHANICS

STATICS

Stable and unstable equilibrium. Friction, Centre of gravity, virtual work.

Central Orbits:

Determination of the Orbit, The Inverse Problem, Differential Equation of Central Orbits, Kepler's Law of Motion.

Motion of Particle in Three Dimensions:

Acceleration in terms of Polar Co-ordinates, Acceleration in terms of Cylindrical Co-ordinates, Acceleration in terms of Cartesian Co-ordinates

Attraction of a rod, attraction of a disc at a point, attraction of a spherical shell and a solid sphere. Potential of a rod, potential of a spherical shell and a solid sphere. The work done by mutual attractive forces, Gauss' theorem, Poisson' Equation, Laplace's theorem, Distribution of matter, Equipotential Surfaces.

Books Recommended:

1. S. L. Loney, Statics, Macmillan Company, London.
2. R. S. Verma, A Text Book on Statics, Pothishala Pvt. Ltd., Allahabad.
3. S. L. Loney, An Elementary Treatise on the Dynamics of a Particle and a Rigid Bodies, Cambridge University Press, 1956.
4. F. Chorlton, Dynamics, CBS Publishers, New Delhi.
5. A. S. Ramsey, Dynamics Part-1 & 2, CBS Publisher & Distributors.

9
10/5/2019

Ash
Mata

Vohra

10/05

Hind

15 Pory
10/5/

Telik

sup

B.Sc.(HONOURS): PART-III

Semester: V

SUBJECT: MATHEMATICS

PAPER: Honors-II/SUBSIDIARY(A)

Session 2019-2020

TITLE: REAL ANALYSIS

SYLLABUS

Real numbers; Axiomatic introduction of real numbers, Bounded and Unbounded sets of real numbers, Least upper bound(i.u.b.), Greatest lower bound (g.l.b.), Extended real number system, Ordered completeness property, Neighborhoods, Interior points, Isolated points, Limit points, Open sets, Closed set, Interior of a set, Closure of a set in real numbers and their properties. Bolzano-Weierstrass theorem, Open covers, Compact sets and Heine-Borel Theorem.

Sequence: Sequences of real numbers, Finite and infinite sequences, Bounded and Monotonic sequences, Limit of a sequence, Fundamental theorems on limits, Convergence of a sequence, Divergent sequence, Oscillating sequence, Cauchy's general principle of convergence, Limit superior and limit inferior of a sequence, Subsequences, Cauchy sequences, Cauchy's theorems on limits,

Infinite series: Convergence and divergence of Infinite Series, Comparison Tests of positive terms Infinite series, , Convergence and divergence of geometric series, p-series test, D-Alembert's ratio test, Raabe's test, Logarithmic test, De-Morgan and Bertrand's test, Cauchy's root test, Cauchy's integral test, Cauchy's condensation test.

Conditional Convergence and Absolute Convergence of series, Cauchy's general principle of Convergence of series, Series with arbitrary terms, Alternating series, Leibnitz's test, Abel's lemma, Abel's test, Dirichlet's test.

Books Recommended:

1. S.C. Malik & Savita Arora: Mathematical Analysis, New Age International R.R.
2. Shanti Narayan : A Course in Mathematical Analysis, S.Chand and company, New Delhi
3. Goldberg : Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 19704.
4. Murray, R. Spiegel : Theory and Problems of Advanced Calculus, Schaum Publishing co., New York.
5. T. M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
6. Earl D. Rainville, Infinite Series, The Macmillan Co., New York.
7. D. Somasundaram and B. Choudhary : A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997

[Handwritten signatures and dates]
Ashu 10/5/2019
Munish
Rajiv 10/10/19
10/5/19
10.5.19
SP
10/5/19

Semester: V

PAPER: HONOURS-II/SUBSIDIARY(B)

TITLE: ABSTRACT ALGEBRA

Definition of a group with example and simple properties of groups, Subgroups and Subgroup criteria, cyclic groups, Cosets, Left and right cosets, Index of a sub-group Coset decomposition, Lagrange's theorem and its consequences, Normal subgroups, Quotient Groups.

Homomorphisms, isomorphisms, automorphisms and inner automorphisms of a group, Permutations groups. Even and odd permutations. Alternating groups, Cayley's theorem.

Introduction to rings, subrings, integral domains and fields, Characteristics of a ring. Ring homomorphism, Kernel of homomorphism, ideals and Quotient rings, Fundamental theorem of homomorphism.

Polynomial Ring; Introduction, Determination of structure of $R[x]$, Degree of a polynomial, Degree of the sum and the product of two polynomials, Monic polynomial, Division Algorithm in $R[x]$, Remainder theorem, Factor theorem, Value of polynomial at $X=C$, zero of a polynomial, polynomial equations and their roots, Synthetic division, G.C.D, Reducible, Irreducible polynomials, Unique Factorization theorem

1. I. N. Herstein, Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
2. A.R.Vashishtha, Krishna Prakashan Mandir, Meerut, U.P.
3. P. B. Bhattacharya, S.K. Jain and S.R. Nagpal, Basic Abstract Algebra (2nd edition).

1. Vivek Sahai and Vikas Bist, Algebra, Narosa Publishing House.
2. I. S. Luther and I.B.S. Passi, Algebra, Vol.-II, Narosa Publishing House.
3. J. B. Gallian, Abstract Algebra, Narosa Publishing House.
4. S. Singh & Q. Zameeruddin, Modern Algebra, Vikas Publishing House

~~10/15/2019~~

AZL

Minter

Hoff

KSP entry

10-51

SUP

Bonus

Semester: VI

PAPER: HONOURS-I

TITLE: ADVANCED ABSTRACT ALGEBRA

SYLLABUS

Direct Product, Double Coset, Cauchy's and Sylow's theorems for finite abelian and non-abelian groups.

Euclidean rings, Polynomial rings, Polynomials over the rational field, The Eisenstein's criterion, Polynomial rings over commutative rings, Unique factorization domain, R and $R[X_1, X_2, \dots, X_n]$ as unique factorization domain.

Solvable groups and Extension of Field, Separable and Inseparable extensions.

Books Recommended:

1. I.N. Herstein : Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
2. A.R. Vashishtha, Krishna Prakashan Mandir, Meerut, U.P.
3. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal : Basic Abstract Algebra (2

Reference Books :

- Reference Books :
1. S. Singh & Q. Zameeruddin, Modern Algebra, Vikas Publishing House (2nd edition).
 2. Vivek Sahai and Vikas Bist : Algebra, Narosa Publishing House.
 3. I.S. Luther and I.B.S. Passi : Algebra, Vol.-II, Narosa Publishing House.
 4. J.B. Gallian: Abstract Algebra, Narosa Publishing House.

~~9~~
~~10/5/2019~~

~~ASU~~

~~10/10/20~~

Motay

Thief

75 Popley
10-5'

T Evis

Brown

sp

B.Sc.(HONOURS): PART-III

Semester: VI

SUBJECT: MATHEMATICS

PAPER: HONOURS-II/SUBSIDIARY(A)

Session 2019-2020

TITLE: LINEAR ALGEBRA

SYLLABUS

Vector spaces, subspaces, Sum and Direct sum of subspaces, Linear span, Linearly Independent and dependent subsets of a vector space. Finitely generated vector space, Existence theorem for basis of a finitely generated vector space, Finite dimensional vector spaces, Invariance of the number of elements of bases sets, Dimensions, Quotient space and its dimension.

Homomorphism and isomorphism of vector spaces, Linear transformations and linear forms on vector spaces, Vector space of all the linear transformations Dual Spaces, Bi-dual spaces, Dual Basis, Null Space, Range space of a linear transformation, Rank and Nullity Theorem,

Algebra of Linear Transformation, Minimal Polynomial of a linear transformation, Singular and non-singular linear transformations, Matrix of a linear Transformation, Change of basis, Eigen values and Eigen vectors of linear transformations, Diagonalisation. Bilinear and Quadratic forms.

Inner product spaces, Cauchy-Schwarz inequality, Triangular inequality, Law of parallelogram, Orthogonal vectors, Orthogonal subsets, Orthogonal sets, Bessel's inequality for finite dimensional vector spaces, Gram-Schmidt, Orthogonalization process.

Books Recommended:

1. K. Hoffman & R. Kunj, Linear Algebra, PHI
2. S. Lang, Linear Algebra, Springer
3. P. B. Bhattacharya, S.K. Jain and S.R. Nagpal, Basic Abstract Algebra (2nd edition).
4. A. R. Vasishtha, Linear Algebra, Pragati Prakashan
5. Vivek Sahai and Vikas Bist, Algebra, Narosa Publishing House.
6. I. S. Luther and I.B.S. Passi, Algebra, Vol.-II,

Handwritten signatures and dates:
Ashi 10/11/2019
Mishra 10/10/19
Anish
Dhruv
10-5-19
10-5-19
10-5-19

B.Sc.(HONOURS): PART-III

Semester: VI

SUBJECT: MATHEMATICS

PAPER: HONOURS-II/SUBSIDIARY(B)

Session 2019-2020

TITLE: REAL & COMPLEX ANALYSIS

SYLLABUS

Riemann integral:

Partition, Norm of a partition, Refinement, Upper and Lower Riemann sums, Upper and Lower Riemann integrals, Properties of R-integrability, Darboux theorem, Integrability of continuous and monotonic functions, The mean value theorem, first and second mean value theorem of integral calculus, The Fundamental theorem of integral calculus.

Improper integrals:

Improper integrals and their convergence, Test for improper integral of I and II kind - Comparison tests, μ - test, Abel's and Dirichlet's tests, Convergence of integrals of a product, Absolute convergence, Frullani's integral, Integral as a function of a parameter.

Metric Space:

Definition and examples of metric spaces, neighbourhoods, limit points, interior points, open and closed sets, closure and interior, boundary points, subspace of a metric space, equivalent metrics, Cauchy sequences, completeness of a metric space. Cantor's Intersection Theorem.

Complex Analysis:

Extended Complex Plane, Continuity and Differentiability of complex functions, Analytic functions, Necessary condition for $f(z)$ to be analytic, Cauchy-Riemann equations Sufficient condition for $f(z)$ to be analytic, Harmonic functions, Conjugate harmonic function, Polar form of Cauchy Riemann equation..

Books Recommended:

1. S. C. Malik & Savita Arora: Mathematical Analysis, New Age International.
2. Shanti Narayan : A Course in Mathematical Analysis, S.Chand and company, New Delhi
3. R. R. Goldberg : Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970.
4. Murray, R. Spiegel : Theory and Problems of Advanced Calculus, Schaum Publishing co., New York.
5. T. M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.
6. D. Somasundaram and B. Choudhary: A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997.

Handwritten signatures and dates:
ASH 10/12/2019
Mishra 10/10/20
Mishra
Harp
10/5/20
SP

Institute for Excellence in Higher Education (IEHE), Bhopal
M. Phil.(Mathematics) **Semester: I**

SUBJECT: MATHEMATICS

PAPER: RESEARCH METHODOLOGY

Session 2019-2020

TITLE: RESEARCH METHODOLOGY

SYLLABUS

Introduction of Research Methodology: Meaning of research, objectives of research, types of research, Motivation in research, significance of research, Research Approaches, research and scientific method, research process, Criteria of Good Research.

Research Problem: Definition, Selection of problem, Identification of problem, necessity and techniques of defining research problem. Formulation of research problem. Objectives of research problem.

Research Design: Meaning, need and features of good research design. Types of Research Designs. Synopsis design for research topic. Developing a Research Plan.

Presentation: Poster and Oral. Presentation tools: Introduction to presentation tool, features and functions, creating presentation, customizing presentation, showing presentation.

MS-Word: Introduction to MS Word, Editing a Document Previewing Documents, Printing Documents, Formatting Documents. Find and Replace, Checking the Grammar and Spelling, Table Insert and Modification, Conversion of Table, Converting a Word document in various format.

MS-Power Point: Creating Presentation using Slide Master, Working with different Views and Menus of Power Point, Working with Slides, Editing and Formatting text, Bullets, Footer, Spell Checking, Printing Presentation, Inserting Objects, Slide Sorter, Slide Transition and animation effects.

Internet: Evolution, Growth of Internet, ISP, Dial-up, Connectivity with Internet, URL, Application, E-Mail Concept, Advantages of E-Mail, Address of E-mail, Basics of Sending and Receiving E-MAIL.

Reference Books:

1. Kothari, C.R. (2010), Research Methodology (Methods and Techniques), New Age International Publishers.
2. Saxena, S. (2010), A first course in Computers, Vikas Publishing house Pvt. Ltd.
3. Michael Devis, Ethics and the University, Routledge (1999).
4. Gurumani, N. (2010), Scientific Thesis Writing and Paper Presentation, MJP Publishers
5. Dahlberg, L. and McCaig, C. (2010), Practical Research and Evaluation, SAGE Publications India Pvt. Ltd.
6. Saxena V. P. Research Methodology: Indira publishing House, Bhopal.

Handwritten signatures and dates:
20/5/2019
Ashu
Mishra
10/5/19
10/05
K.P. Ray
10.5.
D. S. 10.5.
48

Institute for Excellence in Higher Education (IEHE), Bhopal

M. Phil.(Mathematics)

Semester: II

SUBJECT: MATHEMATICS

PAPER: Generalized Integral Transformation

Session 2019-2020

TITLE: Generalized Integral Transformation

SYLLABUS

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 $E(T)$ and its dual; Distributions of compact, Supports, Generalized function.

The Testing-Function Spaces $L(a,b)$ and $L(w,z)$ and their Dual 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.

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.

The testing Function Spaces A , Generalized Functions space A' Orthonormal series Expansions and Generalized integral transformations, Characterization of the Generalized junction in A' and their Transforms, an Operational Calculus for the operator R .

Recommended Books:

1. Basic Reading:-Zemanian A.H. : Generalized Integral Transformations, John-Wiley & Sons (1968).
2. Pathak R.S. : Course in Distributions theory & applications, Narosa (2001).
3. Gwaiz MA., Theory of distributions, Marcel-Dekker (1992).
4. Kanwal R. P. , Generalized function; theory & techniques, Academic press (1983).
5. Keshavan S. , topics in functional Analysis & applications Wiley Eastern.

Handwritten signatures and dates:
10/15/2019
Ash
10/08/19
10/15/19
10/17/19
10/17/19
10/17/19

Institute for Excellence in Higher Education (IEHE), Bhopal

M. Phil.(Mathematics)	Semester: II
-----------------------	---------------------

M. Phil.(Mathematics)	Semester: II
-----------------------	---------------------

SUBJECT: MATHEMATICS **PAPER: Trellis Theory**

SUBJECT: MATHEMATICS **PAPER: Trellis Theory**

Session 2019-2020

TITLE: Trellis Theory

SYLLABUS

Pseudo –ordered Set ,Trellises , Complete trellises, Transitive and Associative elements ,Distributive Elements, Standard Elements, Modular Trellises
Boolean Lattices , Mappings , Ideals , Trellis Groups

Recommended Books:

- Recommended Books:**
1. Skala H. L. , Trellis theory , American Mathematical Society, providence , R. I. 1972.
 2. Gratzer G. : Lattice theory-first Concepts and Distributive Lattices.
 3. Birkhoff G. : Lattice theory, (American Mathematical Society, providence, Rhode Island,(1967) Colloquium Publication,25.

id,(1967) Colloquium Publication,25.

SUBJECT: MATHEMATICS PAPER: Fluid Dynamics

SUBJECT: MATHEMATICS PAPER: Fluid Dynamics

Session 2019-2020

TITLE: **Fluid Dynamics**

SYLLABUS

INTRODUCTION AND PHYSICAL PROPERTIES OF FLUID: Concepts of fluid, 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.

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 Lagrangian methods, equation of continuity in different coordinates, Velocity and acceleration of fluid particle.

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, Helmholtz's Vorticity equation

Bernoulli's equation, Cauchy's integrals, equation for impulsive action example
Flows and circulation Kelvin's circulation theorem, Helmholtz's Vorticity equation

Institute for Excellence in Higher Education (IEHE), Bhopal

M. Phil.(Mathematics)

Semester: II

SUBJECT: MATHEMATICS

PAPER:

Session 2019-2020

TITLE: Numerical Analysis

SYLLABUS

Boundary value problems, shooting method, derivative Boundary condition, Characteristic value: Alternating Direction implicit method, irregular regions and nonrectangular grids .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.

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.

Hyperbolic partial differential equations, solution techniques, Equations in two and three dimensions, finite element methods In hyperbolic partial differential equations.

Recommended Books:

1. Basic Reading: Gerald and Wheatley: Applied numerical Analysis, sixth edition , Pearson education 2002

Handwritten signatures and dates:
10/5/2019
Ashu
Munty
10/10/19
10/5/19
SP
10.5.

Institute for Excellence in Higher Education (IEHE), Bhopal

M. Phil. (Mathematics)

Semester: II

SUBJECT: MATHEMATICS

PAPER: Operations Research

Session 2019-2020

TITLE: Operations Research

Syllabus

Games and Strategies : Introduction, two person Zero-sum games, the maximin minimax principle, Games without saddle points-mixed strategies, graphic solution of $2 \times n$ and $m \times 2$ games, Dominance property, general solution of $m \times n$ Rectangular games.

Dynamic Programming : Introduction, the Recursive equation approach, characteristics of Dynamic programming, Dynamic programming algorithm, solution of L.P.P. by Dynamic programming .

MARKOV Analysis: Introduction, Markov processes, State Transition matrix, Transition diagram, Construction of a State-Transition Matrix, nstep Transition Probabilities Markov analysis algorithm.

Non-Linear Programming : Introduction formulating a NLPP, General NLPP, Constrained optimization with equality constraints, constrained optimization with inequality constraints, saddle point problems, saddle points and NLPP.

NLPP methods : Introduction, Kuhn-Tucker conditions with non-negative constraints, Quadratic programming, Wolfe modified simplex method, Beale's method, separable convex programming, separable programming algorithm.

Network Scheduling by PERT/CPM : Introduction, Network and basic components, logical sequencing rules of network construction critical path analysis, probability considerations in PERT, Distinction between PERT and CPM.

Simulation : Introduction, why simulation methodology of simulation, simulation models, Event type simulation, generation of random numbers, Monte-Carlo simulation, simulation of maintenance problems, simulation of networks, advantage and limitations of simulation.

Recommended book:-

1. Kanti Swaroop, P.K. Gupta and Man Mohan, Operations Research, Eleventh Edition (S.Chand publications),
2. H.A. Taha, Operations Research-An Introduction PHI.

References:-

1. A. Ravindran, D.T. Phillips, J.J. Solberg, "Operations Research: Principles and Practice", second edition, John Wiley and sons (Asia), New Delhi 2006.
2. S.S. Rao, Engineering Optimization, Third Edition, New Age International (P) Ltd. New Delhi 1996.

Handwritten signatures and dates:
10/5/2019
10/5/19
10/5
10/5
10/5

SUBJECT: MATHEMATICS

PAPER: Mathematical Modeling

Session 2019-2020

TITLE: Mathematical Modeling

SYLLABUS

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

Setting up first-order differential equations from word problems

Difference and Differential equation population growth models

Single species population models

A model for detection of diabetes

Combat models

5.1 Three Lanchester Combat Models

5.2 Conventional Combat: The square law

5.3 Guerrilla Combat: The linear law.

Recommended Books:-

1. Mathematical Modeling : J.N. Kapoor, New Age International (P) Limited , Publishers, Reprint 2003,

2. Differential Equations and their Applications: Zafar Ahsan, Second Edition , Prentice-Hill of India, New Delhi – 110001,

3. Differential equation Models : Martin Braun, Courteny S Coleman Donald A Drew, Vol.1 Springer – Verlag.

Handwritten signatures and dates:
10/8/2019
Ash
10/10/19
Mishra
10/15/19
10.5
50

SUBJECT: MATHEMATICS **PAPER: Commutative Algebra**

SUBJECT: MATHEMATICS **PAPER: Commutative Algebra**

Session 2019-2020

TITLE: **Commutative Algebra**

SYLLABUS

Minimal prime and primary ideals: Examples and properties of minimal, prime and primary ideals. The nil radical of an ideal and its properties, semi prime ideals. The associate prime ideal of a primary ideal.

Minimal prime ideals of a ring, Certain radicals of a ring : Jacobson Radical, the definition of the idempotent of R_h can be raised or lifted into R and its properties, primary rings.

Quasi-regular element and its properties, prime radicals, modular ideals, radical of a ring, Boolean rings, regular rings, Stone representation theorem, direct sum of rings, problems.

Birkhoff theorem, rings with chain conditions : Equivalence of three conditions of a ring with a.c.c. , Hilbert basis theorem, Levitsky Theorem.

Recommended Books :

- Recommended Books :**
1. Barton David M.: A first course in rings and ideals Addison Wesley publishing company 1970.
 2. Oscar Zoriski and P. Samuel : Commutative algebra, Vol. 1, Affiliated East press Pvt. Ltd. Delhi.

References :

- References :
1. M. Atiyah and IC. McDonald: Commutative algebra.
 2. Motsumura : Commutative algebra.

Atiyah and IC. McDonald: Commutative algebra.
tsumura : Commutative algebra.

Institute for Excellence in Higher Education (IEHE), Bhopal

M. Phil.(Mathematics)	Semester: III
-----------------------	----------------------

Semester: **III**

SUBJECT: MATHEMATICS **PAPER: Theory of Fuzzy Computation**

PAPER: Theory of Fuzzy Computation

Session 2019-2020

TITLE: Theory of Fuzzy Computation

SYLLABUS

Max-mm automata, General formulation of automata, Classes of automata, Behaviour of Max-mm automata, Equivalence and homomorphism of max-mm automata.

Reduction of max-mm automata, definite max-mm automata, Reduction of max-mm machines, Equivalences, Irreducibility and minimality, Determinism and non-determinism of max-mm automata.

Max-product machines, equivalences, irreducibility and minimality, Max-product grammars and languages, weak regular max-product grammars and languages.

Fuzzy languages, types of grammars, Fuzzy context-free grammars, Context-free max-product grammars, Context-free fuzzy languages, Meaning of context free languages.

~~10/5/2019~~

~~10/5/19~~

T
W

Matus

J.P. Carey

10'5"

SM

Hues

10/5/19

SUP

Institute for Excellence in Higher Education (IEHE), Bhopal

M. Phil. (Mathematics)

Semester: **III**

SUBJECT: MATHEMATICS

PAPER: Theory of Near Ring

Session 2019-2020

TITLE: Theory of Near Ring

SYLLABUS

Definition and properties of N-groups and substructures Homomorphism and Ideals. Annihilators. Near Ring of quotients. Products. Embedding in $M(r)$. Chain condition. Prime ideals, Semi-prime ideals, Nil and Nilpotent ideals. Idempotent elements.

Distributively generated Near Rings. Construction of distributively generated near Rings. Distributively generated Near Rings with finiteness conditions. Polynomial Near Rings.

Near fields. Condition to be a field. The additive group of a Near field. The centre and kernel of a Near field. Dikson Near fields.

Recommended Books:

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

Handwritten signatures and dates:
10/5/2019
10/5
10/5
10/5/19
10/5
10/5

SUBJECT: MATHEMATICS **PAPER: Theory of Choice**

SUBJECT: MATHEMATICS **PAPER: Theory of Choice**

Session 2019-2020

TITLE: **Theory of Choice**

SYLLABUS

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.

A choice Function model, The connection between the choice function model and the preference model, some implications of the choice function model.

Introduction, sets in real Euclidean space, C.U.P. sets, Theorem on C.U.P. sets, Properties of real valued functions. 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.

Recommended Books:

- Recommended Books:**
1. Basic Reading: Axiomatic choice Models, H.N. Weddepohl, Rotterdam University Press, Netherlands 1970.
 2. Social Choice and Individual values Edn.2, Arrow K.J., John Willey and Son's, New York-1963
 3. Handbook of Mathematical Economics-Vol.1, Arrow K.J. and Intriligator Amsterdam, north-Holland 1981.

th-Holland 1981.

Institute for Excellence in Higher Education (IEHE), Bhopal

M. Phil.(Mathematics)

Semester: **III**

SUBJECT: MATHEMATICS PAPER: Topics in Geometric Function Theory

Session 2019-2020

TITLE: Topics in Geometric Function Theory

SYLLABUS

Schwarz's Lemma, Montel's Theorem, Green's Theorem on Harmonic functions, Univalent functions, Keobe Functions, Area theorem, Growth and distortion theorems.

Brief History of D'Branges Theorem, Littlewoods's Theorem, Convex, Starlike Function, Alexander's Theorem. Close to convex functions, Noshiro-Warchawski,s Theorem, Kaplan's Theorem.

Spiraflike functions, Radius of starlikeness, convexity and close to convexity, Differential subordination, Hypergeometric functions Rusheweyh derivative operator, convolution (Hadamard product)

Extreme points, Herglotz representation, meromorphic univalent functions, harmonic univalent functions, Fractional derivatives, coefficient inequalities, closure property.

Recommended Books:

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.

Handwritten signatures and dates:
10/5/2019
10/5
10/5
10/5
10/5/19
10/5
10/5/19

SUBJECT: MATHEMATICS PAPER: Game theory with Economic Application

Session 2019-2020

TITLE: Game theory with Economic Application

SYLLABUS

Static Game with Complete information: Nash Equilibrium, Oligopoly Strategies Trade policy, Property rights and efficiency, Voting games.

Dynamic Games with complete information: Sub game perfect equilibrium, Bargaining time-consistent macroeconomics policy, repeated games and dynamic competition.

Static games with incomplete information: Perfect Bayesian Nash equilibrium, Auctions.

Dynamic Games with incomplete information: Perfect Bayesian equilibrium, Bargaining with private information.

RECOMMENDED BOOKS:-

1. H. Scott Bierman and Luis Fernandez, *Game Theory with economics Applications*, Peason Eduaction second edition.

~~Asn~~

10/17/2019

Musht

Musht

10/15/19

JSP entry

10.5

SUP

Institute for Excellence in Higher Education (IEHE), Bhopal

M.Phil.(Mathematics)

Semester: III

SUBJECT: MATHEMATICS PAPER: Graph Theory and its Applications

Session 2019-2020

TITLE: Graph Theory and its Applications

SYLLABUS

Trees: Properties of trees, Distance and centres in a tree. Rooted, Binary, counting and Spanning trees, Fundamental circuits, Finding all spanning trees of a graph, spanning trees in a weighted graph.

Cut-sets: Properties of a cut-set, fundamental cut-sets, connectivity and separability, network flows, 1. Isomorphism. {Chapter-3 and 4 of (1)}

Planar Graphs: Kuratowski's two graphs, Different representations of a planar graph, Detection of planarity, Geometric dual, Combinatorial dual. {Art. 5.2 to 5.7 of Chapter 5 of (1)}

Matrix representation of graph: Incidence matrix, sub matrices of $A(G)$, Circuit Matrix, Fundamental Circuit Matrix and Rank of B , Application to a switching network, Cut-set Matrix, Relationship among A_f , B_f , C_f path matrix, adjacency matrix. {Chapter 7 of (1)}

Colouring, covering and partitioning: Chromatic number, partitioning, polynomial, Matching's, coverings, the four colour problem.

Directed Graphs: Types of digraphs, Diagraphs and binary relations, Directed paths and connectedness, Euler diagraphs, Trees with directed edges, Fundamental circuits in diagraphs, Matrices A , B and C of Diagraphs, Adjacency matrix of a diagraph, Tournaments Acyclic diagraph and Decyclization. {Chapter 9 of (1)}

Enumeration: Types of enumeration, counting labelled and unlabelled trees. Polya's Counting Theorem. {Art. 10.1 to 10.4 of Chapter 10 of (1)}

Graph in switching and coding theory.

RECOMMENDED BOOKS:-

1. "Graph Theory; with applications to engineering and computer science" by Narsingh Deo.
2. Graph Theory; By Hararay.
3. Design theory by C.C Lindner, C.A Rodger, CRC Press New York 1997.
4. Diagraphs: Theory, Algorithms and application Second edition springer verlog London 2009.
5. Graphs and diagraphs by G. Chart and L. Leshiak Chapman and Hall CRC. NEW York 1996.

Handwritten signatures and dates:
M. Kumar 10/5/19
Ash 10/5/2019
S. J. 10/5/19
M. S. 10/5/19
H. S. P. 10/5/19
S. P. 10/5/19

M.Sc. PREVIOUS

Semester: I

SUBJECT: MATHEMATICS

PAPER: I

Session 2019-2020

TITLE: ADVANCED ABSTRACT ALGEBRA-I

SYLLABUS

Normal series, composition series, Jordan Holder Theorem, Solvable and Nilpotent groups (Chapter-6).

Algebraic extensions of field, Adjunction of roots, Algebraic and transcendental extensions, Algebraically closed fields. (Chapter-15)

Splitting fields, Normal extensions, Multiple roots, finite fields, separable extensions, Automorphism of extensions, Galois extension, fundamental theorem of Galois theory, Fundamental theorem of Algebra (Chapter- 16 & 17).

Roots of unity, Cyclic extensions, Polynomials solvable by radicals. (Chapter-18)

RECOMMENDED BOOKS:

1. P. B. Bhattacharya, S. K. Jain and S. R. Nagpaul, Basic Abstract Algebra, Cambridge University Press.

REFERENCE BOOKS:

1. Topics in Algebra - I.N. Herstein, Wiley Eastern, New Delhi
2. Algebra - V. Sahai & V. Bisht, Narosa Publishing House

[Signature]
10/05/2019

[Signature]
10/05

[Signature]
10.5.

[Signature]

[Signature]

[Signature]
10/5/19

[Signature]

[Signature]

Semester: I

PAPER: II

TITLE: REAL ANALYSIS

SYLLABUS

Inverse function theorem The implicit function theorem, Implicit function theorem (Linear version), Jacobians, Differentiation of integrals, Partition of Unity.

Text Book

- Walter Rudin- Principles of Mathematical Analysis- Mc Graw Hill

REFERENCE

- T.M. Apostol - Mathematical Analysis.

REFERENCE

T.M. Apostol - Mathematical Analysis.

[Handwritten signatures and dates follow]

Institute for Excellence in Higher Education (IEHE), Bhopal**M.Sc. PREVIOUS****Semester: I****SUBJECT: MATHEMATICS****PAPER: III****Session 2019-2020****TITLE: TOPOLOGY-I****SYLLABUS**

Countable and uncountable sets. Infinite sets and Axiom of Choice. Schroeder-Bernstein theorem. Zorn's lemma. Well-ordering theorem. (As given in chapter - I, Article No. 7, 9 & 10 of J. R. Munkers's book)

The definition and some examples of topological spaces. Topological subspace, limit point, derived set. Elementary concepts of open sets, closed sets, closure of a set, dense set, everywhere dense and nowhere dense set. Neighbourhood of a point on a set in a topological spaces, Open base, Isolated point of a set, Interior, Exterior and Boundary points of a set. (As given in chapter - I, Article No. 12 to 17 of J. R. Munkers's book)

Continuous maps and homeomorphism of topological spaces. An open base and open sub-base for topological spaces. (As given in the Chapter-II of G. F. Simmon's Book)

First and Second Countable spaces. Lindelof's theorems. Separable spaces, Disconnected and Connected sets and spaces. Connectedness on Real line, Components, totally disconnected spaces, Locally connected spaces. (As given in the Chapter - III & VI of G.F. Simmon's Book)

Text Books:

1. J.R. Munkres, Topology - A first course, Prentice-Hall of India.
2. G.F. Simmons: Introduction to Topology and Modern Analysis

Reference books :

1. K.D. Joshi: Introduction to general topology, Wiley Eastern

Handwritten signatures and dates at the bottom of the page:

- 10/05/2019
- ASHI
- 10/05
- 10.5.
- 15/11

Semester: **I**

PAPER: IV

Session 2019-2020

TITLE: COMPLEX ANALYSIS-I

SYLLABUS

Liouville's theorem, Fundamental Theorem of Algebra, Maximum Modulus Theorem, Index of a closed curve, Cauchy's Theorem and integral formula (First Version only), Morera's Theorem, Counting zeros, open mapping theorem. Goursat's theorem (As Given in chap. IV of text book)

Singularities. Classification of singularities, Laurent series, Weirstrass Theorem.
Residues. Residue theorem. Argument Principle, Rouché's Theorem (As given in Chap V of text book)

Maximum Modulus Theorem. Schwarz's lemma (As given in chap VI of T.B) Mobius Transformation, their properties and classification. Definition and examples of Conformal Mapping

Text Book

- J. B. Conway, Functions of one complex variable, second Edn., Springer International student Edn.

References:

1. L.V. Ahlfors - complex analysis Mc Graw Hill
2. S. Ponnuswamy Foundations of complex analysis Narosa Publishing house.

10/05/2019

Ashi

Moto

10/05

Hip / IPally

10.51

Charles

10/5/19

I Evis

Sy

*Institute for Excellence in Higher Education (IEHE), Bhopal***M.Sc. PREVIOUS****Semester: I****SUBJECT: MATHEMATICS****PAPER: V****Session 2019-2020****TITLE: Advanced Discrete Mathematics-I****SYLLABUS**

Semigroups and Monoids: Definition, Homomorphism of semi groups and Monoids, Quotient Semigroups, Subsemigroups and submonoids, Direct products (Art 3.2 of [1])

Lattices as partially ordered sets: Definitions, their properties, lattice as Algebraic systems, sublattices, Direct products and Homomorphisms, Some special lattices. (Art 4.1 of [1])

Boolean Algebra: Definitions, various Boolean Identities, subalgebra, Direct product and Homomorphism (Art 4.2 of [1])

Boolean functions: Boolean forms and free Boolean Algebras, values of Boolean expressions and Boolean functions. (Art 4.3 of [1]).

Representation and minimization of Boolean functions (Art 4.4 of [1])

Definitions of graphs, subgraphs, degree of a vertex, paths, circuits, walk, connectivity, Euler graph, complete graph, Trees, Spanning trees, Cut-sets, Fundamental Cut-sets, Fundamental circuits, Minimal spanning trees and Kruskal's Algorithm (Art 1.1-1.5, 2.2, 2.4-2.7, 3.1-3.2, 3.7, 3.8, 3.10, 4.1, 4.2-4.5 of [2])

Planar graphs and their properties, Euler's formula for connected planar graphs, Kuratowski's two graphs (statement only) and its use, matrix representation of graphs (Incidence matrix, Cut-set matrix, Circuit matrix) (Art. 5.2-5.4, 7.1, 7.3, 7.6 of [2])

Recommended Text Book

1. J. P. Tremblay and R. Manohar, Discrete Mathematics Structure, Mc-Graw Hill
2. Narsingh Deo, Graph Theory with applications, Prentice Hall

Handwritten signatures and dates:

- 10/05/2019
- ASH
- 10/5
- 10.31
- 10/5/19
- 10.31
- 10/5/19
- 10.31

Semester: II

PAPER: I

Session 2019-2020

TITLE: ADVANCED ABSTRACT ALGEBRA-II

SYLLABUS

Introduction to Modules, examples, submodules, quotient modules, homomorphism, isomorphism, cyclic modules, simple modules, free modules, Schur's Lemma (Ch-14)

Noetherian and artinian module, Hilbert basis theorem, Wedderburn –Artin theorem, Uniform modules, Primary modules, Noether-Laskar theorem. (Ch-19)

Fundamental theorem of modules over a principle ideal domain and its applications to finitely generated abelian groups (Ch-21)

Smith normal form over a PID and rank (Ch-20), Rational Canonical form, Jordan form (Ch-21)

TEXT BOOKS

TEXT BOOKS
Basic Abstract Algebra – P.B. Bhattacharya, S.K. Jain, S.R. Nagpaul, Cambridge Univ.
Press

REFERENCES

- REFERENCES**
1. Topics in Algebra – I.N. Herstein, Wiley Eastern, New Delhi.
 2. Algebra – V. Sahai & V. Bisht, Narosa Publishing House.

10/05/2019

Ash'

Mash

10/05

Krip

10/05

SPaley

10'5'

Mahalia

10/5/19

P. S. F.

GP

M.Sc. PREVIOUS

Semester: II

SUBJECT: MATHEMATICS

PAPER: II

Session 2019-2020

TITLE: LEBESGUE MEASURE AND INTERGRATION

SYLLABUS

Lebesgue outer measure, F_σ and G_δ - sets, Algebra of sets, σ - algebra, Measurable sets and Lebesgue measure, Measurability of Borel sets, Fundamental theorem, Non-measurable sets.

Measurable functions, Properties of Lebesgue measurable functions, Step functions, Simple function, Operations on measurable functions, Characteristic function, Borel measurable function.

Integral of a bounded function over a set of finite measure, Lebesgue integral, Riemann and Lebesgue integrals, Properties of Lebesgue integral for bounded measurable functions, Lebesgue Bounded convergence theorem, Fatou's lemma, Monotone convergence theorem, Integration of series, Integrable functions, General Lebesgue integral, Lebesgue dominated convergence theorem.

L^p -space, Convex functions, Conjugate numbers, Jensen's inequality, Holder inequalities and Minkowski inequality for L^p -spaces Completeness of L^p -spaces, onvergence in measure, Riesz's theorem, Almost uniform convergence, Egroff theorem, Riesz-Fischer theorem.

Books Recommended:

1. H. L. Royden – Real Analysis, Macmillan, third Indian Edn.
2. G. de Barra, Measure Theory and Integration, Wiley Eastern
3. P. Halmos, Measure Theory

Handwritten signatures and dates:
10/05/2019 Ash
10/05/2019 [Signature]
10/05/2019 [Signature]
10/05/2019 [Signature]
10/05/2019 [Signature]
10/05/2019 [Signature]

M.Sc. PREVIOUS

Semester: II

SUBJECT: MATHEMATICS

PAPER: III

Session 2019-2020

TITLE: TOPOLOGY-II

SYLLABUS

Compactness: Continuous functions and compact sets. Basic properties of Compactness. Compactness and Finite Intersection Property. Product of spaces, Projection maps, Tychonoff's theorem, Local compactness. Alexander subbase theorem, Heine Borel theorem. Compactness in metric spaces. BWP, Sequentially Compact Metric spaces. Lebesgue covering lemma (As given in the chapter-IV of G. F. Simmons's Book)

Separation: T_0 , T_1 -spaces, Hausdorff spaces, Regular, Completely regular spaces and Normal spaces; their characterizations and basic properties. (As given in the Chaper-V of G. F. Simmon's Book)

Urysohn's Lemma, Tietze extension theorem, one point compactification, the Stone Cech Compactification, Urysohn Metrization Theorem (As given in the Chapter-V of G.F. Simmons's Book)

Net the filters: Topology and convergence of nets, Hausdorffness and Compactness of nets, Filters and their convergence, Ultra-filters and compactness. (As given "General Topology by J.L. Kelley, Chapter-2 page 65-75). The fundamental group and covering spaces- Homotopy of paths. The fundamental group. covering spaces. (As given in chapter - IX, article no. 51 to 54 of James R. Munkres's Book)

BOOKS RECOMMENDED:

- BOOKS RECOMMENDED:**
1. James R. Munkres, Topology, A First Course, Prentice Hall of India Pvt. Ltd., New Delhi.
 2. G. F. Simmons. Introduction to Topology and Modern Analysis, McGraw-Hill Book Company.
 3. J. L. Kelley, General Topology, Van Nostrand, Reinhold Co., New York 1968.

10/05/2019

Ash

Mosby

12/05

Moore 10/5/19

15 Pauly
10.5'

2017

5/2

uswami Fundamental of complex analysis. Narosa P.House

Semester: II

PAPER: V

TITLE: ADVANCE DISCRETE MATHEMATICS-II

Finite State Machines and their Transition Table Diagrams, Equivalence of Finite State Machines, Reduced Machines, Homomorphism (Art 4.6 of [1])

Finite Automata, Acceptors, Non-deterministic, Finite Automata and Equivalence of its power to that of Deterministic Finite Automata (Art 6.1 of [1])

Turing Machines and Partial Recursive Functions. (Art 6.2 of [1])

Grammers and Languages (Art 3.3 of [1])

Polish Expression and their compilations (Art 3.4 of [1])

Directed Graphs, Indegree and Outdegree of a Vertex, Weighted Undirected Graphs, Dijkstra's algorithm, Strongly Connected Digraphs.

Matrix representation for a Digraphs (incidence matrix, cut-set matrix, circuit matrix Art 9.1, 9.2, 9.4 9.8 of [2])

1. J. P. Tremblay & R. Manohar, Discrete Mathematical Structures, Mc Graw Hill.
2. Narsingh Deo, Graph Theory with applications, Prentice Hall.

~~10/05/2019~~

~~Ash~~

~~10/05~~

~~MWA~~

~~MWA~~

~~10/5/19~~

~~ISP a per~~

~~10.5~~

~~IWR~~

~~SUP~~

Institute for Excellence in Higher Education (IEHE), Bhopal

M.Sc. Final

S-M31 (R-18)
Semester: III

SUBJECT: MATHEMATICS

PAPER: I

Session 2019-2020

TITLE: Functional Analysis-I

SYLLABUS

Normed linear spaces, Banach spaces and examples, Properties of Normed linear spaces, Basic properties of finite dimensional normed linear spaces.

Normed linear subspaces, Equivalent norms, Riesz lemma and compactness, Quotient space of normed linear spaces and its completeness.

Linear operator, Bounded linear operators and Continuous operators, Non-linear operators.

Linear functional, Bounded linear functional, Dual space with examples.

Recommended Books

1. E. Kreyzig, Introductory Functional Analysis with applications, John Wiley and Sons, New York.
2. G. F. Simmons, Introduction to Topology and Modern Analysis Mc Graw Hill, New York.

References Books

- B. Choudhary and Sudarshan Nanda, Functional Analysis with applications, Wiley Eastern Ltd.

Handwritten signatures and dates:
10/10/2019
Ash
Mishra
9/2/20
P/O S
JSParey
10.5.1
T.S. S.
Maharaj
10/5/17

M.Sc. Final

Semester: III

SUBJECT: MATHEMATICS

PAPER: II

Session 2019-2020

TITLE: Fuzzy Sets and Their Applications-I

SYLLABUS

An overview of crisp sets, Definition of Fuzzy set, Types of Fuzzy sets, α -cut (α -level set), Strong α -cuts, Support of a Fuzzy set, Height, Normal and Sub-normal Fuzzy sets, Convex Fuzzy sets, Cutworthy property, Cardinality of fuzzy set, Sigma count, Equilibrium points of Fuzzy sets, Basic operations on Fuzzy sets. Fuzzy subset, Degree of subethood, Hamming distance (Art. 1.2, 1.3, 1.4 of Chapter 1 of [1])

Properties of α -cuts, Representations of Fuzzy sets in terms of α -cuts, First, Second and Third Decomposition theorems, Extension principle for Fuzzy sets. (Art. 2.1, 2.2, 2.3 of Chapter 2 of [1])

Operations on Fuzzy sets - Fuzzy complements, Sugeno class of fuzzy complement, Yager class of fuzzy complement, Equilibrium of fuzzy complement, Dual point, Increasing and decreasing generators, First and Second characterization theorems of Fuzzy complements, Fuzzy intersection (t-norm), Archimedean t-norm, Standard intersection, Algebraic product, Bounded difference, Drastic intersection Characterization theorem of t-norm, Fuzzy unions (t-co-norm), Archimedean, Standard union, Algebraic sum, Bounded sum, Drastic union, Characterization theorem of t-co-norm, Combinations of operations. (Art. 3.1, 3.2, 3.3, 3.4, 3.5 of Chapter 3 of [1])

Fuzzy Arithmetic : Fuzzy numbers, Arithmetic operations on intervals, Arithmetic operations on Fuzzy numbers, Lattice of Fuzzy numbers, Fuzzy equations. (4.1, 4.3, 4.4, 4.5, 4.6 Chapter 4 of [1])

Recommended Books :

1. Fuzzy sets and Fuzzy logic by G.J. Klir and B. Yuan, Prentice- Hall of India, New Delhi, 2012.
2. Fuzzy set theory and its applications by H.J. Zimmermann, Allied Publishers Ltd., New Delhi, 1991.

Reference Books :

- Fuzzy sets and Uncertainty and Information by G.J. Kalia Tina A. Folger, Prentice Hall of India New Delhi, 2013.
- Introduction to Fuzzy sets and Fuzzy logic by M. Ganesh, PHI Learning Pvt. Ltd. New Delhi, 2012.

Handwritten signatures and dates:
Ash 10/05/2019
Modan 10/05
Rajesh 10/5/19
10/5
T. S. S.
SP

Semester: **III**

PAPER: III

Session 2019-2020

TITLE: Operations Research-I

SYLLABUS

Model in Operations Research, Phase of Operations Research, Uses and Limitations of Operations Research,

General Linear Programming Problem: Simplex method, exceptional cases, artificial variable technique, Big-M method, Two-phase method and cyclic problem, problem of degeneracy. (Chap 3 and 4 of 1)

Duality, fundamental properties of duality and theorem of duality (Chap. 5 of 1)

Text Books

1. Kanti Swarup, P.K. Gupta and Manmohan : Opertions Research, Sultan Chand and Sons, New Delhi

Reference Books

1. S.D. Sharma - Operations Research
2. F.S. Hiller and G.J. Lieberman : Industrial Engineering series, 1995
3. G. Hadley : Linear Programming Narosa Publishing House, 1995
4. G. Hadley - Linear and Dynamic programming Addison - Wesley Reading Mass.
5. H.A. Taha - Operations Research - An introduction, Macmillan Publishing Co, Inc. New York
6. Prem Kumar Gupta and D.S. Hira - Operations Research an introduction, S.Chand and Company Ltd. New Delhi.
7. N.S. Kambo - Mathematical programming techniques, Affiliated East-West Pvt Ltd.

bo - Mathematical programming techniques, Affiliated East-West Pvt Ltd.

Session 2019-2020

TITLE: Integral Transforms-I

SYLLABUS

Introduction to Laplace Transform and inverse Laplace transform, Transform of derivatives, Linearty property. Shifting theorems. Change of scale property. Convolution theorem.

Application of Laplace transform to differential equations and integral equations including initial and boundary value problems.

Application of Laplace transforms to wave equation in one dimension,
Application of Laplace transform to electric circuits.

Application of Laplace transform to beams and heat conduction equation in one dimension.

Text Books

Integral Transforms by Sneddon.

Integral Transforms by Vashishtha - Gupta Krishna Prakashan Mandir.

Reference Books

Integral Transforms by Goyal and Gupta

KS

Transforms by Goyal and Gupta

10/05/2019

Ash

Mohit

Mukesh 10/5/19

JSPorely

10.5.

2.17

sp

Semester: **III****Session 2019-2020**

TITLE: PARTIAL DIFFERENTIAL EQUATIONS -I

Transport Equation-Initial Value Problem Non-homogeneous equations, Laplace's Equations - Fundamental Solution.

Mean Formula properties of Harmonic functions, Green's Functions. Energy Methods.

Heat Equation - Fundamental Solution, Mean Value Formula, Properties of Solutions, Energy Methods.

Wave Equation - Solution by Spherical Means, Non - homogeneous Equations, Energy Methods.

- L. C. Evans, Partial Differential Equations, 1998.

[illegible]

Semester: III

PAPER: V

TITLE: Advanced Special Functions - I

SYLLABUS

Beta function, value of $\Gamma(z)\Gamma(1-z)$, Factorial Function, Legendre's duplication formula, Gauss multiplication theorem.

Contiguous function relations, Hyper geometrical differential equation and its solutions, $F(a, b; c; z)$ as function of its parameters, Elementary series manipulations, Simple transformation, Relations between functions of z and $1 - z$.

Books Recommended:

- Books Recommended:**
1. Rainville, E.D. ; Special Functions, The Macmillan co., New york 1971,
 2. Saran, N., Sharma S.D. and Trivedi - Special Functions with application, Pragati prakashan, 1986.

Reference Books:

- Reference Books:**
1. Lebedev, N.N, Special Functions and Their Applications, Prentice Hall, Englewood Cliffs, New jersey, USA 1995.
 2. Whittaker, E.T. and Watson, G.N., A Course of Modern Anal

A 1995.
and Watson, G.N., A Course of Modern Analysis

10/5/200

ASH

Murphy

10/05

J.P. Meyer

10.5

10/5/19

T. J.

S.P.

M.Sc. FINAL

Semester: IV

SUBJECT: MATHEMATICS

PAPER: I

Session 2019-2020

TITLE: FUNCTIONAL ANALYSIS-II

SYLLABUS

Hilbert space, Orthogonal complements, Orthogonal sets and sequences, Orthonormal sets, Bessel's inequality, Complete orthonormal sets and Parseval's identity, Hilbert adjoint operator and its properties, Self adjoint operators.

Unitary and Normal operators, Positive operators, Hahn-Banach theorem for real linear spaces, Hahn-Banach theorem for complex linear spaces.

Adjoint operators on normed spaces, Relation between adjoint operator and Hilbert adjoint operator, Reflexive spaces.

Category theorem, Baire's category theorem, Uniform boundedness theorem and its applications, Open mapping and Closed graph theorems, Strong and Weak convergence in normed spaces.

Text Books:

1. E. Kreyszig, Introductory Functional Analysis with applications, John Wiley & Sons, New York.
2. G. F. Simmons, Introduction to Topology & Modern Analysis Mc Graw Hill, New York.

Reference:

B. Choudhary and Sudarshan Nanda. Functional Analysis with applications, Wiley Eastern Ltd.

Handwritten notes and signatures:
10/5/2019
ASH
Mishra
10/10/19
10/5/19
10.5.19
SP