List of New Courses Introduced

Department : ***Mathematics***

Program Name : ***B.Sc., MSc.***

Academic Year : 2017-18

List of New Courses Introduced

Sr. No.	Course Code	Name of the Course
01.	MSC 5.1	Abstract Algebra
02.	MSC 5.2	Analysis
03.	MSC 5.3	Mechanics-I
04.	MSO 5.1	Mathematical Statistics-I
05.	MSO 5.2	Numerical Methods
06.	MSO 5.3	Hydro Statics
07.	MSO 5.4	Programming in C (With ANSI Features)
08.	MSO 5.5	Combinatorial Mathematics
09.	MSC 6.1	Linear Algebra
10.	MSC 6.2	Advanced Analysis
11.	MSC 6.3	Mechanics-II
12.	MSO 6.1	Mathematical Statistics-II
13.	MSO 6.2	Number Theory
14.	MSO 6.3	Hydrodynamics
15.	MSO 6.4	Linear Programming Problems
16.	MSO 6.5	Mathematical Finance
17.		Finsler Geometry
18.		Integral Equations

विभागाध्यक्ष
Head
गणित विभाग
Department of Mathematics
गुरु घासीदास विश्वविद्यालय,
Guru Ghasidas Vishwavidyalaya,
बिलासपुर (छ.ग.) 495009, भारत
Bilaspur (C.G.), 495009, India

Minutes of Meetings (MoM) of Board of Studies (BoS)

Academic Year : 2017-18

School : *School of Studies of Mathematical and Computational Science*

Department : *Mathematics*

Date : *June 29, 2017*

Venue : *Department of Mathematics*

Guru Ghasidas Vishwavidyalaya, Bilaspur (CG)

Department of Mathematics

Minutes of Meeting of Board of Studies

A meeting of Board of Studies was held on 29/06/2017. The following members were present in the meeting:

1. Dr. P.P. Murthy (HoD) :(Chairman)
2. Professor S.K. Srivastava (Subject Expert) : (VC Nominee)
   (Dept. of Mathematics, BHU, Varanasi)
3. Professor A.S. Ranadive : (Member)
4. Dr. P.P. Murthy (Associate Professor) : (Member)
5. Dr. B.B. Chaturvedi : (Member)
6. Dr. Manish Kumar Gupta : (Special Invitee)

The following new courses are being offered from the academic year 2017-18

Sr. No.	Programme Name	Semester	Course Code	Name of the course
01	B.Sc. (Hon's)	V	MSC 5.1	ABSTRACT ALGEBRA
02		V	MSC 5.2	ANALYSIS
03		V	MSC 5.3	MECHANICS - I
04		V	MSO 5.1	MATHEMATICAL STATISTICS - I
05		V	MSO 5.2	NUMERACIAL METHODS
06		V	MSO 5.3	HYDRO STATICS
07		V	MSO 5.4	PROGRAMMING IN C (WITH ANSI FEATURES)
08		V	MSO 5.5	COMBINATORIAL MATHEMATICS
09		VI	MSC 6.1	LINEAR ALGEBRA
10		VI	MSC 6.2	ADVANCE ANALYSIS
11		VI	MSC 6.3	MECHANICS - II
12		VI	MSO 6.1	MATHEMATICAL STATISTICS - II
13		VI	MSO 6.2	NUMBER THEORY
14		VI	MSO 6.3	HDRO DYNAMICS
15		VI	MSO 6.4	LINEAR PROGRAMMING PROBLEMS
16		VI	MSO 6.5	MATHEMATICAL FINANCE
17	M.Sc.	III		INTEGRAL EQUATIONS
18	M.Sc.	IV		FINSELR GEOMETRY

Head विभागाध्यक्ष
Head
गणित विभाग
Department of Mathematics
गुरु घासीदास विश्वविद्यालय,
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Bilaspur (C.G.), 495009, India

गुरु घासीदास विश्वविद्यालय
(केन्द्रीय विश्वविद्यालय अधिनियम 2009 क्र. 25 के अंतर्गत स्थापित केन्द्रीय विश्वविद्यालय)
कोनी, बिलासपुर - 495009 (छ.ग.)

Guru Ghasidas Vishwavidyalaya
(A Central University Established by the Central Universities Act 2009 No. 25 of 2009)
Koni, Bilaspur - 495009 (C.G.)

Dr. D. S. Singh
(old)

B. Sc. (HON'S) IN MATHEMATICS

(Syllabus approved by Board of Studies meeting on 09.07.2015)

Department of Pure & Applied Mathematics

Faculty of Mathematical and Computational Sciences

UNDER THE

CHOICE BASED CREDIT SYSTEM

B. Sc. (HON'S) IN MATHEMATICS

SEMESTER	COURSE CODE	CORE COURSE	CREDIT HOURS
I	MSC 1.1	CALCULUS	03
	MSC 1.2	ANALYTICL GEOMETRY OF THREE DIMENSION	03
II	MSC 2.1	ADVANCE CALCULUS	03
	MSC 2.2	STATICS & DYNAMICS	03
III	MSC 3.1	VECTOR CALCULUS, FOURIER AND LAPLACE TRANSFORMS	03
	MSC 3.2	ORDINARY DIFFERENTIAL EQUATIONS	03
IV	MSC 4.1	MODERN ALGEBRA	03
	MSC 4.2	PARTIAL DIFFERENTIAL EQUATIONS	03
V (CORE GROUP)	MSC 5.1	ABSTRACT ALGEBRA	04
	MSC 5.2	ANALYSIS	04
	MSC 5.3	MECHANICS - I	04
V (ELECTIVE GROUP- CHOOSE ANY TWO)	MSO 5.1	MATHEMATICAL STATISTICS - I	04
	MSO 5.2	NUMERACIAL METHODS	04
	MSO 5.3	HYDRO STATICS	04
	MSO 5.4	PROGRAMMING IN C (WITH ANSI FEATURES)	04
	MSO 5.5	COMBINATORIAL MATHEMATICS	04
VI	MSC 6.1	LINEAR ALGEBRA	04

(CORE GROUP)	MSC 6.2	ADVANCE ANALYSIS	04
	MSC 6.3	MECHANICS - II	04
VI (ELECTIVE GROUP- CHOOSE ANY TWO)	MSO 6.1	MATHEMATICAL STATISTICS - II	04
	MSO 6.2	NUMBER THEORY	04
	MSO 6.3	HDRO DYNAMICS	04
	MSO 6.4	LINEAR PROGRAMMING PROBLEMS	04
	MSO 6.5	MATHEMATICAL FINANCE	04

MSC 5.1 : ABSTRACT ALGEBRA

Automorphism and inner automorphism, Automorphism groups. Normalizer and centre. Commutator subgroups. Conjugacy class. Class equation. Cauchy theorem. Sylow theorems.

Group action, isotropy group of an action, stabilizers and orbits. Fixed point of an action.

Rings, Integral Domains and Fields. Ideal and quotient Rings. Simple ring. Ring Homomorphism and isomorphism. Ideal generated by a subset. Principal ideal domain. Prime and maximal ideals. Divisibility in an integral domain. Polynomial Rings. Euclidean Rings, The ring Z[i].

Books Recommended :

1. Vijay K Khanna and S. K. Bhambri, A course in Abstract algebra, Vikas Publishing House Pvt Ltd, Third Edition, 2008.
2. P.B. Bhatacharya, S.K. Jain and S.R. Nagpal, Basic Abstract Algebra (2nd Edition) Cambridge University Press, Indian Edition, 1977.

3. N. Herstain, Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975.
4. N. Jacobson, Basic Algebra, Vol I & II, W.H. Freeman, 1980 (also published by Hindustan Publishing Company).

MSC 5.2 : METHODS OF REAL ANALYSIS

Real Analysis: Least upper bounds, sequence and subsequence, limit of a sequence, convergent sequences, divergent sequences, bounded sequences, monotone sequences, operations on convergent sequences, operations on divergent sequences, limit superior and limit inferior, Cauchy sequences, limit superior and limit inferior for sequences of sets.

Convergence and divergence, series with nonnegative terms, alternating series, conditional convergence and absolute convergence, rearrangements of series, tests for absolute convergence, series whose terms form a non-increasing sequence, summation by parts.

Sets of measure zero, definition of the Riemann integral, existence of the Riemann integral, properties of the Riemann integral, derivatives, Rolle's theorem, the law of the mean, fundamental theorems of calculus, improper integrals, improper integrals(continued).

Books Recommended :

1. Shanti Narayan, A Course of Mathematical Analysis. S. Chand & Company, New Delhi.
2. T. M. Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.
3. R. R. Goldberg, Real Analysis, Oxford & IBH Publishing Company, New Delhi, 1970.
4. S. Lang, Undergraduate Analysis, Springer-Verlag, New York, 1983.
5. P. K. Jain and S. K. Kaushik, An Introduction to Real Analysis, S. Chand & Company, New Delhi, 2000
6. W.Rudin, Principles of Mathematical Analysis, McGraw-Hills.
7. George F. Simmons Introduction to Topology and Modern Analysis, MH International Book Company.

MSC 5.3: MECHANICS -I

Common Catenary: Equation of a common catenary in different forms, Approximation to common catenary and related problems.

Stable and unstable equilibrium: Stability of a body with one degree of freedom, work function, Energy test for stability, conditions of stable and unstable equilibrium if a heavy body rests on a fixed body and related problems.

Moment of inertia and Product of Inertia: moment of inertia of different bodies (rod, disk, ring, hollow sphere, solid sphere, solid cone, hollow cone), problems related to moment of inertia and Product of Inertia, Equimomental system, theorem of parallel axis, Principle axis.

D'Alembert's principle for the motion of rigid body, linear, rotation for finite and impulsive forces, Conservation of momentum and energy, Compound pendulum, Motion about a fixed axis, Reaction of axis of rotation.

Books Recommended :

1. S. L. Loney, An Elementary Treatise on Statics, Kalyani Publishers, New Delhi.
2. S. L. Loney, An Elementary Treatise on the Dynamics of a Particle and of Rigid Bodies, Kalyani Publishers, New Delhi.
3. J. L. Synge and B. A. Griffith, Principles of Mechanics, McGraw-Hill, 1959.
4. N. C. Rana and P. S. Joag, Classical Mechanics, Tata McGraw-Hill, 1991.

MSO 5.1: MATHEMATICAL STATISTICS - I

Descriptive Measures: Measure of central tendency, Measures of Dispersion, Measures of Skewness, Measures of Kurtosis.

Probability: Introduction, Mathematical Probability, Statistical probability, Some theorem on Probability, conditional Probability, Multiplication theorem of probability, Independent events, multiplication theorem of probability for independent events, extension of multiplication theorem of probability to 'n' events, pair wise independent events, Baye's theorem, Geometric probability.

Random variables and Distributions: distribution function, Discrete random variable, continuous random variable, two-dimensional random variables,

Mathematical Expectation: Mathematical expectation, expected value of a function of a random variable, properties of expectation, properties of variance, covariance, some inequalities involving expectation, moments of bivariate probability distributions, conditional expectation and conditional variance.

Generating functions and Law of large numbers: moment generating function, cumulants, characteristic function, some important theorem, Chebychev' inequality, convergence in probability.

Special discrete probability distributions: Discrete uniform distribution, Bernoulli distribution, Poisson distribution, negative binomial distribution, geometric distribution hypergeometric distribution, multinomial distribution.

Special continuous probability distributions: Normal distribution, rectangular distribution, triangular distribution, gamma distribution, Beta distribution of first and second kind. Exponential distribution, standard Laplace distribution, weibul distribution, logistic distribution, Cauchy distribution, central limit theorem, compound distributions.

Correlation: meaning of correlation, scatter diagram, Karl Pearson's coefficient of correlation, calculus of the correlation coefficient for a bivariate frequency distribution, probable error of correlation coefficient, Rank correlation.

Books Recommended :

1. S.C.Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, S. Chand and Sons, New Delhi(2004).

2. Manohar Ray and Harswroop Sharma, Mathematical Statistics, Ram Prasad(1969).

3. D. N. Elhance, Fundamentals of Statistics, Kitab Mahal (1964).

MSO 5.2: Numerical Analysis

Errors and their computations; Numerical solutions of algebraic equations: Bisection, Regula-Falsi, Newton-Raphson, Rate of convergence of iterative methods; Roots of Polinomials: Birge-Vieta method; System of linear equations: Gauss elimination method, Gauss-Jordan method, Jacobi iterative method, Gauss-Seidal iterative method. Eigen value computation: Power method, Jacobi's method.

Finite differences; Interpolation: Newton's forward and backward interpolation, Lagrange's interpolation, Newton's divided difference interpolation; Numerical differentiation. Numerical Quadrature: Newton's cotes quadrature formula, Trapezoidal rule, Simpson's one-third and three-eighth rules, Weddle's rule; Errors in quadrature formulae. Numerical solution to ordinary differential equations of first order: Picard's method, Euler's method, Modified Euler's method, Taylor's method, Runge-Kutta second and fourth order, Implicit Runge-Kutta second order; Predictor Corrector methods: Milne- Simpson method, Adams-Bashforth method.

Books Recommended :

1. M. K. Jain, S. R. K. Iyengar, R. K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International, New Delhi, Sixth edition.
2. C. F. Gerald, P. O. Wheatley, Applied Numerical Analysis, Pearson Education, 2009.
3. S. D. Conte, C de Boor, Elementary Numerical Analysis, McGraw-Hill, 1980.
4. C. E. Froberg, Introduction to Numerical Analysis, (Second Edition), Addition-Wesley, 1979.
5. Melvin J. Maron, Numerical Analysis A Practical Approach, Macmillan Publishing Company Inc., New York, 1982.
6. S. S. Sastry, Introductory Methods of Numerical Analysis, PHI Learning Private Limited, New Delhi, 2010.

MSO 5.3: Programming in C(with ANSI features)

Credits: 3+1(P)

C fundamentals. Constants, Variables and Data types, Operators and expression, formatted input and output. Decision makings, Branching and Looping. Arrays. User defined functions. Structures. Pointers. File handling. Programming based on above.

Books Recommended :

1. B. W. Kernighan and D. M. Ritchie, The C Programming Language 2nd Edition, (ANSI features) Prentice Hall, 1989.
2. V. Rajaraman, Programming in C, Prentice Hall of India, 1994.
3. Byron S. Gotfried, Theory and Problems of Programming with C, Tata McGraw-Hill, 1998.
4. Henry Mullish & Herbert L. Cooper, Spirit of C: An introduction to Modern Programming, Jaico Publishers, Bombay.
5. E. Balagurusamy, Programming in ANSI C, Tata McGraw Hill New Delhi.

MSO 5.4: Combinatorial Mathematics

Counting Principles: Introduction-Basic Counting Principles, Factorial Notation, Binomial Coefficient, Permutations, Combinations, Binomial theorem, Multinomial theorem, Counting subsets, Set-partitions, Stirling numbers, Polya theory of counting: Necklace problem and Burnside's lemma, Cyclic index of a permutation group, Polya's theorems and their immediate applications, The Pigeonhole Principle, Ordered and unordered partitions, Inclusion-Exclusion Principle, Derangements, Inversion formulae.

Recurrence Relations- Introduction, Recursion, Recurrence Relation, Recurrence relation models, Divide and conquer relations Solving Recurrence Relations, Solution of recurrence relations, Solutions by generating functions. Integer partitions, Systems of distinct representatives Linear Homogeneous Recurrence Relations with constant coefficients, Solving Linear Homogeneous Recurrence relations with constant coefficients, Solving General Homogeneous Linear Recurrence Relations.

Generating functions: Algebra of formal power series, Generating function models, Calculating generating functions, Exponential generating functions.

Generation of Permutations and combinations, Tree Diagrams, Latin squares, Hadamard matrices, Combinatorial designs: t designs, BIBDs, Symmetric designs.
Block Diagram and Error- Correction Codes: Block design, Square block designs, Hadamard Configurations, Error Correcting Codes, Steiner Systems, Golay's Perfect code.

Books Recommended :

1. J.H. van Lint and R.M. Wilson, *A Course in Combinatorics*, 2nd Ed., Cambridge University Press, 2001.
2. V. Krishnamurthy, *Combinatorics, Theory and Application*, Affiliated East-West Press 1985.
3. P.J. Cameron, *Combinatorics, Topics, Techniques, Algorithms*, Cambridge University Press, 1995.
4. M. Jr. Hall, *Combinatorial Theory*, 2nd Ed., John Wiley & Sons, 1986.
5. S.S. Sane, *Combinatorial Techniques*, Hindustan Book Agency, 2013.
6. R.A. Brualdi, *Introductory Combinatorics*, 5th Ed., Pearson Education Inc., 2009.
7. Kolman, Busby Ross Discrete Mathematical Structure-PHI
8. Schaum's Series-Mc Graw Hill
9. Ian Anderson, A First course in Combinatorial Mathematics, Springer, 1989.

MSO 5.5: HYDRO STATICS:

Course contains will be finalised later.

MSC 6.1: LINEAR ALGEBRA

Vector space: definition and examples. Subspaces with examples, union and intersection of subspaces. Linear sum and direct sum of two subspaces. Linear spans. Linear dependence and independence of vectors. Basis and dimension of a vector space. Finite dimensional vector spaces. Dimension of linear sum of two subspaces, Quotient space.

Linear transformations - Kernel and range of a linear transformation. The rank-nullity theorem. Fundamental theorem of homomorphism for vector spaces. Algebra of linear transformations. Dual spaces. Matrix representation of a linear transformation. Eigen values and eigen vectors of linear transofrmation. Diagonalization, Cayley Hamilton theorem(without proof).

Inner-product spaces: definition and properties. Cauchy-Schwarz inequality, orthogonal and orthonormal vectors. Gram-Schmidth orthonormalization process. Bessel's inequality. Orthogonal compliment of a subset of an inner-product space.

Books Recommended :

1. N. Herstain, Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975.
2. K. Hoffman and R. Kunze, Linear Algebra, 2nd edition, Prentice-Hall of India, New Delhi, 1971.
3. N. Jacobson, Basic Algebra, Vols I & II, W.H. Freeman, 1980 (also published by Hindustan Publishing Company).
4. K.B. Dutta, Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd, New Delhi, 2000.
5. I.S. Luther and I.B.S. Passi, Algebra, Vol. I - Groups, Narosa Publishing House, Vol. I 1996.

6. V. Krishnamurthy, V.P. Mainra and J. L. Arora, An introduction to Linear Algebra, Affiliated East-West Press Pvt Ltd, 1975.

MSC 6.2 : ADVANCE ANALYSIS

Real Analysis: The Riemann-Stieltjes Integrals: definitions and existence of the integral, a condition of integrability and some theorems, integral as a limit of sum, some important theorems.

Hyperbolic functions, the exponential function, the logarithmic function, definition of x^t, the trigonometric functions, Taylor's theorem, the binomial theorem, L'Hopital's rule.

Point wise convergence of sequences of functions, uniform convergence of sequences of functions, consequences of uniform convergence, convergence and uniform convergence of series of functions, integration and differentiation of series of functions, Abel summability, A continuous, nowhere-differentiable function.

Complex Variables: Definition, Basic properties of complex numbers. Functions of a Complex variable mappings, limits, theorems on limits, limits involving the point a infinity, continuity, derivates, differentiation formulas, Cauchy-Riemann Equations, Sufficient Conditions for Differentiability, Polar Coordinates, Analytic Functions, Examples, Harmonic Functions, Contraction of Analytic Functions(Chapter I and II of James Ward Brown and Ruel V. Churchill).

Metric spaces: Introduction. Neighbourhood, limit points, interior points, open and closed set, closure and interior, boundary points. Subspace of a metric space, Completeness. Cantor's intersection theorem(Chapter : II of G. F. Simmons).

Three famous theorems: the metric space C[a, b], the Weierstrass approximation theorem, Picard existence theorem for differential equations, the Arzela theorem on equi-continuous families.

Books Recommended :

1. T. M. Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.
2. S. C. Malik and Savita Arora, Mathematical Analysis (Fourth Ed.), New Age International Publ. 2010).
3. R. R. Goldberg, Real Analysis, Oxford & IBH Publishing Company, New Delhi, 1970.
4. S. Lang, Undergraduate Analysis, Springer-Verlag, New York, 1983.
5. P. K. Jain and S. K. Kaushik, An Introduction to Real Analysis, S. Chand & Company, New Delhi, 2000
6. W.Rudin, Principles of Mathematical Analysis, McGraw-Hills.
7. George F. Simmons Introduction to Topology and Modern Analysis, MH International Book Company.
8. James Ward Brown and Ruel V. Churchill, Complex Variables and Applications, McGraw-Hill International Ed.(Eight Edition-2009).

MSC 6.3: MECHANICS - II

Forces in three dimensions: Moment of a force, General condition of equilibrium of a rigid body, Wrench and pitch, screw, Resultant wrench of two given wrenches, Poinsot's central axis and related problems, Null point, Null lines and null planes, Conjugate forces and conjugate lines.

Motion of a particle in three dimensions: acceleration in terms of different coordinate systems (Cartesian, spherical polar and cylindrical polar systems).

Motion in a resisting medium: Terminal velocity, motion in vertical line downwards, motion in vertical line upwards, Trajectory in a resisting medium, and related problems

Motion of a particle of varying mass: Equation of a particle of varying mass and related problems

Books Recommended :

1. S.L. Loney, An Elementary Treatise on Statics, Kalyani Publishers, New Delhi.
2. S.L. Loney, An Elementray Treatise on the Dynamics of a Particle and of Rigid Bodies, Kalyani Publishers, New Delhi.
3. J.L. Synge, B.A. Griffith, Principles of Mechanics, McGraw-Hill, 1959.
4. N.C. Rana and P.S. Joag, Classical Mechanics, Tata McGraw-Hill, 1991.

MSO 6.1: MATHEMATICAL STATISTICS - II

Linear and curvilinear regression: linear regression, curvilinear regression, regression curves

Additional topics on correlation and regression: correlation ratio, intra-class correlation, bivariate normal distribution, multiple and partial correlation, plane of regression, properties of residuals, coefficient of multiple correlation coefficient of partial correlatica, multiple correlation in terms of total and partial correlation, expression for regression coefficient in terms of regression coefficients of lower order, expression for partial coefficient in terms of regression coefficients of lower order.

Theory of attributes: Notations, classes and class frequencies, consistency of data, independence of attributes, association of attributes,

Large Sample Theory: Types of sampling, parameter and statistic, tests of significance, procedure for testing of hypothesis, tests of significance for large samples, sampling of attributes, sampling of variables.

Exact sampling distributions-1: derivatives of the chi-square distribution, M.G.F. f chi-square distribution, some theorems on chi-square distribution.

Exact sampling distributions-1: students 't' distribution, applications of t-distributions, distribution of sample correlation coefficient when population correlation coefficient (row=0), F-distribution, applications of F-distribution, relation between t and F distributions, relation between t and F distributions, relation between F and chi-square distributions, Fisher's z-distribution, Fisher's z-transformation.

Books Recommended :

1. S.C.Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, S. Chand and Sons, New Delhi(2004).

2. Manohar Ray and Harswroop Sharma, Mathematical Statistics, Ram Prasad(1969).

3. D. N. Elhance, Fundamentals of Statistics, Kitab Mahal (1964).

MSO 6.2: NUMBER THEORY

Primes and factorization. Division algorithm. Congruence and modular arithmetic. Chinese remainder theorem. Euler phi function. Primtive roots of unity. Quardratic law of reciprocity, application. Arithmetical functions. Mobius inversion formula. The Diophantine equations $x^2 + y^2 = z^2$, $x^4 + y^4 = z^2$. Farey sequences.

Books Recommended :

1. David M. Burton, Elementary Number Theory, Wm. C. Brown Publishers, Dubuque, Iowa 1989.
2. K. Ireland, and M. Rosen, A Classical Introduction to Modern Number Theory, GTM Vol. 84, Springer-Verlag, 1972.
3. G.A. Jones, and J.M. Jones, Elementary Number Theory, Springer-Verlag, 1998.
4. W. Sierpinski, Elementary Theory of Numbers, North-Holland, Ireland, 1988.
5. Niven, S.H. Zuckerman, and L.H. Montgomery, An Introduction to the Theory of Numbers, John Wiley, 1991.
6. H.B. Mann, Addition Theorems, Krieger, 1976.
7. Melvyn B. Nathanson, Additive Number Theory: Inverse Problems and the Geometry of Sumsets, Springer-Verlag, 1996.

MSO 6.3 : LINEAR PROGRAMMING PROBLEMS

Introduction to linear programming problem, Theory of simplex method, optimality and unboundedness, the simplex algorithm, simplex method in tableau format, introduction to artificial variables, two-phase method, Big-M method and their comparison.

Duality, formulation of the dual problem, primal-dual relationships, economic interpretation of the dual.

Transportation problem and its mathematical formulation, northwest-corner method least cost method and Vogel approximation method for determination of starting basic solution, algorithm for solving transportation problem, assignment problem and its mathematical formulation, Hungarian method for solving assignment problem.

Game theory: formulation of two person zero sum games, solving two person zero sum games, games with mixed strategies, graphical solution procedure, linear programming solution of games.

Books Recommended :

1. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, *Linear Programming and Network Flows*, 2nd Ed., John Wiley and Sons, India, 2004.

2. F.S. Hillier and G.J. Lieberman, *Introduction to Operations Research*, 9th Ed., Tata McGraw Hill, Singapore, 2009.
3. Hamdy A. Taha, *Operations Research, An Introduction*, 8th Ed., Prentice-Hall India, 2006.

4. G. Hadley, *Linear Programming*, Narosa Publishing House, New Delhi, 2002.
5. S. D. Sharma, Operations Research, Kedarnath Ramnath, New Delhi.
6. Kanti Swaroop, P. K. Gupta and Man Mohan, S. Chand & Sons, New Delhi.

MSO 6.4: MATHEMATICAL FINANCE

Basic principles: Comparison, arbitrage and risk aversion, Interest (simple and compound, discrete and continuous), time value of money, inflation, net present value, internal rate of return (calculation by bisection and Newton-Raphson methods), comparison of NPV and IRR. Bonds, bond prices and yields, Macaulay and modified duration, term structure of interest rates: spot and forward rates, explanations of term structure, running present value, floating-rate bonds, immunization, convexity, putable and callable bonds.

Asset return, short selling, portfolio return, (brief introduction to expectation, variance, covariance

and correlation), random returns, portfolio mean return and variance, diversification, portfolio diagram, feasible set, Markowitz model (review of Lagrange multipliers for 1 and 2 constraints), Two fund theorem, risk free assets, One fund theorem, capital market line, Sharpe index. Capital Asset Pricing Model (CAPM), betas of stocks and portfolios, security market line, use of CAPM in investment analysis and as a pricing formula, Jensen's index.

Books Recommended :

1. David G. Luenberger, *Investment Science*, Oxford University Press, Delhi, 1998.

2. John C. Hull, *Options, Futures and Other Derivatives*, 6th Ed., Prentice-Hall India, Indian reprint, 2006.

3. Sheldon Ross, *An Elementary Introduction to Mathematical Finance*, 2nd Ed., Cambridge University Press, USA, 2003.

MSO 6.5: HYDRO DYNAMICS

Course contains will finalised later.

09-07-15
(A. S. Ranadive).

Agreed

3. K. Yano: Structure of Manifolds, World Scientific Publishing Co. Pvt. Ltd., 1984.
4. Complex Manifolds and Contact

Integration Theory*

M.M. 60

Note: *A candidate has to attempt five questions. Question No. 1 is compulsory which will consist of short answered type ten questions spread all over the syllabus carrying 20 marks (2 marks each). Rest all questions will carry 10 marks each.*

Note: A candidate has to attempt five questions. Question No.1 is compulsory which will consist of short answered type questions spread all over the syllabus. Rest all questions will carry 10 marks

Signed measure, Hahn Decomposition theorem, mutually singular measure. Randon Nikodyn theorem. Lebsegue decomposition, Riesz representation theorem, Extension theorem (caratheodory), Lebseguestieltjes Integral.

Measurability in a Product Space, the Product measure andFubini's theorem.

Differentiation and Integration, Decomposition in absolutely continuous and singular part.

Recommended Books:

1. H.L. Royden: Real analysis, Macmillian publishing co. Inc, New york
2. S.K.Berberian : Measure and Integration, Chelsea publishing company, New Delhi
3. G.D.Berra: Measure theory and Integration, Willey Eastern Limited
4. J.H.Williamson: Legsegue Integration, Holt Rinehart and Winston, New York, 1962.

INTEGRAL EQUATIONS*

M.M. 60

Note: *A candidate has to attempt five questions. Question No. 1 is compulsory which will consist of short answered type ten questions spread all over the syllabus carrying 20 marks (2 marks each). Rest all questions will carry 10 marks each.*

Basic concept of Integral Equations, Classification of integral equations, Libnitz's rule of differentiation under the sign of integration, transformation of differential equation into integral equation and vice-versa.

Volterra's Integral Equations: Resolvent Kernel, Method of successive approximation.

29/08/2017

03-07-17

Fredholm Integral Equations: Method of successive approximation, Orthogonal Kernels, Iterated kernels, Fredholm determinants, Degenerated kernels, Eigen value and Eigen function of homogeneous integral equations.

Boundary value problem, Green function.

References:

1. Abdul-MajidWazwaz, A first course in Integral Equations, World Scientific Publishing Co. Pvt. Ltd.
2. M. Rahman, Integral Equations and their Applications, WIT*PRESS*, Boston.
3. A.D. Polyanin and A.V. Manzhirov, Handbook of Integral Equations, CRC Press, Boca Raton/London/New York/Washington D.C.
4. Ram P. Kanwal, Linear Integral Equations, Theory and technique, Academic Press, New York/London.
5. A.B. Chandramouli, Integral Equations with Boundary Value Problems, Shiksha Sahitya Prakashan.

FINSLER GEOMETRY*

M.M. 60

Note: *A candidate has to attempt five questions. Question No. 1 is compulsory which will consist of short answered type ten questions spread all over the syllabus carrying 20 marks (2 marks each). Rest all questions will carry 10 marks each.*

Basic Concepts of a Finsler space: Line elements, Finsler space, Minkowskian space, Tangent space, Metric Tensor, Dual tangent space, Hamiltonian function, Angle between two vectors, Generalized Christoffel symbols, Geodesics.

Covariant Differentiation: δ-derivative, Partial δ-derivative, Fundamental postulates of E. Cartan, Different deductions, Cartan's two processes of covariant differentiation, Berwald connection parameters, Berwald's covariant differentiation.

Theory of Curvature: Commutation formulae resulting from Cartan's covariant differentiation, Cartan curvature tensor, Commutation formulae resulting from Berwald's covariant differentiation, Berwald curvature tensor, Generalizations of Bianchi identities, Space of scalar curvature, Space of constant curvature, Generalization of Schur's theorem, Recurrent spaces, Symmetric spaces.

Projective Change: Projective change, Projective invariants, Projective change of Berwald's connection parameters, Projective deviation tensor, Generalized Weyl's projective curvature tensor, Projective connection parameters, Projectively flat spaces, Szabó Theorem.

Lie derivatives and their applications: Infinitesimal transformations, Lie derivative of scalars, vectors and tensors, Lie derivative of connection parameters of Cartan and Berwald, Motion, Affine motion and Projective motion.

Books Recommended:

1. H. Rund, The Differential Geometry of Finsler Spaces, Springer-Verlag, Berlin, 1959.
2. M. Matsumoto, Foundations of Finsler Geometry and Special Finsler Spaces, Kaiseisha Press, Otsu, 1986.
3. P. L. Antonelli (ed.), Handbook of Finsler Geometry, Kluwer Academic Publishers, Dordrecht, The Netherlands, 2003.