

Department of Higher education, Govt. of M.P.

**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

Approved by HE the Governor of M.P.

Class - B.Sc./ B.A.

Subject - Mathematics

Paper Title - Matrices, Theory of Equations and Trigonometry

Semester – I

Date-

Certified that no extra Copies of Syllabus has been Retained by us. All rough work destroyed. Two hard copies and one soft copy submitted in original to Dr. Sonekia, Principal Govt. Hamidia Arts & Commerce College Bhopal.

Signature,

Chairman .....

Members- 1- 2-  
3- 4-  
5- 6-  
7- 8-  
9- 10-  
11- 12-  
13- 14-  
15- 16-

Department of Higher education, Govt. of M.P.

**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

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Class - B.Sc./ B.A.  
Subject - Mathematics - I  
Paper Title - Matrices, Theory of Equations and Trigonometry  
Semester – I

MM-50

**Unit – I**

**Linear independence of row and column matrices , Row rank & column rank of a matrix. equivalence of column and row rank. Eigen values, eigen vectors.**

**Unit – II**

**Characteristic equation of a matrix. Cayley Hamilton theorem and its use in finding inverse of matrix. Application of matrix to a system of linear ( both homogenous and non - homogenous) equations. Theorem on consistency and inconsistency of a system of linear equation. Solving the linear equation with three unknowns.**

**Unit – III**

**Relation between the roots and coefficients of general polynomials in one variable. Transformation of equations, Descarte's rule of signs.**

**Unit – IV**

**Solution of cubic equation (Cardon Method). De Moivre's theorem and its application.**

**Unit – V**

**Direct and inverse circular and hyperbolic functions, Logarithm of a complex quantity, Expansion of trigonometrical function. ( Gregory's Series, Summation of Series)**

**Texts Books :**

1. S.L. Loney – Plane Trigonometry Part II
2. K.B. Datta – Matrix and Linear Algebra Prentice Hall of India Pvt. New Delhi 2000
3. Chandrika Prasad – A Text Book on Algebra and Theory of Equations, Pothishala Pvt. Ltd. Allahabad

**Reference Books:**

1. P. B. Bhattacharya, S. K. Jain and S.R. Nagpaul, First Courses in Linear Algebra, Wiley Eastern, New Delhi. 1983.
2. S. K. Jain, A. Gunewardena and P. B. Bhattacharya, Basic Linear Algebra with MATLAB, Key College Publishing, 2001. Allahabad
3. H.S. Hall and S.R. Knight, Higher Algebra, H.M. publication, 1994.
4. R.S. Verma and K.S. Shukla, Text Book on Trigonometry Pothishala Pvt. Ltd.

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**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

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Class - B.Sc./ B.A.  
Subject - Mathematics - I  
Paper Title - Elementary Abstract Algebra  
Semester – II

**MM-50**

**Unit – I**

**Definition and basic properties of group. Order of an element of a group. Residue classes Modulo, Congruence relation. Subgroups, algebra of subgroups.**

**Unit – II**

**Cyclic groups, simple properties. Coset decomposition and related theorems. Lagrange's theorem and its consequences, Fermat's theorem and Euler's theorem.**

**Unit – III**

**Normal subgroups, Quotient groups, Homomorphism and isomorphism of groups, kernel of Homomorphism. Fundamental theorem of homomorphism of groups.**

**Unit – IV**

**Permutation groups (even and odd permutations) Alternating groups  $A_n$ , Cayley's theorem.**

**Unit – V**

**Introduction to rings, subrings, integral domains and fields, with simple properties and examples. Characteristic of a ring.**

**Text Books :**

1. I. N. Herstein – Topics in Algebra, Wiley Eastern Ltd. New Delhi 1977

**Reference Books:**

1. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra, Wiley Eastern, New Delhi, 1997.
2. I. S. Luther and I.B. S. Passi, Algebra Vol- I , II, Narosa Publishing House.

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**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

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Class - B.Sc./ B.A.  
Subject - Mathematics - II  
Paper Title - Calculus  
Semester – I

**MM-50**

**Unit – I**

**Concept of Partial differentiation, Successive differentiation, Leibnitz theorem, Maclaurin and Taylor series expansions.**

**Unit – II**

**Asymptotes and Curvature, Tests for concavity and convexity, points of inflexion. Multiple points.**

**Unit – III**

**Tracing of curves in cartesian and polar co-ordinates. Integration of irrational algebraic functions and transcendental functions.**

**Unit – IV**

**Reduction formulae, Definite Integrals.**

**Unit – V**

**Quadrature, Rectification, Volumes and Surfaces of solids of revolution of curves.**

**Texts Books :**

- 1. Gorakh Prasad – Differential Calculus, Pothishala pvt. Ltd. Allahabad**
- 2. Gorakh Prasad – Integral Calculus, Pothishala pvt. Ltd. Allahabad**

**Reference Books:**

- 1. Gabriel Klambauer, Mathematical Analysis Marcel Dekkar, Inc. New York, 1975.**
- 2. Murray R. Spiegel, Theory & problems of Advanced Calculus.Schaum's outline series, Schaum Publishing Co. NewYark.**
- 3. P.K. Jain and S. K. Kaushik, An introduction of Real Analysis, S.Chand & Co. New Delhi 2000.**
- 4. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 1999.**

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**Semester wise Syllabus for Undergraduates**

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Class - B.Sc./ B.A.  
Subject - Mathematics - III  
Paper Title - Geometry  
Semester – I

**MM-50**

**Unit – I**

**General equation of second degree. Tracing of conics.**

**Unit – II**

**System of conics, Confocal conics, Polar equation of a conic.**

**Unit – III**

**Equation of cone with given base, generators of cone, condition for three mutually perpendicular generators, Right circular cone.**

**Unit – IV**

**Equation of Cylinder and its properties. Right circular cylinder, enveloping cylinder and their properties.**

**Unit – V**

**Central conicoids, Paraboloids. Plane sections of Conicoids.**

**Texts Books :**

1. N. Saran & R.S. Gupta : Analytical Geometry of Three dimensions. Pothishala Pvt. Ltd. Allahabad
2. S.L. Loney, Elements of Coordinate Geometry, Macmillan and Co. London.

**Reference Books:**

1. P.K. Jain & Khalil Ahmad, A text book of Analytical Geometry of Two Dimensions, Wiley Eastern Ltd. 1994
2. P.K. Jain & Khalil Ahmad, A text book of Analytical Geometry of Three Dimensions, Wiley Eastern Ltd. 1999
3. R.J.T. Bell : Elementary Treatise on Coordinate Geometry of Three dimensions, Macmillan India Ltd. 1994.

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**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

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Class - B.Sc./ B.A.  
Subject - Mathematics - I  
Paper Title - Advanced Calculus ( Part I)  
Semester – III

**MM-50**

**Unit – I**

**Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion.**

**Unit – II**

**Series of non-negative terms. Comparison test, Cauchy's integral test, Ratio test. Raabe's test, logarithmic test, De-Morgan and Bertrand's test ( without proofs). Alternating series. Leibnitz's theorem. Absolute and conditional convergence.**

**Unit – III**

**Continuity of functions of one variable , sequential continuity. Properties of continuous functions. Uniform continuity.**

**Unit – IV**

**Chain rule of differentiability. Mean value theorems and their geometrical interpretations. Darboux's intermediate value theorem for derivatives.**

**Unit – V**

**Limit and continuity of functions of two variables**

**Texts Books :**

1. R.R. Goldberg, Real Analysis, I.B.H. Publishing Co. New Delhi, 1970.
2. Gorakh Prasad, Differential Calculus, Pothishala Pvt. Ltd. Allahabad.

**Reference Books:**

1. T.M. Apostol Mathematical Analysis Narosa Publishing House New Delhi 1985.
2. Murray R. Spiegel, Theory and Problems of Advanced Calculus, Schaum Publishing Co. New York.
3. N. Piskunov, Differential and Integral Calculus , Peace Publishers, Moscow.
4. S.C. Malik, Mathematical Analysis, Wiley Eastern Ltd. New Delhi.

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**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

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Class - B.Sc./ B.A.  
Subject - Mathematics - III  
Paper Title - Mechanics Part - I  
Semester – III

**MM-50**

**Unit – I**

**Analytical conditions of equilibrium of Coplanar forces.**

**Unit – II**

**Virtual work, catenary.**

**Unit – III**

**Forces in three dimensions, Poinsot's central axis.**

**Unit – IV**

**Stable and unstable equilibrium, Null lines and planes.**

**Unit – V**

**Velocities and accelerations along radial and transverse direction, and along tangential and normal directions.**

**Texts Books :**

1. S.L. Loney, Statics, Macmillan & Co. London
2. S.L. Loney, An Elementary Treatise on the Dynamics of a Particle and of Rigid Bodies, Cambridge Uni. Press 1956.

**Reference Book:**

1. R.S. Verma, A Text Book on Statics, Pothishala Pvt. Ltd., Allahabad

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**Semester wise Syllabus for Undergraduates**

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Class - B.Sc./ B.A.  
Subject - Mathematics - III  
Paper Title - Mechanics Part - II  
Semester – IV

**MM-50**

**Unit – I**

**Simple harmonic motion. Elastic strings.**

**Unit – II**

**Motion on smooth and rough plane curves.**

**Unit – III**

**Motion in a resisting medium. Motion of particles of varying mass.**

**Unit – IV**

**Central Orbits. Kepler's laws of motion.**

**Unit – V**

**Motion of a particle in three dimensions, Acceleration in terms of different coordinate systems.**

**Texts Book :**

1. S.L. Loney, An Elementary Treatise on the Dynamics of a Particle and of Rigid bodies, Cambridge Uni. Press 1956.

**Reference Book:**

2. M. Ray, Dynamics of a particle, Students Friends, Agra.

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**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

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Class - B.Sc./ B.A.  
Subject - Mathematics - I  
Paper Title - Advanced Calculus ( Part II)  
Semester – IV

**MM-50**

**Unit – I**

**Partial differentiation. Change of variables. Euler’s Theorem on homogeneous function Taylor’s theorem for functions of two variables.**

**Unit – II**

**Jacobians, Envelopes, Evolutes.**

**Unit – III**

**Maxima, minima and saddle points of functions of two variables. Lagrange’s multiplier method.**

**Unit – IV**

**Indeterminate forms, Beta and Gamma functions.**

**Unit – V**

**Double and triple integrals. Dirichlet’s integrals. Change of order of integration in double integrals.**

**Texts Books :**

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

**Reference Books:**

1. T.M. Apostol, **Mathematical Analysis** Narosa Publishing House, New Delhi 1985
2. Murray R. Spiegel, **Theory and Problems of Advanced Calculus**, Schaum Publishing Co., New York.
3. N. Piskunov , **Differential and Integral Calculus**, Peace Publishers, Moscow.
4. S.C. Malik, **Mathematical Analysis**, Wiley Eastern Ltd., New Delhi.

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**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

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Class - B.Sc./ B.A.  
Subject - Mathematics - III  
Paper Title - Vector Analysis and Vector Calculus  
Semester – II

**MM-50**

**Unit – I**

**Scalar and Vector product of three vectors, Product of four vectors, Reciprocal vectors.**

**Unit – II**

**Vector differentiation. Gradient, Divergence and Curl.**

**Unit – III**

**Vector integration, Theorem of Gauss (without proof ) and problems based on it.**

**Unit – IV**

**Theorem of Green's (without proof ) and problems based on it.**

**Unit – V**

**Stoke's theorem(without proof ) and problems based on it.**

**Text Book :**

1. N. Saran & S.N. Nigam – Introduction to Vector Analyss, Pothishala Pvt. Ltd., Allahabad

**Reference Books:**

1. Murray R. Spiegel, Vector Analysis, Schaum Publishing Co. New York.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons 1999.
3. Shanti Narayan, A text book of Vector Calculus, S. Chand & Co., New Delhi

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**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

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Class - B.Sc./ B.A.  
Subject - Mathematics - II  
Paper Title - Differential Equations (Part – I)  
Semester – II

**MM – 50**

**Unit – I**

**Linear equations and equations reducible to the linear form, Exact differential equations..**

**Unit – II**

**First order higher degree equations for  $x, y, p$ , Clairaut's form and singular solutions.**

**Unit – III**

**Geometrical meaning of a differential equation, Orthogonal trajectories, Linear differential equations with constant coefficients.**

**Unit – IV**

**Homogenous linear ordinary differential equations, linear differential equations of second order. Transformation of the equation by changing the dependent variable and the independent variable.**

**Unit – V**

**Method of variation of parameters, Ordinary simultaneous differential equations.**

**Text Books :**

1. D.A. Murray : **Introductory Course in Differential Equations, Orient Long man, India 1967.**
2. Gorakh Prasad : **Integral Calculus, Pothishala Pvt. Ltd., Allahabad.**

**Reference Books:**

1. G. F. Simmons, **Differential Equations, Tata Mcgraw Hill, 1972.**
2. E.A. Codington, **An introduction to ordinary differential equations, Prentice Hall of India 1961.**
3. H.T.H. Piaggio, **Elementary Treatise on Differential equations and their applications, C.B.S. Publisher and Distributors, Delhi 1985.**
4. W.E. Boyce and P.C. Diproima, **Elementary Differential equations & Boundary Value problems, John Wiley 1986.**
5. Erwin Kreyszig, **Advanced Engineering Mathematics, John Wiley & Sons 1999.**

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**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

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Class - B.Sc./ B.A.  
Subject - Mathematics - II  
Paper Title - Partial Differential Equations & Calculus of Variation  
Semester – IV

**MM – 50**

**Unit – I**

**Partial Differential equations of the first order. Lagrange's solution. Some special types of equations which can be solved easily by methods other than general methods.**

**Unit – II**

**Charpit's general methods of solution, Partial differential equations of second and higher orders. Classification of linear partial differential equations of second order.**

**Unit – III**

**Homogeneous and non- Homogeneous equations with constant coefficients. Partial differential equations reducible to equations with constant coefficients.**

**Unit – IV**

**Calculus of Variations – Variational problems with fixed boundaries. Euler's equation for functionals containing first order derivative and one independent variable. Extremals.**

**Unit – V**

**Functionals dependent on higher order derivatives. Functionals dependent on more than one independent variable. Variational problems in parametric form. Invariance of Euler's equation under co-ordinates transformation.**

**Texts Books :**

1. I.N. Sneddon, Elements of Partial Differential equations, McGraw Hill, Co. 1988.
2. A.S. Gupta, Calculus of Variations with Applications PHI, 1977

**Reference Books:**

1. I. M. Gelfand & S.V. Fomin, Calculus of Variations, Prentice – Hill, Englewood Cliffs ( New Jersey), 1963
2. J.T. Oden & J.N. Reddy , Variational Methods in theoretical Mechanics, Springer –Verlag 1976.

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**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

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Class - B.Sc./ B.A.  
Subject - Mathematics - II  
Paper Title - Differential Equations (Part – II)  
Semester – III

**MM – 50**

**Unit – I**

**Series Solution of Differential Equations-Power series Methods, Bessel's Equations Bessel's function and its Properties, recurrence and generating relations.**

**Unit – II**

**Legendre's Equations, legendre's function and its properties, recurrence and generating relations.**

**Unit – III**

**Orthogonality of functions, Sturm-Liouville problem. Orthogonality of eigen functions, reality of eigen value.**

**Unit – IV**

**Laplace transformations. Linearity of the Laplace transformation. Existence theorem of Laplace transforms, Laplace transforms fo derivatives and integrals. Shifting theorem.**

**Unit – V**

**Differentiation and integration of transforms. Inverse Laplace transforms, Convolution theorem. Applications of Laplace transformation in solving linear differential equations with constent coefficients.**

**Text Books :**

- 1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & sons, 1999**
- 2. R.V. Churchill, Fourir series and boundary value problem.**

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**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

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Class - बी.एस.सी / बी.ए.  
Subject - गणित – I  
Paper Title - प्रगत कलन भाग –1  
Semester – III

MM – 50

**इकाई – प्रथम**

अनुक्रम की परिभाषा, अनुक्रमकों की सीमाओं पर प्रमेय, परिबद्ध एवं एक दिष्ट अनुक्रम कौशी का अभिसरण, मानदंड।

**इकाई – द्वितीय**

अऋणात्मक पदों की श्रेणी, तुलना परीक्षण, कौशी का समाकलन परीक्षण, अनुपात परीक्षण, रॉबी का परीक्षण, लघुगणिकीय परीक्षण, डिमॉर्गन एवं बर्ट्रैन्ड का परीक्षण (बिना उपपत्ति) एकांतर श्रेणियां लिबनीज का प्रमेय।

**इकाई – तृतीय**

एक चर के फलनों का सांतत्य, अनुक्रमणीय सांतत्य, संतत फलनों के गुणधर्म, एक समान सांतत्यता।

**इकाई – चतुर्थ**

अवकलनीयता का श्रृंखला का नियम, माध्यमान प्रमेय एवं उनका ज्यामितीय अर्थ, अवकलन के लिए डॉरबाक्स का माध्यमान प्रमेय।

**इकाई – पाँच**

दो चरों के फलनों की सीमा एवं सांतत्यता।

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As recommended by Central board of Studies and

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Class -	बी.एस.सी / बी.ए.
Subject -	गणित – I
Paper Title -	अमूर्त बीज गणित – प्रथम
Semester –	II

MM – 50

**इकाई – प्रथम**

समूह की परिभाषा एवं मूलभूत गुणधर्म , समूह के अवयव की कोटि, मॉड्यूलों, माडल्यु अवशेष कक्षाएं, सर्वसमता संबंध, उपसमूह, उपसमूहो का बीजगणित।

**इकाई – द्वितीय**

चक्रीय समूह, साधारण गुणधर्म, कोसेट विभाजन एवं संबंध प्रमेयए लेग्रंज प्रमेय एवं उनके निगमन, फार्मा का प्रमेय एवं आयलर का प्रमेय।

**इकाई – तृतीय**

प्रसामान्य उपसमूह, विभाग समूह, समूहो की समाकारिता एवं तुल्याकारिता, समाकारिता की अष्टि, समूहो की समाकारिता का मूलभूत प्रमेय।

**इकाई – चतुर्थ**

क्रमचय समूह (सम एवं विषम क्रमचय ) एकांतर समूह  $A_n$ , कैली का प्रमेय

**इकाई – पाँच**

वलय, उपवलय, पूर्णांकीय प्रांत एवं क्षेत्र का परिचय (सरल गुणधर्म एवं उदाहरणों सहित) वलय की चारित्रिकता।

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Class - बी.एस.सी / बी.ए.

Subject - गणित – III

Paper Title - ज्यामिति

Semester – I

**MM – 50**

**इकाई – प्रथम**

द्विघात का सामान्य समीकरण, शांकवों का अनुरेखण।

**इकाई – द्वितीय**

शांकवों का निकाय, समनामीय शांकव, शांकव का घुवीय समीकरण।

**इकाई – तृतीय**

दिए गए आधार के शंकु का समीकरण, शंकु के जनक, तीन परस्पर लम्बवत जनकों हेतु शर्त, लंबवृत्तीय शंकु।

**इकाई – चतुर्थ**

बेलन का समीकरण एवं उसके गुणधर्म, लंबवृत्तीय बेलन, अन्वलोपिय बेलन एवं उसके गुणधर्म।

**इकाई – पाँच**

केन्द्रीय शांकवज परवलयज शांकवों की समतलीय काट।

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Class - बी.एस.सी / बी.ए.

Subject - गणित – I

Paper Title - प्रगत कलन

Semester – IV

**MM – 50**

**इकाई – प्रथम**

आंशिक अवकलन, चरों का परिवर्तन, समघात फलनों पर आयलर का प्रमेय, दो चरों के फलनों के लिए टेलर का प्रमेय।

**इकाई – द्वितीय**

जेकोबियन एन्वलय, इवोलुट्स ।

**इकाई – तृतीय**

दो चरों के फलनों का उच्चिष्ठ निम्निष्ठ एवं सेंडल बिन्दु, लाग्रांज की गुणांक विधि।

**इकाई – चतुर्थ**

अनिर्धार्य रूप, बीटा एवं गामा फलन।

**इकाई – पॉच**

द्विश एवं त्रि-समाकलन, डिरिख्लेट समाकलन, द्विश सपाकलन में क्रम परिवर्तन

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Class -	बी.एस.सी / बी.ए.
Subject -	गणित – III
Paper Title -	यांत्रिकी भाग – I
Semester –	III

**MM – 50**

इकाई – प्रथम

समतलीय बलों के संतुलन का विश्लेषणात्मक प्रतिबंध।

इकाई – द्वितीय

आभासी कार्य, रंज्जुका।

इकाई – तृतीय

त्रिविमीय बल, पॉयनसॉट केन्द्रीय अक्ष

इकाई – चतुर्थ

स्थाई एवं अस्थाई संतुलन, शून्य रेखा एवं तल

इकाई – पाँच

त्रिज्ज्यीय एवं निर्यग्रेखा दिशा के पारित वेग एवं त्वरण स्पर्शी एवं अभिलंब के परितः वेग एवं त्वरण।

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Approved by HE the Governor of M.P.

Class - बी.एस.सी / बी.ए.

Subject - गणित – II

Paper Title - कलन

Semester – I

**MM – 50**

**इकाई – प्रथम**

आंशिक अवकलन की अवधारणा, उत्तरोत्तर अवकलन, लैबनीज का प्रमेय, मैकलारिन एवं टेलर श्रेणी में विस्तार।

**इकाई – द्वितीय**

अनंत स्पर्शी, वक्रता, उत्तलता एवं अवतलता के परीक्षण, बहुबिन्दु।

**इकाई – तृतीय**

कर्त्तीय एवं घुवीय निर्देशांको में वक्रों का अनुरेखण, अपरिमेय, बीजीय एवं अवीजीय फलनों का समाकलन।

**इकाई – चतुर्थ**

समानयन सूत्र, निश्चित समाकलन।

**इकाई – पाँच**

क्षेत्रफलन, रेक्टिफिकेशन, वक्रों के परिभ्रमण से प्राप्त ठोसों का आयतन एवं सतह।

## B.Sc./ B.A. Semester V

( For B.Sc./ B.A.Degree for which two more subjects in addition to mathematics are required to be studied in the third year)

### Core Courses

Compulsory Paper I – Real and Complex Analysis

Compulsory Paper II - Abstract Algebra

Optional Paper - Any one of the following ( I to XII)

### Note – I

Students who opt for Computer Science as a main subject can not opt. for the following optional papers.

- 1- Principles of Computer Science.
- 2- Programming in C & Numerical Analysis ( part – I)

### Note – II

Students who opt for Statistics as a main subject can not opt. for the following optional papers

- 1- Probability Theory
- 2- Elementary Statistics

### Optional Papers :

- 1- Principles of Computer Science
- 2- Differential Geometry – I
- 3- Elementary Discrete Mathematics
- 4- Dynamics of Rigid Bodies
- 5- Mathematical Modelling - I
- 6- Applications of Mathematics in Finance
- 7- Tensor and Special theory of Relativity
- 8- Elementary and Combinatorial Number theory – I
- 9- Computational Mathematics Laboratory – I
- 10- Probability Theory
- 11- Programming in C and Numerical Analysis ( Part – I)
- 12- Elementary Statistics

## B.Sc./ B.A. Semester VI

( For B.Sc./ B.A Degree for which two more subjects in addition to mathematics are required to be studies in the third year)

### Core Courses

Compulsory Paper I – Metric Spaces

Compulsory Paper II - Linear Algebra

Optional Paper - Any one of the following ( I to XII)

### Note – I

Students who opt for Computer Science as a main subject can not opt. for the following optional papers.

- 1- Programming and Data Structures .
- 2- Programming in C & Numerical Analysis ( part – II)

### Note – II

Students who opt for Statistics as a main subject can not opt. for the following optional papers

- 1- Bivariate Distributions and Optimization.
- 2- Statistical Methods

### Optional Paper

- 1- Programming and Data Structure
- 2- Differential Geometry – II
- 3- Discrete Mathematics
- 4- Hydrostatics
- 5- Mathematical Modelling - II
- 6- Applications of Mathematics in Insurance
- 7- Special Theory of Relativity
- 8- Elementary and Combinatorial Number theory – II
- 9- Computational Mathematics Laboratory – II
- 10- Bivariate Distributions and Optimization
- 11- Programming in C and Numerical Analysis ( Part – II)
- 12- Statistical Methods.

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Subject- गणित- II  
Paper Title- अवकल समीकरण-भाग- II  
Semester- III

कुल अंक- 50

**इकाई-1**

अवकल समीकरणों का श्रेणी हल, घात श्रेणी विधि, बेसल के समीकरण, बेसल का फलन एवं उसके गुण धर्म, पुनरागमन एवं जनक संबंध।

**इकाई-2**

लीजेन्डर समीकरण, लीजेन्डर फलन एवं उसके गुण धर्म, पुनरागमन एवं जनक संबंध।

**इकाई-3**

फलनों की लांबिकता, स्टर्म लुइविले समस्या, आयगन फलनों की लांबिकता, आयगन मान की वास्तविकता।

**इकाई-4**

लाप्लास रूपांतरण, लाप्लास रूपांतरणों की लांबिकता, लाप्लास रूपांतरणों का अस्तित्व प्रमेय, अवकलों एवं समाकलों के लाप्लास रूपांतरण, विस्थापन, प्रमेय।

**इकाई-5**

रूपांतरणों का अवकलन एवं समाकलन, प्रतिलोम लाप्लास फलन, कन्वलूशन प्रमेय, अचर गुणांकों के अवकल समीकरणों को हल करने में लाप्लास रूपांतरणों के अनुप्रयोग।

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Class - बी.एससी./बी0ए0

Subject- गणित- III

Paper Title- यांत्रिकी भाग- II

Semester- IV

कुल अंक- 50

**इकाई-1**

सरल आवर्त गति, प्रत्यास्थ डोरियों

**इकाई-2**

चिकने एवं रूक्ष समतल वक्रों पर गति।

**इकाई-3**

प्रतिरोधी माध्यम में गति, बदलती सहंति के कणों की गति।

**इकाई-4**

केन्द्रीय कक्ष, केपलर के गति के नियम

**इकाई-5**

त्रिविम दिशा में कणों की गति, विभिन्न निर्देशांक पद्धतियों के पदों में त्वरण।

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Subject-	गणित-।
Paper Title-	आव्यूह, समीकरणों का सिद्धांत एवं त्रिकोणमिति
Semester-	I

कुल अंक— 50

**इकाई—1**

पंक्ति एवं स्तम्भ आव्यूहों की रैखिक स्वतंत्रता, आव्यूह की पंक्ति जाति एवं स्तम्भ जाति, स्तंभ जाति एवं पंक्ति जाति की तुल्यता, आयगेन मान एवं आयगेन सदिश

**इकाई—2**

आव्यूह की चारित्रिकता, केले—हैमिल्टन प्रमेय एवं आव्यूह का व्युत्क्रम ज्ञात करने में इसका उपयोग, रैखिक समीकरणों के निकाय (समघात एवं असमघात) के हल के लिये आव्यूहों का प्रयोग, रैखिक समीकरणों के निकाय की संगतता एवं असंगतता पर प्रमेय, तीन अज्ञात राशियों के रैखिक समीकरणों के हल।

**इकाई—3**

एक घात के सामान्य बहुपदों के गुणांकों एवं मूलों के बीच संबंध, समीकरणों का रूपांतरण, चिन्हों का डेस्फार्ट नियम।

**इकाई—4**

त्रिघातीय समीकरणों का हल(कॉर्डन विधि), डी—मॉवर्स प्रमेय एवं इसके उपयोग

**इकाई—5**

प्रत्यक्ष एवं व्युत्क्रम, वृत्तीय एवं अतिपरवलजीय फलन, सम्मिश्र संख्याओं का लघुगुणक, त्रिकोणमितीय फलनों का विस्तार (ग्रेगरी श्रेणी, श्रेणियों का योग)

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Subject-	गणित- II
Paper Title-	आंशिक अवकल समीकरण एवं विचरण का कलन।
Semester-	IV

कुल अंक— 50

**इकाई—1**

प्रथम कोटि के आंशिक अवकल समीकरण, लेग्रांज का हल, कुछ विशिष्ट प्रकार के समीकरण जिन्हें व्यापक विधि के अलावा सरल विधि से हल किया जा सके।

**इकाई—2**

चारपिट की हल की व्यापक विधि, द्वितीय एवं उच्चतर कोटि के आंशिक अवकल समीकरण, द्वितीय कोटि के रैखिक आंशिक अवकल समीकरणों का वर्गीकरण

**इकाई—3**

अचर गुणांकों के समघातीय एवं असमघातीय समीकरण, आंशिक अवकल समीकरण जो अचर गुणांकों वाले समीकरणों में परिवर्तनीय है।

**इकाई—4**

विचरण का कलन— स्थित सीमांत वाले विचरणीय प्रश्न, प्रथम कोटि अवकल एवं एक स्वतंत्र चर को अंतर्विष्ट करने वाले फलनक के लिये आयलर का समीकरण, एक्स्ट्रीमलस।

**इकाई—5**

उच्चतर कोटि के अवकलों पर आधारित फलनक, एक से अधिक स्वतंत्र चरों पर आधारित फलनक, प्राचल रूप के विचरणीय प्रश्न, निर्देशांक रूपांतरण के अधीन आयलर के समीकरण की अपरिवर्तितता।

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Subject- गणित- II

Paper Title- अमूर्त बीजगणित II

Semester- V

कुल अंक— 50

**इकाई—1**

समूह स्वकारिता (स्वसमरूपता), आंतर स्वकारिता, स्वकारिताओं के समूह।

**इकाई—2**

संयुग्मता संबंध एवं सेन्ट्रीलाईजर, प्रसामान्यक, गणता सिद्धांत एवं परिमित समूह का वर्ग समीकरण।

**इकाई—3**

परिमित आबेली एवं अनआबेली समूहों के लिये कौशी एवं सैलो के प्रमेय।

**इकाई—4**

वलय समाकारिता, गुणजावली एवं विभाग वलय, पूर्णांकी प्रांत का भाज्य क्षेत्र, युक्लीडीयन वलय।

**इकाई—5**

बहुपद वलय, परिमेय क्षेत्र पर बहुपद, क्रमविनिमय वलयों पर बहुपद वलय, अद्वितीय गुणन खण्ड प्रांत।

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Class -	बी.एससी./ बी0ए0
Subject-	गणित- II
Paper Title-	रैखिक बीजगणित
Semester-	VI

कुल अंक— 50

**इकाई—1**

सदिश समष्टि की परिभाषा एवं उदाहरण, उपसमष्टि, उपसमष्टियों का योग एवं सीधा योग, रैखिक विस्तृति, रैखिक आश्रितता, स्वतंत्रता एवं उनके मूल गुणधर्म।

**इकाई—2**

आधार, परिमित विमीय सदिश समष्टियाँ, आधार का अस्तित्व प्रमेय, आधार समुच्चय में अवयवों की संख्या की अपरिवर्तनशीलता, विमा, परिमित विमीय सदिश समष्टि की उपसमष्टि की पूरक उपसमष्टि का अस्तित्व, उपसमष्टियों के योग की विमा, विभाग समष्टि एवं उसकी विमा।

**इकाई—3**

रैखिक रूपांतरण एवं उनका आव्यूह निरूपण, रैखिक रूपांतरणों का बीज गणित, जाति शून्यता प्रमेय, आधार का परिवर्तन, द्वैत समष्टि, द्विद्वैत समष्टि एवं प्राकृत तुल्याकारिता, रैखिक रूपांतरण का संलग्न रूपांतरण।

**इकाई—4**

रैखिक रूपांतरणों के आयगन मान एवं आयगन सदिश, विकर्णीकरण द्विएकघाती, द्विघाती एवं हरमिशियन समघात।

**इकाई—5**

आंतर गुणन समष्टि— कौशी स्वार्ज असमिका, लांबिक सदिश, लांबिक पूरक, प्रसामान्य लांबिक समुच्चय एवं आधार, परिमित विमीय समष्टियों हेतु बैसल की असमिका, ग्राम शिमट लांबिकता प्रक्रम।

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**Subject-** गणित-।

**Paper Title-** दूरीक समष्टियाँ

**Semester-** VI

कुल अंक— 50

### **इकाई-1**

दूरीक समष्टि की परिभाषा एवं उदाहरण, सामीप्य, सीमा बिन्दु, अंतः बिन्दु, विवृत्त एवं संवृत समुच्चय, संवरणक एवं अभ्यंतर, परिसीमा बिन्दु, दूरीक समष्टि की उप समष्टि।

### **इकाई-2**

कौशी अनुक्रम, पूर्णता, केन्टर का सर्वनिष्ठ प्रमेय, संकुचन सिद्धांत, पूर्ण क्रमित क्षेत्र के रूप में वास्तविक संख्याएँ, सघन समुच्चय, बेयर का संवर्ग प्रमेय।

### **इकाई-3**

विघटीय द्वितीय एवं प्रथम गणनीय समष्टि, सतत फलन, विस्तार प्रमेय, एक समान संततता।

### **इकाई-4**

संहतता, अनुक्रमणीय संहतता, पूर्ण परिबद्ध समष्टि, परिमित सर्वनिष्ठ प्रगुण।

### **इकाई-5**

संतत फलन एवं संहतित समुच्चय, संबद्धता।

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<b>Subject-</b>	गणित-।
<b>Paper Title-</b>	वास्तविक एवं सम्मिश्र विश्लेषण
<b>Semester-</b>	V

कुल अंक— 50

**इकाई—1**

रीमान समाकल, सतत एवं एकदिष्ट फलनों की समाकलनीयता, समाकलन का मूलभूत प्रमेय, समाकलन के माध्यमान प्रमेय।

**इकाई—2**

वास्तविक मान फलनों की दो चरों के आंशिक अवकलज एवं अवकलनीयता, स्वार्ज एवं यंग के प्रमेय, अस्पष्ट फलन प्रमेय, अर्द्ध एवं पूर्ण अंतराल की फोरियर श्रेणी।

**इकाई—3**

विषम समाकल एवं उनका अभिसरण, तुलना परीक्षण, आबेल एवं डिरिक्लेट का परीक्षण फ्रुलानी समाकल, प्राचलिक फलनों के रूप में समाकल, संततता, प्राचलिक फलनों के रूप में अवकलनीयता एवं समाकलनीयता।

**इकाई—4**

कमित युग्म के रूप में संख्यायें, सम्मिश्र संख्याओं की ज्यामितीय व्याख्या, स्टिरियोग्राफिक प्रक्षेप, सम्मिश्र फलनों की संततता एवं अवकलनीयता।

**इकाई—5**

वैश्लेषिक फलन, कौशी रीमान समीकरण, प्रसंवादी फलन, मोबियस रूपांतरण, स्थिर बिन्दु, तिर्यक अनुपात, व्यूत्क्रम बिन्दु एवं क्रांतिक प्रतिचित्रण।

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Class - बी.एससी./ बी0ए0  
Subject- गणित- II  
Paper Title- अवकलन समीकरण I  
Semester- II

कुल अंक- 50

**इकाई-1**

रैखिक समीकरण, रैखिक समीकरणों में रूपांतरणीय समीकरण, यथावत अवकल समीकरण।

**इकाई-2**

$x, y, p$  में प्रथम कोटि, उच्चघात के समीकरण, क्लारेट फार्म एवं विचित्र हल।

**इकाई-3**

अवकल समीकरण का ज्यामितीय अर्थ, लांबिक संछेदी, अचर गुणांको के रैखिक समीकरण।

**इकाई-4**

सामान्य समघात रैखिक समीकरण, द्विघात रैखिक अवकल समीकरण, परतंत्र एवं स्वतंत्र चरों को बदल कर समीकरण का रूपांतरण।

**इकाई-5**

प्राचल विचरण की विधि, साधारण युगपद अवकल समीकरण।

**Department of Higher education, Govt. of M.P.**

**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

Approved by HE the Governor of M.P.

Class -	बी.एससी./ बी0ए0
Subject-	गणित-III
Paper Title-	सदिश विश्लेषण एवं सदिश कलन
Semester-	II

कुल अंक- 50

**इकाई-1**

तीन सदिशों का अदिश एवं सदिश गुणन, चर सदिशों का गुणन, व्युत्क्रम सदिश।

**इकाई-2**

सदिश अवकलन, ग्रेडिएंट, डायन्ड्रजेंस एवं कर्ल।

**इकाई-3**

सदिश समाकलन, गॉस की प्रमेय (बिना उपपत्ति) एवं उस पर आधारित प्रश्न।

**इकाई-4**

ग्रीन का प्रमेय (बिना उपपत्ति) एवं उस पर आधारित प्रश्न।

**इकाई-5**

स्टोक का प्रमेय (बिना उपपत्ति) एवं उस पर आधारित प्रश्न।

Department of Higher education, Govt. of M.P.

**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

Approved by HE the Governor of M.P.

Class - B.Sc./ B.A.  
Subject - Mathematics - II  
Paper Title - Linear Algebra  
Semester – VI

M.M.: 50

Unit-I

Definition and examples of vector spaces, subspaces. Sum and direct sum of subspace. Linear span. Linear dependence, independence and their basic properties.

Unit - II

Basis. Finite dimensional vector spaces Existence theorem for basis Invariance of the number of elements of a basis set. Dimension. Existence of complementary subspace of a subspace of a finite dimensional vector space. Dimension of sums of subspaces. Quotient space and its dimension.

Unit-III

Linear transformations and their representation as matrices. The Algebra of linear transformations. The rank nullity theorem. Change of basis. Dual space, Bidual space and natural isomorphism. Adjoint of a linear transformation.

Unit - IV

Eigen values and eigen vectors of a linear transformation. Diagonalisation Bilinear. Quadratic and Hermitian forms.

Unit - V

Inner Product Spaces - Cauchy-Schwarz inequality. Orthogonal vectors. Orthogonal complements. Orthonormal sets and bases. Bessel's inequality for finite dimensional spaces. Gram-Schmidt Orthogonalization process.

Text Books :

1. K. Hoffman and R. Kunze, Linear Algebra, 2nd Edition. Prentice Hall Englewood Cliffs, New Jersey. 1971.

References :

1. K.B. Datta. Matrix and Linear Algebra, Prentice hall of India Pvt Ltd., New Delhi, 2000.
2. S.K. Jain, A. Gunawardena & P.B. Bhattacharya. Basic Linear Algebra with MATLAB Key college Publishing (Springer-Verlag) 2001.
3. S. Kumarsaran, Linear Algebra, A Geometric Approach Prentice – Hall of India, 200

Department of Higher education, Govt. of M.P.  
**Semester wise Syllabus for Undergraduates**  
As recommended by Central board of Studies and  
Approved by HE the Governor of M.P.

Class -	B.Sc./ B.A.	
Subject -	Mathematics - I	
Paper Title -	<b>Real and Complex Analysis</b>	
Semester –	V	MM: 50

**Unit -I**

Riemann integral. Integrability of continuous and monotonic functions. The fundamental theorem of integral calculus. Mean value theorems of integral calculus.

**Unit-II**

Partial derivation and differentiability of real-valued functions of two variables. Schwarz and Young's theorem. Implicit function theorem. Fourier series of half and full intervals.

**Unit – III**

Improper integrals and their convergence. Comparison tests, Abel's and Dirichlet's tests Frullani's integral. Integral as a function of a parameter. Continuity, derivability and integrability of an integral of a function of a parameter.

**Unit – IV**

Complex numbers as ordered pairs. Geometric representation of Complex numbers, Stereographic projection. Continuity and differentiability of Complex functions.

**Unit-V**

Analytic functions. Cauchy Riemann equations. Harmonic functions. Mobius transformations. Fixed points. Cross ratio. Inverse points and critical mappings.

**Text Book**

1. R.R Goldberg, Real Analysis, Oxford & IBH Publishing Co., New Delhi, 1970.
2. Shanti Narayan, Theory of Functions of a Complex Variable, S. Chand & Co., New Delhi.

**References**

- 1 T.M Apostol, Mathematical Analysis. Narosa Publishing House. New Delhi, 1 985
- 2 S. Lang. Undergraduate Analysis, Springer-Verlag, New York, 1983.
- 3 D. Somasundaram and B. Choudhary, A first Course in Mathematical Analysis. Narosa Publishing House, New Delhi 199 /.
- 4 Shanti Narayan, A Course of Mathematical Analysis. S. Chand & Co. Delhi.
- 5 RK. Jain and S.K. Kaushik, An introduction to Real Analysis, S. Chand & Co., New Delhi. 2000.
- 6 R. V. Churchill & J.W. Brown, Complex Variables and Applications, 5th Edition, McGraw-Hill New. York. 1990.
- 7 Mark; J. Ablowitz & A. S. Fokas. Complex Variables : Introduction and Applications, Cambridge University Press, South Asian Edition, 1998.
- 8 Ponnuswamy : Complex Analysis, Narosa Publishing Co.

Department of Higher education, Govt. of M.P.  
**Semester wise Syllabus for Undergraduates**  
As recommended by Central board of Studies and  
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Class - B.Sc./ B.A.  
Subject - Mathematics - I  
Paper Title - Metric Spaces  
Semester – VI

M.M.:50

Unit - I

Definition and examples of metric spaces. Neighbourhoods. Limit points. Interior points. Open and closed sets. Closure and interior. Boundary points. Sub space of a metric space.

Unit - II

Cauchy sequences. Completeness Cantor's intersection theorem Contraction principle. Real numbers as a complete ordered field. Dense subsets. Baire Category theorem.

Unit-III

Separable, second countable and first countable spaces. Continuous functions. Extension theorem. Uniform continuity.

Unit -IV

Compactness. Sequential compactness. Totally bounded spaces, Finite intersection property.

Unit - V

Continuous functions and compact sets. Connectedness.

Text Books:

- 1 R.R. Goldberg, Real Analysis, Oxford & IBH Publishing Co.. New Delhi. 1970.
2. G.F. Simmons. Introduction to Topology and Modern Analysis. McGraw-Hill, 1963.

References:

1. P.K. Jain and K. Ahmed Metric Spaces, Narosa Publishing House, New Delhi, 1996.
2. S. Lang, Undergraduate Analysis, Springer-Verlag, New York 1983.
3. E.T. Copson, Metric Spaces, Cambridge University Press, 1968.

Department of Higher education, Govt. of M.P.

**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

Approved by HE the Governor of M.P.

Class - B.Sc./ B.A.  
Subject - Mathematics - II  
Paper Title - **Abstract Algebra**  
Semester – V

M.M.: 50

Unit-I

Group-Automorphisms, inner automorphism. Automorphism groups.

Unit- II

Conjugacy relation and centraliser. Normaliser. Counting principle and the class equation of a finite group.

Unit -III

Cauchy's theorem and Sylow's theorems for finite abelian groups and non abelian groups

Unit - IV

Ring homomorphism. Ideals and Quotient Rings. Field of Quotients of an Integral Domain. Euclidean Rings.

Unit -V

Polynomial Rings. Polynomials over the Rational Field. Polynomial Rings over Commutative Rings. Unique factorization domain.

Text Book:

1. I. N. Herstein Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975.

References :

1. N. Jacobson, Basis Algebra, Vols, I & II. W.H. Freeman, 1980 (also published by Hindustan Publishing Company.)
2. Shanti Narayan, A Text Book of Modern Abstract Algebra, S. Chand & Co. New DelhL
3. P.B. Bhattacharya. S.K. Jain and S.R. Nagpal. Basic Abstract Algebra (2nd Edition) Cambridge University Press, Indian Edition 1997.
4. Vivek Sahai and Vikas Bist Algebra, Norosa Publishing House, 1997
5. I.S. Luther and I.B.S. Passi, Algebra, Vol. I-Groups, Vol. II-Rings, Narosa Publishing House (Vol I-1996, Vol II-1999).
6. D.S. Malik, J.N. Mordeson, and M.K.Sen, Fundamentals of Abstract Algebra, McGraw-Hill International Edition, 1997.

Department of Higher education, Govt. of M.P.  
**Semester wise Syllabus for Undergraduates**  
As recommended by Central board of Studies and  
Approved by HE the Governor of M.P.

Class - B.Sc./ B.A.

Subject - Mathematics III ( Optional XII)

Paper Title - Elementary Statistics

Semester – V MM - 50

Unit I

Frequency distribution - Measures of central tendency. Mean. Median, mode. G.M., K.M., partition values.

Unit II

Measures of dispersion-range, inter quartile range. Mean deviation. Standard deviation, moments, skewness and kurtosis.

Unit - III

Probability-Event sample space, probability of an event addition and multiplication theorems Baye's theorem.

Unit IV

Continuous probability-probability density function and its applications for finding the mean mode, median and standard deviation of various continuous probability distributions. Mathematical expectation, expectation of sum and product of random variables.

Unit - V

Theoretical distribution- Binomial , Poisson distributions and their properties and uses Moment generating function

Text Book

1. Statistics by M. Ray
2. Mathematical Statistics by J.N. Kapoor, H.C. Saxena (S. Chand)

Reference Book

1. Statistical Methods, H.K.L Pathak, Shiksha Sahitya Prakash. Meerut
2. Fundamentals of Mathematical Statistics, Kapoor and Gupta

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**Semester wise Syllabus for Undergraduates**  
As recommended by Central board of Studies and  
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Class - B.Sc./ B.A.  
Subject - Mathematics – III ( Optional – XII)  
Paper Title - Statistical Methods  
Semester – VI

**MM. - 50**

**Unit- I**

Normal, rectangular and exponential distributions, their properties and uses.

**Unit- II**

Methods of least squares, curve fitting, correlation.

**Unit- II**

Regression, partial and multiple correlations (upto three variables only.)

**Unit - IV**

Sampling-Sampling of large samples, Null and alternative hypothesis, errors of first and second kinds, level of significance, critical region, tests of significance based on  $\chi^2$

**Unit- V**

Tests of significance based on t, F and z.

Text Book

1. Statistics by M. **Ray**
2. Mathematical Statistics , J.N.-Kapoor, H.C. Saxena (S. Chand)

Reference Books

1. Fundamentals of Mathematical Statistics. Kapoor and Gupta

Department of Higher education, Govt. of M.P.

**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

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Class - B.Sc./ B.A.  
Subject - Mathematics – III (Optional – IV)  
Paper Title - **Dynamics of Rigid Bodies**  
Semester – V

Unit I

Moments and products of inertia.

Unit II

The Momental Ellipsoid. Equipomental Systems. Principal axes.

Unit III

D'Alembert's principle. The general equations of motion of a rigid body. Motion of the Centre of inertia and motion relative to the Centre of inertia

Unit IV

Motion about a fixed axis. The compound pendulum Centre of percussion

Unit V

Motion of a rigid body in two dimensions under finite and impulsive forces. Conservation of Momentum and Energy,

Text book

1. S.L. Loney. An Elementary Treatise on the Dynamics of a Particle of Rigid.bodies. Cambridge University Press, 1956.

References :

- 1 AS. Ramsey, Dynamics, part I Cambridge University Press, 1973.
2. M. Ray and H.S. Sharma, Dynamics of Rigid Body, Students Friends, Agra

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**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

Approved by HE the Governor of M.P.

Class - B.Sc./ B.A.  
Subject - Mathematics  
Paper Title - Hydrostatics – III ( Optional IV)  
Semester – VI

Unit – I

Pressure equation, condition of equilibrium. Lines of Force. Homogeneous and heterogeneous fluids.

Unit II

Elastic fluids. Surface of equal pressure. Fluid at rest under action of gravity. Rotating fluids.

**Unit III**

Fluid Pressure on plane surfaces. Centre of pressure. Resultant pressure on curved surfaces.

Unit IV

Equilibrium of floating bodies. Curves of buoyancy. Surface of buoyancy. Stability of equilibrium of floating bodies. Meta centre. Work done in producing a displacement.

**Unit V**

Vessel containing liquid. Gas laws. Mixture of gases. Internal Energy Adiabatic expansion. Work done in compressing a gas. Isothermal Atmosphere. Connective equilibrium.

Text book

1. W.H. Besant and AS. Ramsey, A Treatise on Hydromechanics, part I Hydrostatics. ELBS and G.Bell and Sons Ltd., London.
2. M. Ray and H.S. Sharma, Hydrostatics, students friends. .Agra

Department of Higher education, Govt. of M.P.  
**Semester wise Syllabus for Undergraduates**  
As recommended by Central board of Studies and  
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Class - B.Sc./ B.A.  
Subject - Mathematics – III ( Optional II)  
Paper Title - Differential Geometry- I  
Semester – V

M.M 50

Unit I

Contravariant and covariant vectors. Definition of Tensor, Gradient, Tensor field, Addition and subtraction of Tensors, Multiplication of Tensors.

Unit II

Inner product of Tensors, Contraction, symmetric Tensor, Anti-symmetric Tensor, Quotient law, Reciprocal, Invariant relative Tensor.

Unit III

Local Theory of curves - Space curves. Examples, Planar curves, Helices. Serret-Frenet formulae. \

Unit - IV

Existence of space curves, Involutives and evolutes of curves. Global Curve Theory - Rotation index. Convex curves, Isoperimetric inequality. Four vertex theorem.

Unit V

Local Theory of Surfaces - Parametric patches on surface. First Fundamental form and arc length. Normal curvature. Vector field along a curve. Second fundamental form of a surface. Weingarten map.

Text Book :

1. J. A Thorpe, Introduction to Differential Geometry, Springer-verlag.

References:

1. I.M. Singer and J.A Thorpe, 'Lecture notes -Elementary.' Topology. and Geometry, Springer Verlag, 1967.
2. B.O. Neill Elementary Differential Geometry, Academic Press 1966.
3. S. Stembeg, Lectures on Differential Geometry, Prentice-Hall, 1964.
4. M. DoCarmo, Differential Geometry of curves and surfaces, Prentice-Hall 1976.

Department of Higher education, Govt. of M.P.

**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

Approved by HE the Governor of M.P.

Class - B.Sc./ B.A.  
Subject - Mathematics – ( Optional – II)  
Paper Title - Differential Geometry-II  
Semester – VI

M.M.-50

Unit I

Geodesic curvature and Gauss formulae. Shape operator  $L_p$  of a surface at a point, third fundamental form of a surface. Principal curvatures. Gaussian Curvature. Mean and normal curvature Gauss theorem egregium Isometry groups and the fundamental existence theorem for surfaces.

Unit II

Global Theory of surfaces - Geodesic coordinate patches. Gauss-Bonnet formula. Euler characteristic of a surface. Index of a vector field. Space of constant curvature.

Unit III

Intrinsic Theory of Surfaces in Riemannian Geometry - Parallel translation and connections. Cartan's structural equations and curvature. Interpretation of curvature.

Unit IV

Geodesic curvature and Gauss -Bonnet for a 2-dimensional Riemann surface. Geodesic coordinate systems. Isometries and spaces of constant curvature and the 3 types of geometry.

Unit V

Transic Extension Theory of surfaces in  $R^3$  - Spherical image. Parallel translation for imbedded surfaces in  $R^3$  Classification of compact connected oriented surfaces in  $R^3$  relative to curvature.

Text Books :

1. J. A Thorpe, Introduction to Differential Geometry, Springer-verlag.

References:

1. I.M. Singer and J.A Thorpe, Lecture notes -Elementary.' Topology. and Geometry, Springer Verlag, 1967.
2. B.O. Neill Elementary Differential Geometry, Academic Press 1966.
3. S. Stembeg, Lectures on Differential Geometry, Prentice-Hall, 1964.
4. M. DoCarmo, Differential Geometry of curves and surfaces, Prentice-Hall 1976.

Department of Higher education, Govt. of M.P.  
**Semester wise Syllabus for Undergraduates**  
As recommended by Central board of Studies and  
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Class - B.Sc./ B.A.  
Subject - Mathematics – III ( Optional VI)  
Paper Title - Applications of Mathematics in Finance  
Semester – V

M.M.,50

Unit - 1

Financial Management - An overview. Nature and Scope of Financial Management, Goals of Financial Management and main decisions of financial management. Difference between risk, speculation and gambling.

Unit-II

Time value of Money - Interest rate and discount rate. Present value and future value discrete case as well as continuous compounding case. Annuities and its kinds.

Unit -III

Meaning of return. Return as Internal Rate of Return (IRR). Numerical Methods like Newton Raphson Method to calculate IRR Measurement of returns under uncertainty situations.

Unit - IV

Meaning of risk. Difference between risk and uncertainty. Types of risks. Measurements of risk Calculation of security and Portfolio risk and Return- Markowitz Model. Sharpe's Single Index Model- Systematic Risk and Unsystematic Risk.

Unit - V

Taylor series and Bond Valuation Calculation of Duration and Convexity of bonds. Financial Derivatives - Futures. Forward. Swaps and Options. Call and Put Option. Call and Put Parity Theorem.

Text Book:

1. Sheldon M Ross, An Introduction to Mathematical Finance, Cambridge University Press.
2. Mark S. Dorfman, Introduction to Risk management and insurance, Prentice Hall Englewood Cliffs, New Jersey.

References:

1. Aswath Damodaran, Corporate Finance - Theory and Practice, John Wiley & Inc.
2. John C. Hull, Options, Futures, and Other Derivatives, Prentice-Hall of India Private Limited.
3. CD. Daykin, T. Pentikainen and M. Pesonen, Practical Risk Theory for Actuaries. Chapman & Hall

Department of Higher education, Govt. of M.P.

**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

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Class - B.Sc./ B.A.  
Subject - Mathematics – III ( Optional VI)  
Paper Title - Applications of Mathematics in Insurance  
Semester – VI

MM- 50

Unit -1

Insurance Fundamentals - Insurance defined. Meaning of loss. Chances of loss, peril, hazard, and proximate cause in insurance. Costs and benefits of insurance to the society

Unit-II

Branches of insurance-life insurance and various types of general insurance. Insurable loss exposures-feature of a loss that is ideal for insurance.

Unit-III

Life Insurance Mathematics - Construction of Mortality Tables. Computation of Premium of Life Insurance for a fixed duration and for the whole life.

Unit-IV

Determination of claims for General Insurance-Using Poisson Distribution and Negative Binomial Distribution-the Polya Case. Pricing of contingent claims through Arbitrage and Arbitrage Theorem.

Unit -V

Determination of the amount of Claims in General Insurance - Compound Aggregate claim model and its properties, and claims of reinsurance. Calculation of a compound claim density function F-recursive and approximate formulae for F.

**Text Book:**

1. Sheldon M. Ross, An Introduction to Mathematical Finance, Cambridge University Press.
2. Mark S. Dorfman, Introduction to Risk Management and Insurance, Prentice Hall, Englewood Cliffs, New Jersey.

**References :**

1. Aswath Damodaran, Corporate Finance - Theory and Practice, John Wiley & Inc.
2. C.D. Day kin, T Pentikainen and M. Pesonan Practical Risk Theory for Actuaries, Chapman & Hall

Department of Higher education, Govt. of M.P.  
**Semester wise Syllabus for Undergraduates**  
As recommended by Central board of Studies and  
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Class - B.Sc./ B.A.  
Subject - Mathematics – III ( Optional VII)  
Paper Title - Tensor and Special Theory of Relativity  
Semester – V MM-50

Unit -1

Contravariant and covariant vectors, Definition of Tensor. Gradient. Tensor field, Addition and subtractions of Tensors, Multiplication of Tensors.

Unit - II

Inner product of Tensors, Contraction, symmetric Tensor, Anti-symmetric Tensor. Quotient law. Reciprocal Invariant relative Tensor.

Unit - III

Review of Newtonian mechanics - Inertial frames. Speed of light and Galilean relativity. Michelson-Morley experiment. Loreniz-Fitzgerold contraction Hypothesis.

Unit-IV

Relative character of space and time. Postulates of special theory of relativity. Lorentz transformation equations and its geometrical interpretation Group properties of Lorentz transformations

Unit -V

Relativistic kinematics - Composition of parallel velocities. Length contraction. Time dilation.

Text Book

1. A. W. Joshi Matrix and Tensor in Physics, Willey Eastern.
2. R. Resnick, Introduction to Special Relativity, Willey Eastern Pvt Ltd. 1972

References :

1. C. Moller The Theory of Relativity. Oxford Clarendon Press, 1952
2. PG Bergmann, Introducdon to the Theory of Relativity, Prentice Hall of India, Pvt Ltd. 1969
3. J.L. Anderson, Principles of Relativity Physics, Academic Press, 1967.
4. W. Rindler, Essential Relativity, Nostrand Reinhold Company, 1969
5. V. A. Ugarov, Special Theory of Relativity, Mir Publishers. 1979.
7. J.L Synge, Relativity : Hie Special Theory. North-Holland Publishing Company, 1956
8. The W.G. Dixon, Special relativity : The Foundation of Macroscopic Physics, Cambridge-University Press, 1982

Department of Higher education, Govt. of M.P.  
**Semester wise Syllabus for Undergraduates**  
As recommended by Central board of Studies and  
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Class - B.Sc./ B.A.  
Subject - Mathematics III ( Optional VII)  
Paper Title - Special Theory of Relativity  
Semester – VI

M.M.50

Unit - I

Transformation equations for components of velocity and acceleration of a particle and Lorentz contraction factor.

Unit -II

Geometrical representation of space - time - Four dimensional Minkowski an space-time of special relativity. Time-like, light-like and space-like intervals.

Unit - III

Null cone. Proper time. World line of a particle. Four vectors and tensors in Minkowskian space-time.

Unit - IV

Relativistic mechanics - Variation of mass with velocity Equivalence of mass and energy. Transformation equations for mass momentum and energy. Energy-momentum four vector

Unit-V

Relativistic force and Transformation equations for its components. Relativistic Lagrangian and Hamiltonian. Relativistic equations of motion of a particle. Energy momentum tensor of a continuous material distribution.

Text Book

1. A.W. Joshi. Matrix and Tensor in Physics, Willey Eastern
2. R Resnicx Introduction to Special Relativity, Wiley Eastern Pvt. Ltd. 1972

References :

1. C. Moller, The Theory of Relativity, Oxford Clarendon Press, 1952
2. PG Bergmann Introduction to the Theory of Relativity, Prentice Hall of India, Pvt. Ltd. 1969
3. J.L. Anderson, Principles of Relativity Physics, Academic Press. 1967.
4. W. Rindler, Essential Relativity. Van Nostrand Reinhold Company, 1969
5. V.A. Ugarov, Special Theory of Relativity. Mir Publishers, 1979.
6. J.L. Synge, Relativity : The Special Theory, North-Holland Publishing Company, 1956
7. W.G. Dixon, Special relativity : The Foundation of Macroscopic Physics, Cambridge University Press, 1982

Department of Higher education, Govt. of M.P.  
**Semester wise Syllabus for Undergraduates**  
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Class - B.Sc./ B.A.  
Subject - Mathematics – III ( Optional VIII)  
Paper Title - Elementary and Combinatorial Number Theory-I  
Semester – V

Unit -I

Primes and factorization. Division algorithm.

Unit -II

Congruences and modular arithmetic Chinese remainder theorem.

Unit - III

Euler phi function. Primitive roots of unity.

Unit -IV

Quadratic law of reciprocity. Applications.

Unit -V

Arithmetical functions. Mobius inversion formula.'

Text Book:

1. I. Niven, S.H. Zuckerman, and L.H. Montgomery, An Introduction to the Theory of Numbers, John Wiley, 1991.
2. G.H. Hardy, Number Theory.
3. Meivyn B. Nathans on. Additive Number Theory : Inverse Problems and the Geometry of Sumsets, Springer, 1996.

References :

1. David M. Burton, Elementary Number Theory, Wm. C. Brown Publishers, Dubugue, 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. 1998.
4. David M. Burton, Elementary Number Theory, Wm. C. Brown Publishers, Dubugue, Iowa. 1989.
5. K. Ireland, and M. Rosen, A Classical Introduction to Modern Number Theory, GTM Vol. 84. Springer-Verlag, 1972.
6. G. A. Jones, and J.M. Jones, Elementary Number Theory, Springer, 1998.
7. W. Sierpinski. Elementary Theory of Numbers, North-Holland, 1988. Ireland.
8. K. Rosen and M Rosen, A Classical Introduction to Modern Number Theory, GTM Vol 84 Springer-Verlag, 1972.
9. H.B. Mann, Addition theorems, Krieger, 1976

Department of Higher education, Govt. of M.P.  
**Semester wise Syllabus for Undergraduates**  
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Class - B.Sc./ B.A.  
Subject - Mathematics – III ( Optional VIII)  
Paper Title - Elementary, and Combinatorial Number Theory - II  
Semester – VI

M.M. 50

Unit-I

The Diophantine equations  $x^2 + y^2 = z^2$ ,  $x^4 + y^4 = z^4$

Unit - II

Farey sequences .Set addition. Theorems of Mann, Davenport and Chowla.

Unit-III

Vosper Theorem, Kneser theorem, e-transform and its properties.

Unit - IV

Theorem of Besicovitch E=G-Z theorem.

Unit – V

Erdos-Heilbronn conjecture. Freiman's theorem.

Text Book

1. I. Niven. S.H. Zuckerman and L.H Montgomery, An Introduction to the theory of Numbers. John Eiley 1991.
2. G.H. Hardy, Number Theory.
3. Melvyn B. Nathansa, Additive Number Theory: Inverse Problems and the Geometry- of sumests. Springer. 1996.

References :

1. David M. Burton Elementary Number Theory, Wm. C. Brown Publishers,Dubugue, Iowa 1989
2. K. Ireland, and M. Rosen A Classical Introduction to Modem Number Theory, GTM \ol. 84, Springer-Verlag, 1972.
3. G A Jones and J.M Jones, Elementary Number Theory. Springer, 1998.
4. W. Sierpinski. Elementry Theory of Numbers, North-Holland 1988. Ireland.
5. K. Rosen and M. Rosen, A Classical Introduction to Modern Number Theory, GTM Vol. 84. Soringer-Verlag, 1972.

Department of Higher education, Govt. of M.P.  
**Semester wise Syllabus for Undergraduates**  
As recommended by Central board of Studies and  
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Class - B.Sc./ B.A.  
Subject - Mathematics – III ( Optional V)  
Paper Title - Mathematical Modelling - I  
Semester – V

Unit -I

The process of Applied Mathematics. Setting up first order differential equations.

Unit -II

Qualitative solution sketching. Stability of solutions.

Unit-III

Difference and differential equation models of growth and decay

Unit -IV

Single species population model, Exponential and logistic population models.

Unit -V

An age structure model, prey predator models for two species.

Text Books:

1. Kapoor, J.N. : Mathematical models in Biology and Medicine. EWp (1985)
2. SAXENA V.P. : Bio-Mathematics an introduction, M.P. Hindu Growth Academy 1993
3. Martin Braun C.S. Coleman, DA Drew (Eds) Differential Equation Models.
4. Steven J.B. Lucas W.P., Straffin B.D. (Eds.) Political and Related Models, Vol. 2

Reference Books :

1. Cullen Linen. Models in Biology.
2. Rubinow, SI : Introduction to Mathematical Biology. John Wiley and Sons 1975.

Department of Higher education, Govt. of M.P.  
**Semester wise Syllabus for Undergraduates**  
As recommended by Central board of Studies and  
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Class - B.Sc./ B.A.  
Subject - Mathematics – III ( Optional – V)  
Paper Title - Mathematical Modelling - II  
Semester – VI

MM. 50

Unit -I

Introduction to pharmaco kinetics. Compartments.

Unit -II

Two and three compartment models in pharmaco kinetics. Epidemiological models.

Unit -III

SI, SIS, SIR and SIER models of epidemic of growth.

Unit -IV

Traffic models, car following models

Unit -V

Model from Political science proportional representation, cumulative voting, comparison voting.

Text Book:

1. Kapoor. J.N. : Mathematical models in Biology and Medicine. EWp (1985)
2. Saxena V.P. : Bio-mathematics an introduction, M.P. Hindu Growth Academy, 1993
3. Martin Braun, C.S. Coleman DA Drew (Eds) Differential Equation Models, Vol. - I
4. Steven J.B. Lucas W.F., Straffin P.D (Eds.) Political and Related Models, Vol. 2

Reference Books :

1. Cullen Linen Models in Biology.
2. Rubinow. SI: Introduction to Mathematical Biology, John Wiley and son 1975.

Department of Higher education, Govt. of M.P.  
**Semester wise Syllabus for Undergraduates**  
As recommended by Central board of Studies and  
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Class - B.Sc./ B.A.  
Subject - Mathematics – III ( Optional IX)  
Paper Title - Computational Mathematics Laboratory - I  
Semester – V

Computational Mathematics Laboratory:

The student is expected to familiarize himself herself with popular software's for numerical co-impuation and optimization, Real life problems requiring knowledge of numerical algorithms for linear and nonlinear algebraic equations Eigen value problems. Finite difference methods. Interpolation, Differentiation. Integration Ordinary differential equations etc. should be attempted. Capabilities to deal with linear, integer and nonlinear optimization problems need to be developed. The objective of such a laboratory is to equip students to MODEL and simulate large-scale systems using optimization modeling languages. (The concerned teacher is expected to provide the necessary theoretical background before the student does the corresponding practical). To this end software's like MATLAB, LINDO, MATHEMATICA, MAPLE can be adopted. Following course outline is suggested based on MATLAB and LINDO.

Unit-I

Plotting of functions.

Unit -II

Matrix operations, vector and matrix manipulations, matrix function.

Unit -III

Data analysis and curve fitting.

Unit -IV

Use of FFT algorithms

Unit -V

Numerical integration.

Text Books :

1. MATHEMATICA - Stephen Wolfram, Cambridge.
2. Introduction to operations research. F.S. Hiller and GJ. Liebetman.

References:

1. MATLAB -High performance numeric computation and visualization software :  
User's "guide. /
- 2.- Optimization modelling with LINDO : Linus Schrage

Department of Higher education, Govt. of M.P.  
**Semester wise Syllabus for Undergraduates**  
As recommended by Central board of Studies and  
Approved by HE the Governor of M.P.

Class - B.Sc./ B.A.  
Subject - Mathematics – III ( Optional IX)  
Paper Title - Computational Mathematics Laboratory - II  
Semester – VI

Computational Mathematics Laboratory:

The student is expected to familiarize himself/herself with popular softwares for numerical computation and optimization. Real life problems requiring knowledge of numerical algorithms for linear and nonlinear algebraic equations Eigen value problems. Finite difference methods. Interpolation, Differentiation, Integration ordinary differential equations etc. should be attempted. Capabilities deal with linear, integer and nonlinear optimization problems need to be developed. The objective of such a laboratory is to equip students to model and simulate large-scale systems using optimization modeling languages. (The concerned teacher is expected to provide the necessary theoretical background before the student does the corresponding practical). To this end softwares like MATLAB, LINDO, MATHEMATICA, MAPLE can be adopted- Following course outline is suggested based on MATLAB and LINDO.

Unit - I

Nonlinear equations and optimization functions. Differential equations.

Unit -I

2-D Graphics and 3-D Graphics - general purpose graphics functions, colour maps and colour controls.

Unit -III

Examples : Number theory, picture of an FFT, Function of a complex variable. Chaotic motion in 3-D

Unit - IV

Sparse matrices - Iterative methods for sparse linear equations, Eigen values of sparse matrices. Game of life.

Unit - V

Linear Programming, Integer programming and Quadratic Programming – Modelling and simulation techniques.

Text Books:

1. MATHEMATICA - Stephen Wolfram, Cambridge.
2. Introduction to operations research, F.S. Hiller and G.J. Lieberman.

References :

1. MATLAB -High performance numeric computation and visualization software : User's guide.
2. Optimization modelling with LINDO : Linus Schrage

Department of Higher education, Govt. of M.P.

**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

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Class -	B.Sc./ B.A.
Subject -	Mathematics – III ( Optional X)
Paper Title -	Bivariate Distributions and Optimization
Semester –	VI

Unit-I

Bivariate random variables ; joint distribution. Marginal and conditional distributions, Correlation coefficient. Functions of random variables : Sum of random variables, the law of large numbers and central limit theorem, the approximation of distributions.

Unit II

Uncertainty. Information and Entropy. Conditional entropy. Solution of certain logical problems by calculating information.

Unit - III

The linear programming Problem Formulation. Linear programming in matrix notation. Graphical solution of linear programming problems. Some basic properties of convex sets, convex functions.

Unit - IV

Theory and application of the simplex method. The solution of a linear programming problem. Charne's M-technique The two phase method.

Unit - V

Principle of duality in linear programming problem. Fundamental duality theorem. Simple problems. The Transportation and Assignment problems. (Balanced case)

Text Books:

1. S.C. Gupta and V.K. Kapoor, Mathematical Statistics.
2. G. Hadley, Linear Programming. Narosa Publishing House 1995

References :

1. S.M Ross, Introduction to Probability Model (Sixth edition) Academic Press, 1997.
2. LBlake, An Introduction to Applied Probability, John Wiley & Sons, 1979.
3. J. Pitman, Probability, Narosa, 1993
4. A.M. Yagolam and I. M . Yagolam Probability and Information Hindustan Publishing Corporation. Delhi. 1983.
5. Mokhtar S. Bazaraa. John J. Jarvis and Hanifd. Shirali Linear Programming and Network flows. John Wiley & Sons. 1990. -
6. S.I. Gass. Linear Programming ; Methods and Applications (4th edition) McGraw, -Hill. New York 1975.
7. Kanti Swaroop. P. K. Gupta and Man Mohan, Operations Research Sultan Chand & Sons. New Delhi, 1998,

List of Practicals :

1. Graphical solution of two dimensional LPP.
2. Maximisation of an objective function in a LPP with or without artificial variables.
3. Minimisation of an objective function in a LPP.
4. Optimum solution of a T.P. by Vogel's methods.
5. Optimum solution of an assignment problem.
6. Calculation of correlation coefficient of a bi variate data
7. Writing of dual problem of a given LPP.

Department of Higher education, Govt. of M.P.

**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

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Class - B.Sc./ B.A.  
Subject - Mathematics – III ( Optional X)  
Paper Title - Probability Theory  
Semester – V

Unit I

Notion of probability ; Random experiments, Sample space. Axiom of probability. Elementary properties of probability, Equally likely outcome problems.

Unit - II

Random Variables : Concept, cumulative distribution function. Discrete and continuous random variables, Expectations, Mean, Variance, Moment generating function.

Unit - III

Discrete random variable . Bernoulli random variable, binomial random variable. Geometric random variable, Poisson random variable and corresponding distributions

Unit - IV

Continuous random variables : Uniform random variable, Exponential random variable. Gamma random variable. normal random variable and corresponding distributions.

Unit - V

Conditional probability and conditional expectations, Bayes theorem, independence, Computing expectation by conditioning; Some applications -a list model A random graph, Polya's urn model

- Text Book:

- S.C. Gupta and V.K Kapoor, Mathematical Statistics.

- References:

- S.M. Ross, Introduction to Probability Model (Sixth edition)
- Academic Press, 1997.
- G.I. Blake, An Introduction to Applied Probability, John Wiley & Sons, 1979.
- J. Pitman Probability. Narosa, 1993.
- A.M. Yaglom and I.M. Yaglom, Probability and Information, Hindustan Publishing Corporation, Delhi 1983.

Department of Higher education, Govt. of M.P.

**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

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Class - B.Sc./ B.A.  
Subject - Mathematics III ( Optional XI)  
Paper Title - Programming in C and Numerical Analysis  
Semester – V

Unit -I

Programmer's model of a computer. Algorithms, Flow Charts, Data Types, Artificial and input output instruction. Decisions control structures. Decision statements

Unit - II

Logical and Conditional operators. Loop. Case control structures. Functions.. Recursions. Arrays.

Unit - III

Solution of Equations : Bisection. Secant Regula Falsi. Newton's Method. Roots of second degree Polynomials

Unit - IV

Interpolation Lagrange interpolation. Divided Differences, Interpolation Formulas using Differences, Numerical Quadrature . Newton-Cotes's Formulas, Gauss Quadrature Formulas.

Unit - V

Linear Equations Direct Methods for Solving Systems of Linear Equations (Gauss elimination LU Decomposition. Cholesky Decomposition), Iterative methods (Jacobi. Gauss - Seidel Reduction Methods).

Text Books

1. V Raja raman Programming C, Prentice Hall of India, 1994
2. C E Froberg. Introduction to Numerical Analysis, (Second Edition L Addison-Wesley \_ i979, Other references.

Reference:

1. Henry, Mullish and Herbert, L. Copper, Spirit of C: An Introduction to Modern Programming, Jaico Publishers.
2. M K Jain, S.R.K. Iyengar, R. K. Jain. Numerical Methods Problems and Solutions, New Age International (P)Ltd. 1996.

Department of Higher education, Govt. of M.P.

**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

Approved by HE the Governor of M.P.

Class - B.Sc./ B.A.  
Subject - Mathematics – III ( Optional XI)  
Paper Title - Programming in C & Numerical Analysis - II  
Semester – VI

MM- 35+15=50

Unit-1

The Algebraic Eigenvalue problem Jacobi's Method. Given's Method, Householder's Method Power Method QR Method. Lanczos Method.

Unit – II

Ordinary Differential Equations : Euler Method. Single-step Methods, Runge-Kutta's Method Multi-step Methods, Milne-Simpson Method. Methods Based on Numerical Integration, Methods Based on numerical Differentiation, Boundary Value Problems, Eigenvalue Problems

Unit- III

Approximation : Different Types of Approximation, Least Square Polynomial Approximation, Polynomial Approximation using Orthogonal Polynomials. Approximation with Trigonometric Functions. Exponential Functions. Chebychev Polynomials, Rational Functions Monte Carlo Methods

Unit-IV

Random number generation, congruential generators, statistical tests of pseudo-random numbers. Random variate generation inverse transform method,

Unit-V

Composition method, acceptance- rejection method, generation of exponential, normal variates, binomial and Poisson variates.

Text Book :

- 1 C E Frobery, Introduction to Numerical Analysis, (Second Edition) Addison-Wesley, 1979,

Reference:

1. M. K. Jain, R. K. Iyengar, R .K. Jain, Numerical Methods Problems and Solutions, New Age International (P) Ltd. 1999.
2. R Y. Rubistein, Simulation and Monte Carlo Methods, John Wiley, 1981.

Department of Higher education, Govt. of M.P.

**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

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Class - B.Sc./ B.A.  
Subject - Mathematics - – III ( Optional XII)  
Paper Title - Elementary Statistics  
Semester – V

Unit I

Frequency distribution - Measures of central tendency, Mean, Median, mode, G.M., H.M., partition values

Unit II

Measures of dispersion-range, inter quartile range, Mean deviation, Standard deviation, moments, skewness and kurtosis.

Unit - III

Probability-Event, sample space, probability of an event, addition and multiplication theorems Baye's theorem.

Unit IV

Continuous probability, probability density function and its applications for finding the mean, mode, median and standard deviation of various continuous probability distributions, Mathematical expectation, expectation of sum and product of random variables.

Unit - V

Theoretical distribution- Binomial, Poisson distributions and their properties and use, Moment generating function Text Book

1. Statistics by M. Ray
2. Mathematical Statistics by J.N. Kapoor, H.C. Saxena (S. Chand)

References Book:

Statistical Methods, H.K. Pathak, Shiksha Sahitya Prakash, Meerut

Fundamentals of Mathematical Statistics, Kapoor and Gupta

Department of Higher education, Govt. of M.P.

**Semester wise Syllabus for Undergraduates**

As recommended by Central board of Studies and

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Class - B.Sc./ B.A.

Subject - Mathematics - III (Optional XII)

Paper Title - Statistical Method

Semester – VI

Unit- I

Normal rectangulars and exponential distributions, their properties and uses.

Unit-II

Methods of least squares, curve fitting, correlation.

Unit- III

Regression .partial and multiple correlations (upto three variables only.)

Unit - IV

Sampling-Sampling of large samples. Null and alternative hypothesis, errors of first and second kinds, level of significance, critical region, tests of significance based on  $X^2$

Unit- V

Tests of significance based on t F and Z-test.

Text Books:

1. Statistics by M. Ray
- 2, Mathematical Statistics , J.N. Kapoor. HC. Saxena (S. Chand)

Reference Books

- . Fundamentals of Mathematical Statistics, Kapoor and Gupta

**Department of Higher Education, Govt. of M.P.**

**Semester Wise Syllabus For Graduates**

As recommended by Central Board of Studies and

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Class - B.Sc./B.A.  
Subject – MATHEMATICS-III (Optional Paper-III)  
Paper Title - Elementary Discrete Mathematics  
Semester- V

Unit 1

Sets and Propositions – Cardinality. Mathematical Induction Principle of Inclusion and exclusion.

Unit 2

Relations and Functions – Binary Relations. Equivalence Relations and Partitions. Partial Order Relation Functions and Pigeonhole Principle.

Unit 3

Graphs – Basic Terminology Multigraphs. Weighted Graphs.

Unit 4

Paths and Circuits. Shortest Paths. Eulerian Paths and Circuits. Travelling Salesman Problem. Trees and its Properties.

Unit 5

Planar graphs.

Recommended Texts:

1. C.L. Liu, Elements of Discrete Mathematics, (Second Edition), McGraw Hill, International Edition, Computer Science series 1986.
2. Narsingh Deo : Graph Theory, McGraw Hill.

Reference Book:

1. Babu Ram, Discrete Mathematics, Vinayak Publication.

**Department Of Higher Education, Govt. of M.P.**

**Semester Wise Syllabus For Graduates**

As recommended by central Board of studies and

Approved by HH the Governor of M.P.

Class-	B.Sc./B.A.
Subject –	MATHEMATICS-III(Optional Paper-III)
Paper Title –	Discrete Mathematics
Semester -	VI

MM -50

Unit I

Computability and Formal Languages Ordered sets, Languages, Phrase structure grammars. Types of grammars and Languages.

Unit 2

Discrete Numeric Functions and Generating Functions.

Unit 3

Recurrence relations and recursive algorithms – Linear recurrence relations with constant Coefficients.

Unit 4

Lattices and Algebraic structures, Duality. Distributive and Complemented Lattices.

Unit 5

Boolean Algebras and Boolean Lattices. Boolean Functions and Expressions. Propositional Calculus, Design and Implementation of Digital Networks. Switching Circuits.

Text Book :

1. C.L. Liu. Elements of Discrete Mathematics. (Second Edition), McGraw Hill, International Edition, Computer Science Series 1986.

Reference Books :

1. Babu Ram, Discrete Mathematics, Vinayak Publications.