

COURSE STRUCTURE
M.Sc./M.A. SEMESTER – IV, June 2010
MATHEMATICS

Name of the papers	Theory (M.M.)	Mini Passing M.	C.C.E.	Mini Passing M.	Practical M.M.	Minimum Passing M	Total
Compulsory Paper 1. Operations Research Optional Paper'	35	12	15	05	-----	-----	50
Four paper out of the following have to be chosen, opting not more than on e from each group.							
Group I (1) Approximation by trigonometric and algebraic polynomials (2) Partial Differential equation (3) Differential Structure on Manifolds (4) General Theory of Relativity and Cosmology	35	12	15	05	-----	-----	50
Group II (1) Algebraic Topology (2) Abstract Harmonic Analysis (3) Advanced Graph Theory (4) Advanced Special Function .	35	12	15	05	-----	-----	50
Group III (1) Theory of Linear Operators (2) Mechanics (3) Advanced Numerical Analysis (4) Advance Functional Analysis	35	12	15	05	-----	-----	50
Group IV (1) Fuzzy Sets and their Applications (2) Computational Biology (3) Jacobi Polynomial & H-Function (4) Fluid Mechanics	35	12	15	05	-----	-----	50

Group V								
(1) Wavelets		35	12	15	05	-----	-----	50
(2) Bio-Mechanics								
(3) Analytic Number Theory								
(4) Integral Transform								
(5) Functional Analysis II								
Group VI		25	09	10	14	15	06	50
(1) Programming in C (Theory & Practical)		35	12	15	05	-----	-----	50
(2) Mathematics of Finance & Insurance		35	12	15	05	-----	-----	50
(3) Integration Theory								
(4) Spherical Trigonometry and astronomy								
Paper VI.	Job - Oriented Project Work.							50
Paper VII.	Comprehensive Viva-Voce.							50
Grand Total								350
<p>Note: - 1- At the end of each Semester a Comprehensive Viva - Voce is to be conducted by a board of at least three examiners which includes at least one external examiner.</p> <p>2- Other optional papers according to the availability of subject experts may be added to any group.</p>								

COURSE STRUCTURE
M.Sc./M.A. SEMESTER - IV, June 2010
MATHEMATICS

Compulsory

Paper 1. Operations Research

Four papers out of the following have to be chosen, opting not more than one from each group.

Group I

- (1) Approximation by trigonometric and algebraic polynomials
- (2) Partial Differential Equations
- (3) Differentiable Structures on manifolds
- (4) General Relativity and Cosmology

Group II

- (1) Algebraic Topology
- (2) Abstract Harmonic Analysis
- (3) Advanced Graph Theory
- (4) Advanced special function.

Group III

- (1) Theory of Linear Operators
- (2) Mechanics
- (3) Advanced Numerical Analysis
- (4) Advance Functional Analysis

Group IV

- (1) Fuzzy Sets and their Applications
- (2) Computational Biology
- (3) Jacobi Polynomials and H-Function
- (4) Fluid Mechanics

Group V

- (1) Wavelets
- (2) Bio-Mechanics
- (3) Spherical Trigonometry & Astronomy
- (4) Integral Transform
- (5) Functional Analysis II

Group VI

- (1) Programming in C (Theory & Practical)
- (2) Mathematics of Finance & Insurance
- (3) Integration Theory
- (4) Analytic Number. Theory

Paper VI. Job - Oriented Project Work.

Paper VII. Comprehensive Viva-Voce.

Not :- 1- At the end of each Semester a Comprehensive Viva - Voce is to be conducted by a board of at least three examiners which includes at least one external examiner.
2- Other optional papers according to the availability of subject experts may be added to any group.

उच्च शिक्षा विभाग, म०प्र० शासन

(एम.एस.सी./एम.ए. (स्नातकोत्तर) कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के राज्यपाल द्वारा अनुमोदित

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

M.Sc./M.A (Post Graduates) Semester wise Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.

Max. Marks/अधिकतम अंक : 50
अधिकतम अंक/Max. Marks 50

कक्षा Class	:	<input type="text" value="M.Sc./M.A. (Mathematics)"/>
सेमेस्टर Semester	:	<input type="text" value="IV"/>
विषय समूह का शीर्षक Title of Subject/ Group	:	<input type="text" value="Operations Research"/>
प्रश्न पत्र क्रं- Paper No.	:	<input type="text" value="1st"/>
अनिवार्य/ वैकल्पिक Compulsory/ Optional	:	<input type="text" value="Compulsory"/>

Unit -1 Operations Research and its scope. Origin and Development of Operations Research, Characteristics of Operations Research, Model in Operations Research, Phase of Operations Research, Uses and Limitations of Operations Research, Linear Programming Problems, Mathematical Formulation, Graphical Solution Method.

Unit - 2 Inventory theory : Inventory models on economic lot size system with uniform and non uniform demand, Economic lot size with finite rate of replenishment, A simple order level system with constant rate of demand with shortage, Generalized economic lot size model, Multi items deterministic models, Probabilistic model, Instantaneous demand, no setup cost model, Uniform demand, no setup cost model

Unit- 3 Waiting lines, distribution theorem, classification of queuing model: models: (M/M/1):(∞/FCFS), (M/M/1)(N/FCFS). General Erlang queuing model, (M/M/S):(∞/FCFS), (M/M/S):(N/FCFS), (M/E_k/1):(∞/FCFS)

Unit - 4 Network analysis, constraints in Network, Construction of network, critical Path Method (CPM)PERT, PERT Calculation, Resource Leveling by Network Techniques and advances of network (PERT/CPM), Replacement problem: Replacement problem when money value does not change/changes with Time, Group replacement policy, Mortality theorem.

Unit -5 Game theory- Two persons, Zero-sum Games, Maximin-Minimax principle, games without saddle points-Mixed strategies, Graphical solution of 2xm and mx2 games, Solution by Linear Programming, Non-Linear programming Techniques-Kuhn-Tucker Conditions, Non-negative Constraints.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. S.D. Sharma, Operations Research.
2. F.S. Hiller and G.J. Lieberman, Industrial Engineering Series, 1995(This book comes with a CD containing software)

उच्च शिक्षा विभाग, म०प्र० शासन

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केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के राज्यपाल द्वारा अनुमोदित)

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

M.Sc./M.A (Post Graduates) Semester wise Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.

Max. Marks/अधिकतम अंक : 50

अधिकतम अंक / Max. Marks 50

कक्षा Class	:	M.Sc./M.A. (Mathematics)
सेमेस्टर Semester	:	IV
विषय समूह का शीर्षक Title of Subject/ Group	:	APPROXIMATION BY TRIGONOMETRIC AND ALGEBRAIC POLYNOMIALS
प्रश्न पत्र क्रं- Paper No.	:	II/III/IV/V
अनिवार्य/ वैकल्पिक Compulsory/ Optional	:	Optional Gr-I (1)

Unit -1 Fourier Series, Preliminaries, convergence of Fourier series, summability convergence of trigonometric series. ([1] Page 203 to 220).

Unit - 2 The degree of approximation by trigonometric polynomial Generalities, Theorem of Jackson, The degree of approximation of differentiable functions, Inverse theorems, Differential functions. ([2] Page 54 to 62).

Unit- 3 The degree of approximation by Algebraic polynomials, Preliminaries, The approximation theorems, Inequalities for the derivatives of polynomials, Inverse theorems. ([2] Page 63 to 75).

UNit - 4 Approximation by linear polynomials operators, sums of de la Vallee Pousson-positive operators, the principle of uniform boundedness, operators that preserve trigonometric polynomials, Trigonometric saturation classes. ([2] Page 92 to 102).

UNit -5 Least First Power of Approximation, Approximation on an Interval, Some computational aspects ([3] Page 66 to 83).

Text Books:

1. Hrshikesh N Mhaskar and D.V. Pai; Fundamentals of Approximation Theory, Narosa Publishing House, 2000.
2. G.G., Lorentz, Approximation of Functions, Holt, Rinehart and Wiston, Inc. 1966.
3. T.J. Rivilin, An Introduction to the Approximation of Functions.

Reference Books :

1. Timan, A.F., Theory of Functions of Real Variable, New York, Mackmillan, 1963.
2. G. Meinnardus, Approximation of Functions, Theory and Numerical Methods, Springer Verlag Vol-13, 1967.

उच्च शिक्षा विभाग, म०प्र० शासन

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

M.Sc./M.A (Post Graduates) Semester wise Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.

Max. Marks/अधिकतम अंक : 50

अधिकतम अंक / Max. Marks 50

कक्षा Class	:	M.Sc./M.A (Mathematics)
सेमेस्टर Semester	:	IV
विषय समूह का शीर्षक Title of Subject/ Group	:	Partial Differential Equations
प्रश्न पत्र क्रं. Paper No.	:	II/III/IV/V
अनिवार्य/ वैकल्पिक Compulsory/ Optional	:	Optional Gr-1 (2)

Unit 1- Transport Equation-Initial Value Problem Non-homogeneous equations, Laplace's Equations - Fundamental Solution, Mean Value Formula properties of Harmonic functions, Green's Functions. Energy Methods.

Unit 2- Heat Equation - Fundamental Solution, Mean Value Formula, Properties of Solutions, Energy Methods Wave Equation - Solution by Spherical Means, Non - homogeneous Equations, Energy Methods.

Unit 3- Nonlinear First order PDE. Complete integrals, Envelopes, Characteristics, Hamilton Jacobi Equation (Calculus) of Variations, Hamilton's ODE, Legendre Transform, Hopf-Lax formulae, weak solution, Uniqueness.

Unit 4- Conservation Laws (Shocks, Entropy Condition Lax - Oleinic formula, Weak solutions, Uniqueness. Riemanns Problem Long Time behavior) Representation of Solution - Separation of Variables, Similarity Solutions (Plane and Traveling Waves - Solution , Similarity under Scaling).

Unit 5- Fourier and Lap lace Transform, Hopf - Cole Transform, Hodograph and Legendrey Transforms, Potential Functions, Asymptotes (Singular Perturbations, Lap laces Method, Geometric Optics, Stationary Phase Homogenization) Power Series (Non - characteristic surface, Real Analytic functions, Cauchy - Kovalevskaya Theorem).

Recommended Books :-

(1) L.C. Evans, Partial Differential Equations, 1998.

उच्च शिक्षा विभाग, म०प्र० शासन

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M.Sc./M.A (Post Graduates) Semester wise Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.

Max. Marks/अधिकतम अंक : 50

अधिकतम अंक / Max. Marks 50

कक्षा Class	:	M.Sc./M.A (Mathematics)
सेमेस्टर Semester	:	IV
विषय समूह का शीर्षक Title of Subject/ Group	:	Differentiable Structures on a Manifold
प्रश्न पत्र क्रं. Paper No.	:	II/III/IV/V
अनिवार्य/ वैकल्पिक Compulsory/ Optional	:	Optional Gr-1 (3)

Unit - I

Sub manifolds & Hypersurfaces. Normals. Gauss's Formulae. Weingarten equations. Lines of Curvature Generalized Gauss and Mainardi-Codazzi equations.

Unit - II

Almost Complex manifolds. Nijenhuis tensors. Contra variant and covariant almost analytic vector fields F - Connection Almost Hermit manifolds. Almost analytic vector fields. Curvature tensor. Linear Connections.

Unit - III

Kahler manifolds. Affine connection. Holomorphic sectional curvature. Curvature tensor. Almost analytic vector fields.

Unit - IV

Nearly Kahler manifolds, Curvature identities. Constant Holomorphic sectional curvature Almost analytic vector fields Almost Kahler Manifold Anilities vector fields

Unit - V

Almost Contact manifolds : Lie derivative normal contact structure, Affinely almost almost cosymplectic manifold, Almost Grayn manifolds: D-conformal transformation, Perticular affined connection K- Contact Rumanian manifolds.

- 1- **B.B, Sinha, An Introduction to Modern Differential Geometry, Kalyani Publishers, New Delhi. 1982.**
- 2- **K. Yano and M. Kon, Structure of Manifolds, World Scientific Publishing co-Pvt. Ltd. 1984.**
- 3- **A. Bejaneu, Geometry of Cr- Submanifolds, D. Reidel Publishing Company, Dordrecht, 1986**

Reference Books:

- 1- **R.S, Mishra, A course in tensors with application to Riemannian geometry pothishala Pvt. Ltd. 1965.**
- 2- **R.S. Mishra, Structures on Differentiable manifold and their applications, Chandrema Prakashan Allahabad, 1984.**

उच्च शिक्षा विभाग, म०प्र० शासन

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M.Sc./M.A (Post Graduates) Semester wise Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.

Max. Marks/अधिकतम अंक : 50

अधिकतम अंक / Max. Marks 50

कक्षा Class	:	M.Sc./M.A (Mathematics)
सेमेस्टर Semester	:	IV
विषय समूह का शीर्षक Title of Subject/ Group	:	General Theory of Relativity
प्रश्न पत्र क्रं. Paper No.	:	II/III/IV/V
अनिवार्य/ वैकल्पिक Compulsory/ Optional	:	Optional Gr-1 (4)

Unit I

Transformation of coordinates. Tensors. Algebra of Tensors. Symmetric and skew symmetric Tensors. Contraction of tensors and quotient law. Riemannian metric. Christoffel Symbols.

Unit II

Covariant derivatives. Gradient, Divergence and Curl. Intrinsic derivatives and geodesics, Riemann Christoffel curvature tensor and its symmetry properties. Bianchi identities and Einstein tensor.

Unit III

Review of the special theory of relativity and the Newtonian Theory of gravitation. Principle of equivalence and general covariance, geodesic principle. Newtonian approximation of relativistic equations of motion. Einstein's field equations and its Newtonian approximation.

Unit IV

Schwarzschild external solution and its isotropic form. Planetary orbits and analogues of Kepler's Laws in general relativity. Advance of perihelion of a planet. Bending of light rays in a gravitational field. Gravitational redshift of spectral lines. Radar echo delay.

Unit V

Energy-momentum tensor of a perfect fluid. Schwarzschild internal solution. Boundary conditions.

Recommended Books:

- [1] S.R.Roy and Raj Bali: Theory of Relativity Jaipur Publishing House,Jaipur, 1987.
- [2] S. K. Shrivastva: General Relativity and Cosmology, PHI, New Delhi.
- [3] J.V. Narlikar, General Relativity and Cosmology: The Macmillan Company of India Limited, 1978.

References:

- [1] C.E. Weatherburn, An Introduction to Riemannian Geometry and the tensor Calculus, Cambridge University, Press 1950.
- [2] H. Stephani, General Relativity: An Introduction to the theory of the gravitational field, Cambridge University Press 1982.
- [3] A.S. Eddington, The Mathematical Theory of Relativity. Cambridge University Press, 1965.
- [4] R. Adler, M. Bazin, M. Schiffer, Introduction to general relativity, McGraw Hill Inc., 1975.

उच्च शिक्षा विभाग, म0प्र0 शासन

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केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के राज्यपाल द्वारा अनुमोदित

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

M.Sc./M.A (Post Graduates) Semester wise Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.

Max. Marks/अधिकतम अंक : 50
अधिकतम अंक / Max. Marks 50

कक्षा Class	:	M.Sc./M.A (Mathematics)
सेमेस्टर Semester	:	IV
विषय समूह का शीर्षक Title of Subject/ Group	:	"Integral Transforms with Application"
प्रश्न पत्र क्रं. Paper No.	:	Ist
अनिवार्य/ वैकल्पिक Compulsory/ Optional	:	Optional Gr-V (4)

Unit - 1 Application of Laplace Transforms : Laplace's equations, Laplace's wave equation. (As given in [1])

Unit - 2 Application of Laplace Transforms in Heat conduction equation. (As given [1])

Unit -3 Application of Laplace Transform to Boundary Value Problems. Electric Circuits. Application to Beams. (As given in [1])

Unit -4 The complex Fourier Transform, Inversion Formula, Fourier cosine and sine transform, properties of Fourier Transforms, Convolution & Parseval's identity. (As given in [2])

Unit -5 Fourier Transform of the derivatives, Finite Fourier Sine & Cosine Transform, Inversion Operational and combined properties Fourier transform.

Books recommended :-

- [1] **Integral Transforms by Goyal & Gupta.**
- [2] **Integral Transforms by Vashishtha & Gupta, Krishna Prakashan, Meerut.**

उच्च शिक्षा विभाग, म०प्र० शासन

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केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के राज्यपाल द्वारा अनुमोदित)

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

M.Sc./M.A (Post Graduates) Semester wise Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.

Max. Marks/अधिकतम अंक : 50

अधिकतम अंक / Max. Marks 50

कक्षा Class	:	M.Sc./M.A. (Mathematics)
सेमेस्टर Semester	:	IV
विषय समूह का शीर्षक Title of Subject/ Group	:	ALGEBRAIC TOPOLOGY
प्रश्न पत्र क्रं- Paper No.	:	II/III/IV/V
अनिवार्य/ वैकल्पिक Compulsory/ Optional	:	Optional Gr-II (2)

Unit -1 The Fundamental Group: Introduction, Homotopy, Definition and Examples, Contractible space, Homotopy Equivalence and Homotopy Type, Comb space, Retract, Deformation retract, and Strong deformation retract.

Unit - 2 Fundamental Group and its properties: Path and path homotopy, Path homotopy is an equivalence relation, Homotopy class, The set $\pi_1(X, x_0)$ is a group, Properties of fundamental groups, Homomorphism induced by a continuous map, Properties of induced homomorphism.

Unit- 3 Simply connected space, S^n is simply connected for $n \geq 2$, Results for computing fundamental groups of Disk D^n and the product space $X \times Y$, Path Lifting and Homotopy Lifting Property, Theorem 2.6.3 (Statement only), Fundamental group of Circle, Punctured plane, Torus, and Cylinder.

Unit - 4 Covering Projections: Definition and Examples, Properties of Covering Projections, Lift of a map, Uniqueness of lifts, Path Lifting and Homotopy Lifting Property (Statement only).

Unit -5 Applications of Homotopy Lifting Theorem: The Monodromy Theorem, Proposition 5.3.2 (Statement only), Lifting Theorem, Covering homomorphism, Group of Deck Transformations, Necessary and sufficient conditions for homomorphism and isomorphism of covering spaces.

Text Book: Satya Deo, Algebraic Topology - A Primer, Hindustan Book Agency, TRIM Series # 27, New Delhi, 2003.

Reference Books:

1. Fred H. Croom, Basic Concepts of Algebraic Topology, Springer Verlag, 1978.
2. James R. Munkres, Topology, 2nd Edition, PHI, 2002.

उच्च शिक्षा विभाग, म०प्र० शासन

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M.Sc./M.A (Post Graduates) Semester wise Syllabus

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Max. Marks/अधिकतम अंक : 50

अधिकतम अंक / Max. Marks 50

कक्षा Class	:	M.Sc./M.A. (Mathematics)
सेमेस्टर Semester	:	IV
विषय समूह का शीर्षक Title of Subject/ Group	:	Abstract Harmonic Analysis
प्रश्न पत्र क्रं- Paper No.	:	II/III/IV/V
अनिवार्य/ वैकल्पिक Compulsory/ Optional	:	Optional Gr-II (2)

Unit -1 The concept of usual metric topology and the real line as a locally compact Hausdorff topological abelian group and circle group, Translates of functions and characters, Banach space of continuous function and L^p space ($1 \leq p < \infty$), Fourier transform in L^1 and its properties.

Unit - 2 Denseness of the set T of trigonometric polynomials in C and L^p space ($1 \leq p < \infty$), Definition and properties of convolutions, The space L^1 as a commutative Banach algebra with respect to convolution as multiplication, Approximate identities and their properties.

Unit- 3 The Haar covering function Existence and properties of Haar covering function Definition and properties of the function $I_g(f)$.
Existence and Uniqueness of the Haar integral

Unit - 4 Translation in $L_p(G)$, uniform continuity of translation character properties of characters Examples of characters, character group or dual group Locally compact abelian group non – trivial complex homomorphism.

UNit -5 The Fourier transform, convolution of function set $A(\Gamma)$ of all Fourier transforms invariance, of $A(\Gamma)$, Fourier Stieltjes transform set $B(\Gamma)$ of all Fourier Stieltjes transform, invariance of $B(\Gamma)$

Text Books:

1. R.E. Edwards, Fourier Series: A Modern Introduction, Vol. I Springer-Verlag, 1979 (For Units I & II).
2. Taqdir Hussain Introduction to Topological Groups W.D. Saunders Company 1966 to ok W.O. (unit III)
3. W. Rudin, Fourier Analysis on Groups, Interscience Publication, New York, 1987 (For IV and Unit V).

Reference Books:

1. Hans Reiter and Jan D. Stegman, Classical Harmonic Analysis and Locally Compact Groups, Oxford Science Publication, 2000.
2. Hewitt and Ross -Abstract Harmonic Analysis I, Springer-Verlag, 1979.
3. John J. Benedetto -Harmonic Analysis and Application, CRC Press New York, 1997.

उच्च शिक्षा विभाग, म०प्र० शासन

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Max. Marks/अधिकतम अंक : 50

अधिकतम अंक / Max. Marks 50

कक्षा Class	:	M.Sc./M.A (Mathematics)
सेमेस्टर Semester	:	IV
विषय समूह का शीर्षक Title of Subject/ Group	:	ADVANCED GRAPH THEORY
प्रश्न पत्र कं. Paper No.	:	II/III/IV/V
अनिवार्य/ वैकल्पिक Compulsory/ Optional	:	Optional Gr-II (3)

Unit -1 Revision of graph theoretic preliminaries, Operations on graphs. Graph Isomorphism Disconnected graph and their Components. Traveling salesman problem, round table problem, Konisberg Bridge problem Eulerian and Hamiltonian Paths and circuits.

Unit -2 Properties of trees, Distance centre, radius, diameter eccentricity and related theorems, Graph as Metric space Rooted and binary trees, Labelled graph and trees spanning tree, weighted spanning tree, Shortest path, Fundamental circuits, Rank and nullity, cutsets and cut vertices, fundamental cutsets.

Unit-3 Connectivity and separability in graphs Abstract graphs geometric graphs planar graphs Kurtowski two graphs embedding and regions of a planar graphs Detection of planarity, Geometric dual and combinationa dual.

Unit - 4 Coloring and covering of graphs, Chromatic, Polynomial chromatic partitioning Dimmer problem Domination sets independent sets, Four colour conjecture.

Unit - 5 Digraph and types of digraphs, Digraph and binary relation Equivalence relation in a graph Directed path walk circuit and connectedness Eulerian digraph, arborcence matrices A, B and C of digraphs, Adjacency metric of a digraph, Alogorithms, Kruskal algorithm, Prism algorithm, Dijkstra Algorithm.

Text Book :-

1- Graph Theory with Application to Engineering and Computer Science by Narsingh Deo.

Reference Book :-

1- Graph Theory by Harary.

उच्च शिक्षा विभाग, म०प्र० शासन

(एम.एस.सी./एम.ए. (स्नातकोत्तर) कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के राज्यपाल द्वारा अनुमोदित

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

M.Sc./M.A (Post Graduates) Semester wise Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.

Max. Marks/अधिकतम अंक : 50

अधिकतम अंक / Max. Marks 50

कक्षा Class	:	M.Sc./M.A (Mathematics)
सेमेस्टर Semester	:	IV
विषय समूह का शीर्षक Title of Subject Group	:	ADVANCED SPECIAL FUNCTION
प्रश्न पत्र क्रं. Paper No.	:	II/III/IV/V
अनिवार्य/ वैकल्पिक Compulsory/ Optional	:	Optional Gr-II (4)

Unit I Gamma and Beta Functions :

The Euler or Mascheroni Constant γ

, Gamma Function, A series for $\Gamma'(z) / \Gamma(z)$, Difference equation $\Gamma(z+1) = z\Gamma(z)$, Euler's integral for $\Gamma(z)$, Beta function, value of $\Gamma(z)\Gamma(1-z)$, Factorial Function, Legendre's duplication formula, Gauss multiplication theorem.

Unit - II Hypergeometric and Generalized Hypergeometric functions:

Function ${}_2F_1(a,b;c;z)$ A simple integral form evaluation of ${}_2F_1(a,b;c;z)$ Contiguous function relations, Hyper geometrical differential equation and its solutions, $F(a,b;c;z)$ as function of its parameters, Elementary series manipulations, Simple transformation, Relations between functions of z and $1-z$

Unit-III Bessel function and Legendre polynomials :

Definition of $J_n(z)$, Bessel's differential equation, Generating function, Bessel's integral with index half and an odd integer, Generating function for Legendre polynomials Rodrigues formula, Bateman's generating function, Additional generating funtions, Hypergeometric forms of $P_n(X)$, Special properties of $P_n(X)$, Some more generating functions, Laplace's first integral form, Othergonality.

Unit IV- Hermite polynomial :

Definition of Hermite polynomials $H_n(x)$, Pure recurrence relations, Differential recurrence relations, Rodrigue's formula, Other generating functions, Othogonality, Expansion of polynomials, more generating functions.

Unit V- Laguerre Polynomials :

The Laguerre Polynomials $L_n(X)$, Generating functions, Pure recurrence relations, Differential recurrence relation, Rodrigo's formula, Orthogonal, Expansion of polynomials, Special properties, Other generating functions.

Books Recommended ;

- 1- Rainville, E.D. ; Special Functions, The Macmillan co., New york 1971,**
- 2- Srivastava, H.M. Gupta, K.C. and Goyal, S.P.; The H-functions of One and Two Variables with applications, South Asian Publication, New Delhi.**
- 3- Saran, N., Sharma S.D. and Trivedi, - Special Functions with application, Pragati prakashan, 1986.**

Reference Books.

- 1- Lebdev, N.N, Special Functions and Their Applications, Prentice Hall, Englewood Cliffs, New jersey, USA 1995.**
- 2- Whittaker, E.T. and Watson, G.N., A Course of Modern Analysis Cambridge University Press, London, 1963**

Department of Higher Education Govt. of M.P.

Semester wise syllabus for P.G.

As recommended by Central board of studies and

Approved by HE the Governor of M.P.

अधिकतम अंक / Max. Marks **35**

कक्षा Class	:	M.Sc. / M.A.
सेमेस्टर Semester	:	MATHAMATICS
विषय समूह का शीर्षक Title of Subject/ Group	:	Theory of Linear Operators
प्रश्न पत्र क्र. Paper No.	:	II/III/IV/V
अनिवार्य / वैकल्पिक Compulsory/ Optional	:	Optional Gr- III (1)

Unit 1-

Spectral theory in normed linear spaces, resolvent set and spectrum, Spectral properties of bounded linear operators. Properties of resolvent and spectrum. Spectral mapping theorem for polynomials.

Unit 2-

Spectral radius of a bounded linear operator on a complex Banach space. Elementary theory of Banach algebras. General properties of compact linear operators.

Unit 3-

Spectral properties of compact linear operators on normed spaces. Behaviours of Compact linear operators with respect to solvability of operators equation.

Unit 4-

Fredholm type theorems. Fredholm alternative theorem. Fredholm alternative for integral equation. spectral properties of bounded self – adjoint linear operator on complete Hilbert space..

Unit 5-

Positive operators Monotone sequence theorem for bounded self – adjoint operators on a complex Hilbert space. square roots of a positive operator. projection operators.

Recommended Books:

- 1 E. Kreyszig Introductory functional analysis with applications, John Wiley & Sons, New York, 1978.

Reference Books:

- 1 P. R. Halmos Introduction to Hilbert space and the theory of Spectral Multiplicity, Second edition, Chelsea publishing co. N.Y. 1957.
- 2 N. Dunford and J.T. Schwartz, linear operator -3 part, Interscience / Wiley, New York 1958-71.
- 3 G. Bachman and L. Narci, Functional analysis, Academic press New York, 1966.

Department of Higher Education Govt. of M.P.

Semester wise syllabus for P.G.

As recommended by Central board of studies and

Approved by HE the Governor of M.P.

अधिकतम अंक / Max. Marks **35**

कक्षा Class	:	M.Sc. / M.A.
सेमेस्टर Semester	:	MATHAMATICS
विषय समूह का शीर्षक Title of Subject/ Group	:	Mechanics
प्रश्न पत्र क्र. Paper No.	:	II/III/IV/V
अनिवार्य / वैकल्पिक Compulsory/ Optional	:	Optional Gr- III (2)

Unit 1-

Generalized coordinates. Holonomic and Non- holonomic systems, Scleronomic and Rheonomic system generalized potential. Lagrange's equation of first kind, Lagrange's equation of second Kind. Uniqueness of solution. Energy equation for conservation fields.

Unit 2-

Hamilton's variables. Donkin's theorem. Hamilton's canonical equations. Cyclic coordinates routh's equation Poisson's bracket Poisson's Identity. Jacobi – Poisson theorem. Motivating problem problems of calculus of variations, shortest distance. Minimum surface of revolution. Brachistochrone problem. Isoperimetric problem. Geodesic.

Unit3-

Fundamental lemma of calculus of variations Euler's equation for one dependent function and its generalization to (i) n dependent function (ii) higher order derivatives. Conditional extremum under geometric constraints and under integral constraints. Hamilton's Principle of least action Poincare Cartan Integral invariant Whittaker equation Jacobi's equations. Statement of Lee HWA Chung's theorem.

Unit 4-

Hamilton – Jacobi equation. Jacobi theorem. Method of separation of variables. Lagrange Brackets. Condition of canonical character of a transformation in terms of Lagrange brackets and Poisson brackets Invariance of Lagrange brackets and Poisson brackets under canonical Transformation.

Unit 5-

Attraction and potential of rod disc spherical shells and sphere. Surface integral of normal attraction (application & Gauss theorem) Laplace's and Poisson equation. Work done by self attraction systems. Distribution for a given potential. Equipotential surfaces. Surface and solid harmonic. Surface density in terms of surface harmonics.

Reference Books:

- 1 F. Gantmacher, Lectures in Analytic Mechanics MIR Publishers.
- 2 H. Goldstein Classical Mechanics (2nd Edition), Narosa Publishing House , New Delhi.

Department of Higher Education Govt. of M.P.

Semester wise syllabus for P.G.

As recommended by Central board of studies and

Approved by HE the Governor of M.P.

अधिकतम अंक / Max. Marks : **35**

कक्षा Class	:	M.Sc. / M.A.
सेमेस्टर Semester	:	IV
विषय समूह का शीर्षक Title of Subject/ Group	:	Advanced Numerical Analysis
प्रश्न पत्र क्र. Paper No.	:	II/III/IV/V
अनिवार्य / वैकल्पिक Compulsory/ Optional	:	Optional Gr- III (3)

Unit 1-

Piece wise and spline interpolation, Bivariate inter polation Approximation, least squares approximation

Unit 2-

Uniform approximation Rational approximation, choice of method, numerical differantiation optimum choice of step length

Unit 3 –

Extrapolation methods ordinary differential equations. multi step methods Predictor and corrector method, stability analysis of multistep methods.

Unit 4–

Ordinary differential equation – boundary value problems shooting method.

Unit 5-

Finite difference methods, finite element method

Text book –

Numerical Method for scientific and Engineering computation by M.K. Jain, S.R.K. Iyenger, R.K. Jain south Edition (2003) New Age.

उच्च शिक्षा विभाग, म०प्र० शासन

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केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के राज्यपाल द्वारा अनुमोदित

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

M.Sc./M.A (Post Graduates) Semester wise Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.

Max. Marks/अधिकतम अंक : 50

अधिकतम अंक / Max. Marks 50

कक्षा Class	:	M.Sc./M.A (Mathematics)
सेमेस्टर Semester	:	IV
विषय समूह का शीर्षक Title of Subject/ Group	:	ADVANCED FUNCTIONAL ANALYSIS
प्रश्न पत्र कं. Paper No.	:	II/III/IV/V
अनिवार्य / वैकल्पिक Compulsory/ Optional	:	Optional Gr-III (4)

Unit - I

Differentiation in normed spaces, Gateaux derivative, Fretchet Derivative, Sub differential, Fixed-point theorems and their applications, Banach contraction principle and its generalization Application of Banach contraction principle.

Unit - II

Definition and examples of topological vector spaces, Convex, Balanced and absorbing sets and their properties, Minkowski's functional, Subspace, Product space and quotient space of a topological vector space.

Unit - III

Finite dimensional topological vector spaces, Locally convex topological vector spaces, Normable and metrizable topological vector spaces, complete topological vector spaces.

Unit - IV

Frechet space, Uniform-boundedness principle, Open mapping theorem and closed graph theorem for Frechet spaces, Banach - Alaoglu theorem.

Unit - V

Variation Inequalities, Lions-Stampacchia theory, Physical phenomena represented by variation inequalities, points and External sets Krein Miliman's theorem.

Text Books:-

- 1- Functional Analysis with Applications by A.H. Siddiqi, Tala Mc. Graw Hill Publishing Company.
- 2- Linear Topological Spaces by Kelley J.L. , Van Nostrand East West Press, New Delhi.

Reference Books:-

- 1- Toposigical Vector spaces and Distributions by John Horvath, Addison-Wesley Publishing Company, 1966.
- 2- Modern methods in Topological vecotr spaces by albert Wilansky, Mcgraw-Hill, 1978.
- 3- Functional Analysis by K. Chandra Sekhar Rao, Narosa 2002.

उच्च शिक्षा विभाग, म०प्र० शासन

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

M.Sc./M.A (Post Graduates) Semester wise Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.

Max. Marks/अधिकतम अंक : 50
अधिकतम अंक/Max. Marks 50

कक्षा Class	:	M.Sc./M.A. (Mathematics)
सेमेस्टर Semester	:	IV
विषय समूह का शीर्षक Title of Subject/ Group	:	Fuzzy Sets and Their Application
प्रश्न पत्र क्रं- Paper No.	:	II/III/IV/V
अनिवार्य/ वैकल्पिक Compulsory/ Optional	:	Optional Gr-IV (1)

Unit -1 Fuzzy sets: Basic Definitions, α -level sets, Convex fuzzy set, Basic operations on fuzzy sets, types of fuzzy sets, Extensions: Types of fuzzy sets, Further operations on fuzzy sets, Cartesian product, Algebraic products, Bounded sum and Difference, t-norm & t-conorm.

Unit - 2 Extension principle and applications, Zadeh extension principle, image and inverse image of fuzzy sets, fuzzy numbers, algebraic operations with fuzzy numbers, extended operation and its properties, Special extended operation, addition, subtraction, product and division of fuzzy numbers.

Unit- 3 Fuzzy relations on fuzzy sets, The union & intersection of fuzzy relations, Composition of fuzzy relations, max-* and max-product compositions, min-max composition and its properties, reflexivity, symmetry, transitivity, and their examples, special fuzzy relations, similarity relation.

Unit - 4 Fuzzy graphs: Definition and Examples, Fuzzy sub-graph, Spanning sub-graph, path in a fuzzy graph, strength and length of a path, μ -length and μ -distances, connected nodes, fuzzy forest, fuzzy tree, Examples, Fuzzy Analysis: Fuzzy functions on fuzzy sets, classical function, fuzzy function, Examples.

Unit -5 Fuzzy Logic: An overview of classical logic, Its connectives, Tautologies, Contradiction, Fuzzy logic, Logical connectives for fuzzy logic, Examples, Approximate reasoning, its rules, Examples, other forms of implication operations, Linguistic hedges, Examples.

Text Books:

1. Fuzzy set theory and its Applications by H.J. Zimmermann, Allied Publishers Ltd., New Delhi, 1991 (For Units I to IV).
2. Fuzzy Logic with Engineering Applications by T.J. Ross, John Wiley & Sons, IInd Ed., 2005 (For Unit V).

Reference Books:

1. Fuzzy sets and Fuzzy Logic by G.J. Klir and B. Yuan, Prentice Hall of India, New Delhi, 1995.

उच्च शिक्षा विभाग, म०प्र० शासन

(एम.एस.सी./एम.ए. (स्नातकोत्तर) कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के राज्यपाल द्वारा अनुमोदित

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

M.Sc./M.A (Post Graduates) Semester wise Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.

Max. Marks/अधिकतम अंक : 50

अधिकतम अंक / Max. Marks 50

कक्षा Class	:	M.Sc./M.A (Mathematics)
सेमेस्टर Semester	:	IV
विषय समूह का शीर्षक Title of Subject/ Group	:	Computational Biology
प्रश्न पत्र क्रं. Paper No.	:	II/III/IV/V
अनिवार्य/ वैकल्पिक Compulsory/ Optional	:	Optional Gr-IV (2)

- Unit -1 Basic concepts of Molecular biology, DNA and Proteins, The Central Dogma, Gene and Genome Sequences.**
- Unit - 2- Restriction Maps - Graphs, Interval graphs. Measuring Fragment sizes, Algorithms for double digest problem (DDP) - Algorithms and complexity, Approaches to DDP.**
- Unit 3- Integer programming, Partition Problems, Traveling Salesman Problem (TSP) simulated annealing Sequence.**
- Unit 4- Assembly - Sequencing strategies, Assembly in practices, fragment overlap statistics.**
- Unit 5- Fragment alignment, Sequence accuracy, sequence comparisons Methods - Local and global alignment, Dynamic programming method.**

Text Books:-

- 1- **Introduction to Computational Biology by M.S, Waterman Chapman & Hall, 1995.**
- 2- **Bio informatics - A practical Guide to the analysis of Genes and Proteins by A. Baxevanis and B. Ouelette, WileyInterscience (1998).**

Reference Books:-

- 1- **Introduction to Bio informatics by Attwood.**
- 2- **Bioinformatics-Sequence and Genome analysis by David W.Mount.**

उच्च शिक्षा विभाग, म०प्र० शासन

(एम.एस.सी./एम.ए. (स्नातकोत्तर) कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के राज्यपाल द्वारा अनुमोदित

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

M.Sc./M.A (Post Graduates) Semester wise Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.

Max. Marks/अधिकतम अंक : 50

अधिकतम अंक / Max. Marks 50

कक्षा Class	:	M.Sc./M.A (Mathematics)
सेमेस्टर Semester	:	IV
विषय समूह का शीर्षक Title of Subject/ Group	:	Jacobi Polynomials and H - Functions
प्रश्न पत्र क्रं. Paper No.	:	II/III/IV/V
अनिवार्य / वैकल्पिक Compulsory/ Optional	:	Optional Gr-IV (3)

Unit - 1-

Jacobi Polynomials. Bateman's Generating functions. Rodrigues formula.

Orthogonality. Differential recurrence relations. Pure recurrence relations. Mixed relations.

Unit 2- The H Functions of one variable. Definition. Asymptotic expansion. Simple transformation and elementary properties. Mellin and Laplace transforms. Special cases,

Unit 3-

Differentiation formulas of H Function one Variable, Partial derivatives with respect to parameters. Contiguous relation and simple. expansion formula.

Unit 4- The H Functions of two variables, Definition and notation. Asymptotic behavior elementary properties special cases. Derivatives. Contiguous relations Total Count of recurrences.

Unit 5-

Finite Summation formulas for the H Functions of two variables, Method and schemes for obtaining sum of finite or infinite series. Double Summation formulas.

Books Recommended :

- 1- Rainville. E.D. : Special Functions. The Macmillan Co.. New. York. 1971.**
- 2- Shrivastava. H.M. , Gupta K.C. and Goyal. S.P. : The H- Functions of One and Two Variables with applications. South Asian Publication New Delhi.**

Reference Books :

- 1- Lebedev. N.N. Special functions and Their Applications. Prentice Hall. Englewood Hall phase new jersey USA, 1965.**
- 2- Whittaker. E.T, and Watson G.N. A Course of Modern analysis. Cambridge University Press. London 1963**

उच्च शिक्षा विभाग, म०प्र० शासन

(एम.एस.सी./एम.ए. (स्नातकोत्तर) कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम
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Department of Higher Education, Govt. of M.P.

M.Sc./M.A (Post Graduates) Semester wise Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.

Max. Marks/अधिकतम अंक : 50

अधिकतम अंक / Max. Marks 50

कक्षा Class	:	M.Sc./M.A (Mathematics)
सेमेस्टर Semester	:	IV
विषय समूह का शीर्षक Title of Subject/ Group	:	Fluid Mechanics
प्रश्न पत्र क्रं. Paper No.	:	II/III/IV/V
अनिवार्य / वैकल्पिक Compulsory/ Optional	:	Optional Gr-IV (4)

Unit 1- Lagrangian and Eulerian Methods, equation of continuity, types of flow lines, velocity potential, stream function irrotational and rotational motions, vortex lines.

Unit 2- Lagrange's and Euler's equation of motion, burnoulli's theorem, irrotational motion in two dimensions, Complex velocity potential, sources, sinks conformal mapping, theorem of blasius.

Unit 3- Motion of a sphere through agapsquid at rest as infinity. equation of motion of a sphere, stress components in a real fluid.

Unit 4- Relations between rectangular components of stress convection between streses and gradients of velocity, plane Poiseuille and coquette flows between two parallel plate, flow through tubes of uniform, cross - section in the former of circle, annulus under constant pressure gradient.

Unit 5- Dynamical similarity, Reynolds number, Prandtl's boundary layer, boundary layer equations in two dimension, blasius solution, boundary layer thickness, displacement thickness, Karman itegral conditions, separation of boundary layer flow.

Text Books.

- 1- A text book of Fluid Mechanics in SI units by R.K, Rajput.**
- 2- An introduction to Fluid Dynamics by R.K. Rathy, Oxford and IBH Published Co.**

Reference Books:

- 1- Fluid Mechanics (Springer) By Joseph H. Spurk.**
- 2- Fluid Mechanics by Irfan A Khan (H.R.W.)**
- 3- An Introduction to Fluid Mechanics by G.K. Batchelor, Foundation Books, New Delhi, 1994.**

उच्च शिक्षा विभाग, म०प्र० शासन

(एम.एस.सी./एम.ए. (स्नातकोत्तर) कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के राज्यपाल द्वारा अनुमोदित

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

M.Sc./M.A (Post Graduates) Semester wise Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.

Max. Marks/अधिकतम अंक : 50

अधिकतम अंक / Max. Marks 50

कक्षा Class	:	M.Sc./M.A (Mathematics)
सेमेस्टर Semester	:	IV
विषय समूह का शीर्षक Title of Subject/ Group	:	WAVELETS
प्रश्न पत्र क्रं. Paper No.	:	II/III/IV/V
अनिवार्य/ वैकल्पिक Compulsory/ Optional	:	Optional Gr-V (1)

Unit 1 Haar's simple wavelets, Haar Wavelet transforms, Inverse Haar Wavelet transforms, Multi dimensional wavelets, Two - dimensional Haar Wavelets.

Unit -2 Application of wavelets, Noise reduction Data compression, Edge detection, Daubechies wavelet (DW), approximation of samples with D wavelets, Fast DW transform and its inverse.

Unit 3- Inner products and orthogonal projection, Applications of orthogonal projection to computer graphics, Computation of functions and wavelets, Discrete and fast Fourier transform with inverse and applications.

Unit 4- Fourier series for periodic functions its convergence and inversion, uniform convergence of Fourier series, Bessel's inequality, Parseval's inequality.

Unit 5 The Fourier transform Convolution and inversion of Fourier transform Weight functions, approximate identities.

Text Books:-

- 1- Wavelets made easy by Y. Nieveregelt**
- 2- A first Course on Wavelets by E. Hernandez and G. Weiss.**

Reference Books.

- 1- An Introduction to Wavelets by Chui, Academic Press.**

उच्च शिक्षा विभाग, म0प्र0 शासन

(एम.एस.सी./एम.ए. (स्नातकोत्तर) कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के राज्यपाल द्वारा अनुमोदित

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

M.Sc./M.A (Post Graduates) Semester wise Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.

Max. Marks/अधिकतम अंक : 50

अधिकतम अंक / Max. Marks 50

कक्षा Class	:	M.Sc./M.A (Mathematics)
सेमेस्टर Semester	:	IV
विषय समूह का शीर्षक Title of Subject/ Group	:	BIOMECHANICS
प्रश्न पत्र क्रं. Paper No.	:	II/III/IV/V
अनिवार्य/ वैकल्पिक Compulsory/ Optional	:	Optional Gr-V (2)

Unit 1 Bio-physics of Human Cardio - vascular system: Types of Blood Vessels, Properties of Blood, Flow in Tubes, Poiseuibles law, Erythrocyte Sedimentation Rate , Stroke's law , Palatial flow in elastic vessels.

Unit 2- Bio - physics of Human Thermo- Regulation Head Flow in Human Dermal and Subdermal parts; Derivation of Governing partial differential equations Incorporating Microcirculation and perspiration.

Unit 3- Solution of steady state and Unsteady - state flow problems in one dimesion, application of finite element method and exact solutions.

Unit 4- Diffusion processes in biology ; diffusion in Tissue Fick's principle, One, two and three Dimensional diffusion problems and their solution, Water Transport, Diffusion through membranes.

Unit 5 Respiratory Gas Flows, flow in Airways, Interaction Between convection and diffusion Exchange between Alvoelar Gas and Erythrocytes, Pulmonary function Test, Dynamics of Ventilation system.

Text books:

- 1- Introduction to Mathematical Biology by S.I. Rubinow, J. Wiley & Sons.**
- 2- Biomechanics by Y.C, Fung, Springer - Verlag.**
- 3- Introduction to Biomathematics by V.P. Saxena, Vishwa Prakashan (Wiley eastern)**

Reference Book :-

- 1- Biofluid Dynamics by Mazumdar.**

Department of Higher Education Govt. of M.P.
Semester wise syllabus for P.G.
As recommended by Central board of studies and
Approved by HE the Governor of M.P.

अधिकतम अंक / Max. Marks 50

कक्षा Class	:	M.Sc. / M.A.
सेमेस्टर Semester	:	IV
विषय समूह का शीर्षक Title of Subject/ Group	:	Analytic Number Theory
प्रश्न पत्र क्र. Paper No.	:	II/III/IV/V
अनिवार्य/ वैकल्पिक Compulsory/ Optional	:	Optional Gr- V (3)

Unit 1- Characters of finite abelian groups, The Character Group, Dirichlet characters, Sums involving Dirichlet characters.

Unit 2- Dirichlet Theorem on primes in arithmetic progressions.

Unit 3- Dirichlet series and Euler products, the function defined by Dirichlet series, the halfplane of convergence of a Dirichlet series.

Unit 4- Integral formula for the coefficients of Dirichlet series, Analytic properties of Dirichlet series, Mean value formula for Dirichlet series.

Unit 5- Properties of the gamma function, Integral representations of Hurwitz zeta functions, Analytic continuation of Hurwitz zeta function.

Book Recommended :

1- T.M. Apostol, Introduction to Analytic Number Theory, Narosa Pub, House, 1989.

उच्च शिक्षा विभाग, म०प्र० शासन

(एम.एस.सी./एम.ए. (स्नातकोत्तर) कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के राज्यपाल द्वारा अनुमोदित

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

M.Sc./M.A (Post Graduates) Semester wise Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.

Max. Marks/अधिकतम अंक : 50

अधिकतम अंक / Max. Marks 50

कक्षा Class	:	M.Sc./M.A (Mathematics)
सेमेस्टर Semester	:	IV
विषय समूह का शीर्षक Title of Subject/ Group	:	Integral Transforms
प्रश्न पत्र क्रं. Paper No.	:	Ist
अनिवार्य/ वैकल्पिक Compulsory/ Optional	:	Optional Gr-V (4)

Unit - 1 Application of Laplace Transforms : Laplace's equations, Laplace's wave equation.

Unit - 2 Application of Laplace Transforms in Heat conduction equation.

Unit -3 Application of Laplace Transform to Boundary Value Problems. Electric Circuits. Application to Beams.

Unit -4 The complex Fourier Transform, Inversion Formula, Fourier cosine and sine transform, properties of Fourier Transforms, Convolution & Parseval's identity.

Unit -5 Fourier Transform of the derivatives, Finite Fourier Sine & Cosine Transform, Inversion Operational and combined properties Fourier transform.

Books recommended :-

[1] **Integral Transforms by Goyal & Gupta.**

[2] **Integral Transforms by Sneddon**

MATHEMATICS

Optional paer Gr. VII Integration Theory

Unit 1 General meansues Examples, Semifinite and o finite measures, Completeion of a measure, Measurable functions.

Unit 2 Signed measures, Hahn Decomposition Theorem, Mutually Singular Measures Jordon Decomposition theorem.

Unit 3 Radon - Nikodym Theorem, Lebesgue Decomposition Theorem, Caratheodary Extension Theorem.

Unit 4- Baire sets, Baire measures, Regularity of measures on locally compact spaces, Product measures, Fubini's theorem.

Unit 5 Integration of continuous functions wiyh compact support on locally compact spaces, Riesz - Makov theorem.

Recommended Books:

1- H.L. Royden Real Analysis, macmillan publishing co. Inc. Newyork, 4th Edition, 1993.

Referance Books:

1- P.R, Halmos, Measure theory, Van Nostrand

2- I.K. Rana, Introduction to measure and integration, Narosa Publishing House, New Delhi.