बरकतउल्ला विश्वविद्यालय, भोपाल

Barkatullah Vishwavidyalaya, Bhopal

As per model syllabus of U.G.C. New Delhi, drafted by Central Board of Studies and Approved by Higher Education and the Governor of M.P.

विज्ञान संकाय

पाठ्यक्रम एवं निर्धारित पुस्तकें

एम.एस.सी./एम.ए. चतुर्थ सेमेस्टर परीक्षा 2010–11

गणित

(संशोधित पाठ्यक्रम)

FACULTY OF SCIENCE
Syllabus for

M.Sc./M.A. IV Semester Examination 2010-11

Mathematics

(Revised Syllabus)

प्रकाशक

कुलसचिव

बरकतउल्ला विश्वविद्यालय, भोपाल

मूल्य – 50/–

FOURTH SEMESTER

1. Course Code :
2. Course Name : **M.Sc./M.A. (Mathematics)**
3. Total Paper : **5**
4. Compulsory Paper : **4**
5. Optional Paper : **1**
6. Project : **Y**
7. Maximum marks : **300**
8. Minimum Passing percentage **: 36**
9. Project Work **: 50**
10. Project passing marks **: 18**
11. Comprehensive Viva-Voce : **50**
12. Comprehensive Viva-Voce Passing Marks: **18**

Sub. code	Subject Name	Theory									Practical		Total	
		Paper					CCE		Total Marks					
		1st	2nd	3rd	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Compulsory Paper														
	Functional Analysis-II	35	0	0	35	13	15	5	50	18	0	0	50	18
Note : Four paper out of the following have to be chosen opting not more than one from each grup.														
Optional Group-I														
	Advanced functional analysis-II	35	0	0	35	13	15	5	50	18	0	0	50	18
	Partial differential Equations –II	35	0	0	35	13	15	5	50	18	0	0	50	18
	Differentiable Structure on a manifold-II	35	0	0	35	13	15	5	50	18	0	0	50	18
	General theory of relativity and Cosmology-II -II	35	0	0	35	13	15	5	50	18	0	0	50	18
Group- II														
	Algebraic topology-II	35	0	0	35	13	15	5	50	18	0	0	50	18
	Abstract Harmonic Analysis-II	35	0	0	35	13	15	5	50	18	0	0	50	18
	Advanced Graph Theory-II	35	0	0	35	13	15	5	50	18	0	0	50	18
	Advanced special function-II	35	0	0	35	13	15	5	50	18	0	0	50	18
Group – III														
	Theory of linear operators-II	35	0	0	35	13	15	5	50	18	0	0	50	18
	Mechanics-II	35	0	0	35	13	15	5	50	18	0	0	50	18
	Advanced Numerical Analysis-II	35	0	0	35	13	15	5	50	18	0	0	50	18
	Fuzzy sets and their application-II	35	0	0	35	13	15	5	50	18	0	0	50	18
Group – IV														
	Operations research –II	35	0	0	35	13	15	5	50	18	0	0	50	18
	Computational biology –II	35	0	0	35	13	15	5	50	18	0	0	50	18
	Jacobin Polynomial & H. Function –II	35	0	0	35	13	15	5	50	18	0	0	50	18
	Fluid Mechanics –II	35	0	0	35	13	15	5	50	18	0	0	50	18
Group –V														
	Wavelets –II	35	0	0	35	13	15	5	50	18	0	0	50	18
	Biomechanics –II	35	0	0	35	13	15	5	50	18	0	0	50	18
	Analytic Number Theory –II	35	0	0	35	13	15	5	50	18	0	0	50	18
	Integral Transform –II	35	0	0	35	13	15	5	50	18	0	0	50	18
Group –VI														
	Programming in C (theory & practical)-II	25	0	0	25	8	10	4	0	0	15	06	50	18
	Mathematics of Finance & Insurance-II	35	0	0	35	13	15	5	50	18	0	0	50	18
	Integration Theory-II	35	0	0	35	13	15	5	50	18	0	0	50	18
	Spherical Trigonometry and astronomy-II	35	0	0	35	13	15	5	50	18	0	0	50	18
	Job oriented project work	0	0	0	0	0	0	0	50	18	0	0	50	18
	Comprehensive viva-voce	0	0	0	0	0	0	0	50	18	0	0	50	18

विशेष टीपः– (1) विद्वत परिषद की स्थाई समिति की बैठक दिनांक 26/12/08 के पद क्रमांक 8/13/43 के लिये गये निर्णय अनुसार स्नातकोत्तर में प्रोजेक्ट कार्य में 36 प्रतिशत उत्तीर्णांक अंक प्राप्त करना अनिवार्य होगा। तदानुसार प्रोजेक्ट के अंकों को श्रेणी प्रदाय हेतु गणना में नही लिया जावेगा।

COURSE STRUCTURE

M.Sc./M.A. SEMESTER - IV

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. Functional Analysis-II Optional Paper's Four papers out of the following have to be chosen, opting not more than one from each group.	35	12	15	05	-------	-------	50
Group I (1) Advanced Functional Analysis-II (2) Partial Differential Equations-II (3) Differentiable Structures on manifolds-II (4) General Theory of Relativity and Cosmology-II	35	12	15	05	-------	-------	50
Group II (1) Algebraic Topology-II (2) Abstract Harmonic Analysis-II (3) Advanced Graph Theory-II (4) Advanced Special Function-II	35	12	15	05	-------	-------	50
Group III (1) Theory of Linear Operators-II (2) Mechanics-II (3) Advanced Numerical Analysis-II (4) Fuzzy Sets and their Applications-II	35	12	15	05	-------	-------	50
Group IV (1) Operations Research-II (2) Computational Biology-II (3) Jacobi Polynomial & H-Function-II (4) Fluid Mechanics-II	35	12	15	05	-------	-------	50

Group V (1) Wavelets-II (2) Bio-Mechanic-II (3) Analytic Number Theory-II (4) Integral Transform-II	35	12	15	05	-------	-------	50
Group VI (1) Programming in C (Theory & Practical) -II (2) Mathematics of Finance & Insurance-II (3) Integration Theory-II (4) Spherical Trigonometry and astronomy-II	25 35 35	08 12 12	10 15 15	04 05 05	15 ---- ----	06 ---- -----	50 50 50
Paper VI. Job - Oriented Project Work.							50
Paper VII. Comprehensive Viva-Voce.							50
Grand Total							
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. 2- Other optional papers according to the availability of subject experts may be added to any group.							

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

M.Sc.(Post Graduates) semester wise Syllabus

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Max. Marks/अधिकतम अंक : 35

Class / कक्षा	:	**M.Sc/M.A**
Semester / सेमेस्टर	:	**सेमेस्टर चतुर्थ**
Title of Subject Group / विषय समूह का शीर्षक	:	**Mathematics**
Paper No. & Title / प्रश्नपत्र क्र. एवं शीर्षक	:	**Functional Analysis-II**
Compulsory / अनिवार्य या Optional / वैकल्पिक	:	**Compulsory / अनिवार्य**

Unit I Uniform boundedness theorem and some of its consequences, Open mapping and closed graph theorems.

Unit II Hahn-Banach theorem for real linear spaces, Hahn-Banach theorem for complex linear spaces and normed linear spaces.

Unit III Reflexive spaces. Hilbert spaces, Orthonormal Sets, Bessel's inequality. Complete orthonormal sets and Parseval's ldentity,

Unit-IV Projection Mapping , Projection theorem structure of Hilbert spaces. Riesz representation theorem.

Unit-V Adjoint of an operator on a Hilbert space. Reflexivity of Hilbert spaces. Self-adjoint operators, Positive operators, Projection, Normal and Unitary operators.

Text Books :

[1] E. Kreyszig, Introductory Functional Analysis with applications, John Wiley & Sons New York.

[2] G.F. Simmons, Introduction to Topology & Modern Analysis Mc Graw Hill, NewYork.

Reference :

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

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Max. Marks/अधिकतम अंक : 35

Class / कक्षा	:	**M.Sc/M.A**
Semester / सेमेस्टर	:	**सेमेस्टर चतुर्थ**
Title of Subject Group / विषय समूह का शीर्षक	:	**Mathematics**
Paper No. / प्रश्नपत्र क्र.	:	**II/III/IV/V**
Title / शीर्षक	:	**Advanced Functional Analysis-II**
Compulsory / अनिवार्य या Optional / वैकल्पिक	:	**Gr-I (I) Optional / वैकल्पिक**

: Particulars/ विवरण :

Unit – I Finite dimensional topological vector spaces, Locally convex topological vector spaces,

Unit – II Normable and metrizable topological vector spaces, complete topological vector spaces.

Unit –III Frechet space, Uniform-boundedness principle, Open mapping theorem and closed graph theorem for Frechet spaces,

Unit-IV Banach - Alaoglu theorem. Variation Inequalities, Lions-Stampacchia theory,

Unit-V 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.

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Max. Marks/अधिकतम अंक : 35

Class / कक्षा	:	**M.Sc/M.A**
Semester / सेमेस्टर	:	**सेमेस्टर चतुर्थ**
Title of Subject Group / विषय समूह का शीर्षक	:	**Mathematics**
Paper No. / प्रश्नपत्र क्र.	:	**II/III/IV/V**
Title / शीर्षक	:	**Partial Differential Equations-II**
Compulsory / अनिवार्य या Optional / वैकल्पिक	:	**Gr-I (II) Optional / वैकल्पिक**

: Particulars/ विवरण :

Unit 1- Nonlinear First order PDE. Complete integrals, Envelopes, Characteristies,

Unit 2- Hamilton Jacobi Equation (Calulus) of Variations, Hamiltons ODE, Legendre Transform, Hopf-Lax formulae, weak solution, Uniqueness.

Unit 3- 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 4- Fourier and Laplace Transform, Hopf - Cole Transform, Hodograph and Legendrey Transforms, Potential Functions, Asymptotes (Singular Perturbations, Laplaces Method, Geometric Optics,

Unit 5- Stationary Phase Homogenization) Power Series (Non-characteristic surface, Real Analytic functions, Cauchy - Kovalevskaya Theorem).

Recommended Books :-

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

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Max. Marks/अधिकतम अंक : 35

Class / कक्षा	:	**M.Sc/M.A**
Semester / सेमेस्टर	:	**सेमेस्टर चतुर्थ**
Title of Subject Group / विषय समूह का शीर्षक	:	**Mathematics**
Paper No. / प्रश्नपत्र क्र.	:	**II/III/IV/V**
Title / शीर्षक	:	**Differentiable Structures on a Manifold-II**
Compulsory / अनिवार्य या Optional / वैकल्पिक	:	**Gr-I (III) Optional / वैकल्पिक**

: Particulars/ विवरण :

Unit – I Kahler manifolds. Affine connection.

Unit – II Holomorphic sectional curvature. Curvature tensor. Almost analytic vector fields.

Unit -III Nearly Kahler manifolds, Curvature identities. Constant Holomorphic sectional curvature.

Unit-IV Almost analytic vector fields Almost Kahler Manifold Anilities vector fields. Almost Contact manifolds : Lie derivative normal contact structure,

Unit- V Affinely almost almost cosymplectic manifold, Almost Grayn manifolds: D-conformal transformation, Perticular affined connection K- Contact Rumanian manifolds.

Reference Books:-

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 tensons with application to Riemannian geometry pothishala Pvt. Ltd. 1965.

2- R.S. Mishra, Structures on Differentiable manifold and there applications, Chandrema Prakashan Allahabad, 1984.

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M.Sc.(Post Graduates) semester wise Syllabus

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

Max. Marks/अधिकतम अंक : 35

Class / कक्षा	:	**M.Sc/M.A**
Semester / सेमेस्टर	:	**सेमेस्टर चतुर्थ**
Title of Subject Group / विषय समूह का शीर्षक	:	**Mathematics**
Paper No. / प्रश्नपत्र क्र.	:	**II/III/IV/V**
Title / शीर्षक	:	**General Theory of Relativity-II**
Compulsory / अनिवार्य या Optional / वैकल्पिक	:	**Gr-I (IV) Optional / वैकल्पिक**

: Particulars/ विवरण :

Unit-I Review of the special theory of relativity and the Newtonian Theory of gravitation. Principle of equivalence and general covariance, geodesic principle.

Unit-II Newtonian approximation of relativistic equations of motion. Einstein's field equations and its Newtonian approximation.

Unit-III Schwarzschild external solution and its isotropic form. Planetary orbits and anologues of Kepler's Laws in general relativity. Advance of perihelion of a planet.

Unit-IV 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.

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Max. Marks/अधिकतम अंक : 35

Class / कक्षा	:	**M.Sc/M.A**
Semester / सेमेस्टर	:	**सेमेस्टर चतुर्थ**
Title of Subject Group / विषय समूह का शीर्षक	:	**Mathematics**
Paper No. / प्रश्नपत्र क्र.	:	**II/III/IV/V**
Title / शीर्षक	:	**ALGEBRAIC TOPOLOGY-II**
Compulsory / अनिवार्य या Optional / वैकल्पिक	:	**Gr-II (I) Optional / वैकल्पिक**

: Particulars/ विवरण :

Unit - 1 Free product of groups, Free groups, the Siefert - van Kampen theorem and its applications

Unit - 2 Classification of Surfaces: Fundamental groups of surfaces.

Unit – 3 Homology of surfaces, Cutting and pasting Construction of Compact surfaces.

Unit- 4 The classification theorem. Equivalence of covering space.

Unit-5 Covering transformations, The universal covering space and its existence. :

BOOK RECOMMENDED :

[1] J.R. Munkres, Topology, Second edition, Prentice - Hall of India, 2000.

[2] J.R. Munkres, Elements of Algebraic topolgy, Addison - Wesley Publishing company, 1984.

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Max. Marks/अधिकतम अंक : 35

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

: Particulars/ विवरण

:

Unit- 1 The Haar covering function Existence and properties of Haar covering function Definition and properties of the function Ig (f) . Existence and Uniqueness of the Haar integral.

Unit-2 Translation in Lp(G), uniform continuity of translation character properties of characters.

Unit-3 Character group or dual group Locally compact abelian group non – trivial complex homomorphism.

Unit-4 The Fourier transform, convolution of function set A (Γ) of all Fourier transforms invariance, of A (Γ).

Unit-5 Fourier Stieltjes transform set B(Γ) of all Fourier Stieltjes transform, invariance of B (Γ)

RECOMMENDED BOOKS.

1- George Bachman Elements of Abstract Harmonic Analysis Academic Press, New Your. 1964

2- Taqdir Hussain Introduction to Topological Group W.D. Saudss Company 1966 to ok W.O.

3- Walter Rudin, Fourier Analysis On Group Intersceince publisher , John wiley, New York, 1967

REFERENCE BOOKS.

1- Edwin Hewit and Kenneth A. Ross. Abstract Harmonic Analysis -1, Springer - Verlag, Berlin, 1963.

2- lynn H. Loomis : An Introduction to Abstract Harmonic Analysis, D, Van Nostrand Co. Princeton

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Max. Marks/अधिकतम अंक : 35

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

: Particulars/ विवरण

:

Unit - I Connectivity and separability in graphs Abstract graphs geometric graphs planar graphs Kurtowski two graphs embedding and regions of a planar graphs Detection of planarity.

Unit -II Geometric dual and combination dual.

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

Unit -IV Digraph and types of digraphs, Digraph and binary relation Equivalence relation in a graph Directed path walk circuit and connectedness Eulerian digraph, arborscence matrices A, B and C of digraphs.

Unit-V Adjacency metric of a digraph, Alogorithms, Kruskal algorithm, Prism algorithm, Dijkastra Algorithm.

TEXT BOOK :-

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

REFERENCE BOOK :-

1- Graph Theory by Harary

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M.Sc.(Post Graduates) semester wise Syllabus

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

Max. Marks/अधिकतम अंक : 35

Class / कक्षा	:	**M.Sc. /**M.A.
Semester / सेमेस्टर	:	**सेमेस्टर चतुर्थ**
Title of Subject Group / विषय समूह का शीर्षक	:	**Mathematics**
Paper No. / प्रश्नपत्र क्र.	:	**II/III/IV/V**
Title / शीर्षक	:	**A DVANCED SPECIAL FUNCTION-II**
Compulsory / अनिवार्य या Optional / वैकल्पिक	:	**Gr-II (IV) Optional / वैकल्पिक**

: Particulars/ विवरण :

Unit-I **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,

Unit-II Generating function for Legendre polynomials Rodrigues formula, Bateman's generating function, Additional generating functions, Hypergeometric forms of P_n (X).

Unit-III Special properties of P_nX), Some more generating functions, Laplace's first integral form, Othergonality.

Unit IV- Definition of Hermite polynomials Hn (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.

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M.Sc.(Post Graduates) semester wise Syllabus

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Max. Marks/अधिकतम अंक : 35

Class / कक्षा	:	**M.Sc. /**M.A.
Semester / सेमेस्टर	:	**सेमेस्टर चतुर्थ**
Title of Subject Group / विषय समूह का शीर्षक	:	**Mathematics**
Paper No. / प्रश्नपत्र क्र.	:	**II/III/IV/V**
Title / शीर्षक	:	**Theory of Linear Operators-II**
Compulsory / अनिवार्य या Optional / वैकल्पिक	:	**Gr-III (I) Optional / वैकल्पिक**

: Particulars/ विवरण

:

Unit – I Spectral properties of compact linear operators on normed spaces.

Unit-II Behaviours of Compact linear operators with respect to solvability of operators equation.

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

Unit –IV Positive operators Monotone sequence theorem for bounded self – adjoint operators on a complex Hilbert space.

Unit-V Square roots of a positive operator. projection operators.

RECOMMENDED BOOKS:

1 E. Kreyszig Introductory functional analysis with applications, Jhon wiley & Sons, New York, 1978.

REFERANCE 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. Dundford 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.

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Max. Marks/अधिकतम अंक : 35

Class / कक्षा	:	**M.Sc. /**M.A.
Semester / सेमेस्टर	:	**सेमेस्टर चतुर्थ**
Title of Subject Group / विषय समूह का शीर्षक	:	**Mathematics**
Paper No. / प्रश्नपत्र क्र.	:	**II/III/IV/V**
Title / शीर्षक	:	**Mechanics-II**
Compulsory / अनिवार्य या Optional / वैकल्पिक	:	**Gr-III (II) Optional / वैकल्पिक**

: Particulars/ विवरण :

Unit – I 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.

Unit-II Conditional extermum under geometric constraints and under integral constraints. Hamilton's Principle of least action Poincare Carten Integal invariant Whittaker equation Jacobi's equations. Statement of lee HWA Chung's theorem.

Unit–III Hamilton – Jacobi equation. Jacobi theorem. Method of separation of variables. Lagrange Barckets. Condition of canonical character of a transformation in terms of Lagrange brackets and Poisson brackets Invariance of Largange brackets and Poisson brackets under canonical transformation.

Unit – IV Attraction and potential of rod disc spherical shells and sphere. Surface integral of normal attraction (application & Gauss theorem) Laplace's and poison equation. Work done by self attraction systems.

Unit-V Distribution for a given potential. Equipotent 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 (2^{nd} Edition), Narosa Publishing House, New Delhi

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

: Particulars/ विवरण :

Unit- I Extrapolation methods ordinary differential equations. multi step methods Predicator and corrector method,

Unit- II Stability analysis of multistep methods. Ordinary differential equation

Unit-III Boundary value problems shooting method.

Unit –IV Finite difference methods.

Unit-V 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.

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Max. Marks/अधिकतम अंक : 35

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

: Particulars/ विवरण :

Unit – I Fuzzy Relation and fuzzy graphs – Fuzzy relation on Fuzzy sets, Composition of Fuzzy relation,

Unit – II Min-Max composition and its properties, Fuzzy equivalence relation Fuzzy compatibility relation Fuzzy relation equation Fuzzy graphs, Similarity relation.

Unit – III Possibility Theory-Fuzzy measures, Evidence theory, Necessity Measure, possibility measure.

Unit-IV Possibility distribution, possibility theory and fuzzy sets possibility theory versus probability theory.

Unit – V Fuzzy Logic-An overview of classical logic, multivalued logics, Fuzzy proposition Fuzzy quantifiers Linguistic variables and hedges, Inference from conditional fuzzy proposition, the compositional rule of inference.

TEXT BOOKS:

1 Fuzzy set theory and its Applications by H.J. Zimmermann, Allied Publishers Ltd., New Delhi, 1991.

2 Fuzzy sets and Fuzzy logic by G.J. Klir and B. Yuan Prentice – Hall of India, New Delhi,1995

REFERENCE BOOKS:-

Fuzzy sets and Uncertainty and Information by G.J. Kalia Tina A. Foljer - Prentice - Hall of India

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Max. Marks/अधिकतम अंक : 35

Class / कक्षा	:	**M.Sc. /**M.A.
Semester / सेमेस्टर	:	**सेमेस्टर चतुर्थ**
Title of Subject Group / विषय समूह का शीर्षक	:	**Mathematics**
Paper No. / प्रश्नपत्र क्र.	:	**II/III/IV/V**
Title / शीर्षक	:	**Operations Research-II**
Compulsory / अनिवार्य या Optional / वैकल्पिक	:	**Gr-IV (I) Optional / वैकल्पिक**

: Particulars/ विवरण :

Unit-I Transportation problems : North - West Corner Method Least - Cost Method. Vogel's Approximation Method, MODI Method,

Unit-II Exceptional cases and problem of degeneracy, Assignment problems.

Unit-III 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) Simulation : Monte - Carlo Simulation.

Unit-IV Simulation of Networks , Advantage and Limitation of Simulation.

Unit-V Game theory - Two persons, Zero - Sum Games, Maximix - 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.

RECOMMENDED BOOKS :-

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

REFERENCE BOOKS:-

1- S.D, Sharma, Operation Research,

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

3- G. Hadley , Linear Programming, Narosa Publishing House. 1995.

4- G. Hadley, Linear and Dynamic programming, Addison - Wesley Reading Mass.

5- H.A. Taha, Operations Research - An introduction, Macmillan Publishing co. Inc. New York.

6- Prem Kumar Gupta and D.S. Hira, Operation Research, an Introduction, S. Chand & Company Ltd. New Delhi.

7- N.S. Kambo, Mathematical Programming Techniques, Affiliated East - West Pvt. Ltd. New Delhi. Madras.

उच्च शिक्षा विभाग, म.प्र. शासन

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M.Sc.(Post Graduates) semester wise Syllabus

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

Max. Marks/अधिकतम अंक : 35

Class / कक्षा	:	**M.Sc. /**M.A.
Semester / सेमेस्टर	:	**सेमेस्टर चतुर्थ**
Title of Subject Group / विषय समूह का शीर्षक	:	**Mathematics**
Paper No. / प्रश्नपत्र क्र.	:	**II/III/IV/V**
Title / शीर्षक	:	**Computational Biology-II**
Compulsory / अनिवार्य या Optional / वैकल्पिक	:	**Gr-IV (II) Optional / वैकल्पिक**

: Particulars/ विवरण :

Unit- I	Integer programming, Partition Problems, Traveling Salesman Problem (TSP) simulated annealing Sequence.
Unit- II	Assembly - Sequencing strategies,
Unit-III	Traveling Salesman Problem (TSP) simulated annealing sequence.
Unit-IV	Fragment alignment, Sequence accuracy,
Unit-V	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, Wiley Interscience (1998).

Reference Books:-

1- Introduction to Bio informatics by Attwood.

2- Bioinformatics-Sequence and Genome analysis by David W. Mount.

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M.Sc.(Post Graduates) semester wise Syllabus

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Max. Marks/अधिकतम अंक : 35

Class / कक्षा	:	**M.Sc.** /M.A.
Semester / सेमेस्टर	:	**सेमेस्टर चतुर्थ**
Title of Subject Group / विषय समूह का शीर्षक	:	**Mathematics**
Paper No. / प्रश्नपत्र क्र.	:	**II/III/IV/V**
Title / शीर्षक	:	**Jocobi Polynomials and H - Functions-II**
Compulsory / अनिवार्य या Optional / वैकल्पिक	:	**Gr-IV (III) Optional / वैकल्पिक**

: Particulars/ विवरण :

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

Unit -II The H Functions of two variables, Definition and notation. Asymptotic behavior elementary properties special cases.

Unit-III Derivatives. Contiguous relations Total Count of recurrences.

Unit -IV Finite Summation formulas for the H Functions of two variables,

Unit-V 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- Lebdev. N.N. Special functions and Their Applications. Prentice Hall. Englewood Hall phase new Jersy USA, 1965.

2- Whittaker. E.T, and Watson G.N. A Course of Modern analysis. Cambridge University Press. London 1963.

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Max. Marks/अधिकतम अंक : 35

Class / कक्षा	:	**M.Sc.** /M.A.
Semester / सेमेस्टर	:	**सेमेस्टर चतुर्थ**
Title of Subject Group / विषय समूह का शीर्षक	:	**Mathematics**
Paper No. / प्रश्नपत्र क्र.	:	**II/III/IV/V**
Title / शीर्षक	:	**Fluid Mechanics-II**
Compulsory / अनिवार्य या Optional / वैकल्पिक	:	**Gr-IV (IV) Optional / वैकल्पिक**

: Particulars/ विवरण :

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

Unit- II Relations between rectangular components of stress convection between streses and gradients of velocity.

Unit-III 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-IV Dynamical similarity, Reynolds number, Prandt's boundary layer, boundary layer equations in two dimension, blasius solution.

Unit-V 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.

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Max. Marks/अधिकतम अंक : 35

Class / कक्षा	:	**M.Sc. /**M.A.
Semester / सेमेस्टर	:	**सेमेस्टर चतुर्थ**
Title of Subject Group / विषय समूह का शीर्षक	:	**Mathematics**
Paper No. / प्रश्नपत्र क्र.	:	**II/III/IV/V**
Title / शीर्षक	:	**WAVELETS-II**
Compulsory / अनिवार्य या Optional / वैकल्पिक	:	**Gr-V (I) Optional / वैकल्पिक**

: Particulars/ विवरण :

Unit -I Inner products and orthogonal projection.

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

Unit-III Fourier series for periodic functions its convergence and inversion,

Unit-IV uniform convergence of Fourier series, Bessel's inequality, Parseval's inequality.

Unit-V 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.

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M.Sc.(Post Graduates) semester wise Syllabus

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Max. Marks/अधिकतम अंक : 35

Class / कक्षा	:	**M.Sc. /**M.A.
Semester / सेमेस्टर	:	**सेमेस्टर चतुर्थ**
Title of Subject Group / विषय समूह का शीर्षक	:	**Mathematics**
Paper No. / प्रश्नपत्र क्र.	:	**II/III/IV/V**
Title / शीर्षक	:	**BIOMECHANICS-II**
Compulsory / अनिवार्य या Optional / वैकल्पिक	:	**Gr-V (II) Optional / वैकल्पिक**

: Particulars/ विवरण :

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

Unit -II Diffusion processes in biology; diffusion in Tissue Fick's principle.

Unit-III One, two and three Dimensional diffusion problems and their solution, Water Transport, Diffusion through membranes.

Unit -IV Respiratory Gas Flows, flow in Airways, Interaction Between convection and diffusion Exchange between Alvoelar Gas and Erythrocytes.

Unit-V 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

उच्च शिक्षा विभाग, म.प्र. शासन

एम.एस–सी.(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.(Post Graduates) semester wise Syllabus

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

Max. Marks/अधिकतम अंक : 35

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

: Particulars/ विवरण :

Unit -I Dirichlet series and Euler products.

Unit-II The function defined by Dirichlet series, the halfplane of convergence of a Dirichlet series.

Unit -III Integral formula for the coefficients of Dirichlet series.

Unit-IV Analytic properties of Dirichilet series, Mean value formula for Dirichilet series.

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

BOOK ROCOMMNEDED :

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

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M.Sc.(Post Graduates) semester wise Syllabus

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Max. Marks/अधिकतम अंक : 35

Class / कक्षा	:	**M.Sc. /**M.A.
Semester / सेमेस्टर	:	**सेमेस्टर चतुर्थ**
Title of Subject Group / विषय समूह का शीर्षक	:	**Mathematics**
Paper No. / प्रश्नपत्र क्र.	:	**II/III/IV/V**
Title / शीर्षक	:	**Integral Transforms-II**
Compulsory / अनिवार्य या Optional / वैकल्पिक	:	**Gr-V (IV) Optional / वैकल्पिक**

: Particulars/ विवरण :

Unit - I Application of Laplace Transform to Boundary Value Problems.

Unit - II Electric Circuits. Application to Beams.

Unit -III The complex Fourier Transform, Inversion Formula, Fourier cosine and sine transform.

Unit-IV Properties of Fourier. Transforms, Convolution & Parseval's identity.

Unit-V 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

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

M.Sc./M.A. (Post Graduate) Semester wise Syllabus
As recommended by Central Board of Studies and approved by the Governor of M.P.

अधिकतम अंक / Max. Marks 25

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

: Particulars/ विवरण :

Unit -I Control Flow – Conditional Branching, the Switch Statement. looping. nested loops.

Unit-II The Break and Continue statement . the goto statement infinite loop.

Unit-III Operators and Expressions - Precedence and associatively. Unary plus and Minus operators. Binary Arithmetic operators arithmetic assignment operators. Increment and decrement operators. Comma Operator Relational operators logical operators bit- Manipulation operators Bitwise assignment operators. Cast operators size of Operators , Conditional Operators , memory operator.

Unit -IV Arrays and multidimensional Arrays. Storage Classes – fixed vs. Automatic Duration Scope, global variable.

Unit-V The Register Specific Structures and Unions.

Recommended Books:

1 Peter A Darnell and Philip E. Margolis, C; A Software Engineering Approched narosa Publishing House (Springer International Student Edition) 1993.

Reference Books:

1 Samuel P. Harkison and Gly L Steele Jr. C; A Reference manual , 2an Edition Prentice hall 1984.

2 Brain W Kernigham & Dennis M Ritchie the C Programmed Language 2nd Edition (ANSI features), Prentice Hall 1989

Practical MM : 15

1. Program to find roots of quadratic equation.
2. Program to rules x to the Power N.
3. Program to add digits of a number.
4. Program to check whether a number is prime or not prime.
5. Program to print given number in reserve order.
6. Program to print GCD of two numbers.
7. Program to generate Fibonacci series
8. Program for reversing an array using function.
9. Program to calculate factorial of a given number.
10. Program to find the sum of first a natural numbers.
11. Program for linear search
12. Program for library search

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

M.Sc./M.A. (Post Graduate) Semester wise Syllabus
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अधिकतम अंक / Max. Marks 35

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

: Particulars/ विवरण :

Unit-I A Brief introduction to financial Markets.

Unit-II Basics of Securities, Stocks Bonds and financial derivatives.

Unit-III Viz forwards, Futures, Options and Swaps.

Unit-IV An Introduction to stochastic Calculus stochastic process, geometric Brownian motion stochastic integration and ito's lemma.

Unit-V Option Pricing models- Binamial Models and Black Scholes Option Pricing Model for European Options, Black Scholes formula and computation of greeks.

TEXT BOOKS:

1. Options, Futures and other Drivatives by John C. Hull Prentice – Hall of India Pvt. Ltd.
2. An introduction to Mathematic Finance by Cheldon M. Ross, Cambridge University Press.

REFERENCE BOOKS:

1. An Introduction to Mathematics of Financial Derivatives by Salih N. Neftci, Academic Press, Inc.
2. Mathematics of Financial markets by Ribert J. Elliot & P.E. Kopp Springer Verlag, New York Inc

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

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

M.Sc.(Post Graduates) semester wise Syllabus

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Max. Marks/अधिकतम अंक : 35

Class / कक्षा	:	**M.Sc. /**M.A.
Semester / सेमेस्टर	:	**सेमेस्टर चतुर्थ**
Title of Subject Group / विषय समूह का शीर्षक	:	**Mathematics**
Paper No. / प्रश्नपत्र क्र.	:	**II/III/IV/V**
Title / शीर्षक	:	**Integration Theory-II**
Compulsory / अनिवार्य या Optional / वैकल्पिक	:	**Gr-VI (III) Optional / वैकल्पिक**

: Particulars/ विवरण :

Unit -I Radon - Nikodym Theorem, Lebesgue Decomposition Theorem.

Unit-II Caratheodary Extension Theorem.

Unit-III Baire sets, Baire measures, Regularity of measures on locally compact spaces.

Unit-IV Product measures, Fubini's theorem.

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

RECOMMENDED BOOKS:

1- H.L. Royden Real Analysis, macmillan publishing co. Inc. New York, 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.

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M.Sc./M.A. (Post Graduate) Semester wise Syllabus
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अधिकतम अंक / Max. Marks 35

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

: Particulars/ विवरण :

Unit -I Spherical Astronomy - Various system of references and related topics.

Unit -II Celestial sphere,

Unit-III Transit instrument.

Unit IV Atmospheric Retraction.

Unit-V Time planetary phenomena.

TEXT BOOKS:-

1- A text book of spherical trigonometry : Gorakh Prasad.

2- A text book of spherical Astronomy : Gorakh Prasad.

REFERENCE BOOK.

1- Spherical Astronomy – Smarat

2- spherical Astronomy – Bell