GONDWANA UNIVERSITY,
GADCHIROLI.

STUDY COMMITTEE IN MATHEMATICS
M.SC. I & II (MATHEMATICS)
SEMESTER WISE SYLLABUS

WITH EFFECT FROM
2012-13 Subsequently

GONDWANA UNIVERSITY, GADCHIROLI.

STUDY COMMITTEE IN MATHEMATICS

M.SC. I & II (MATHEMATICS)

SEMESTER WISE SYLLABUS

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2012-13 Subsequently

Total Marks : 2500

Each Paper : 100 marks theory + 25 marks sessional

Periods Allotted per week per paper : 05 Hrs.

M. Sc. Semester-I

Compulsory Papers

1. Paper I Algebra-I
2. Paper II Real Analysis-I
3. Paper III Topology-I
4. Paper IV Linear Algebra and differential equations

Optional Papers (Any One)

5. Paper V Numerical Analysis
6. Paper VI Integral Equations
7. Paper VII Fuzzy Mathematics-I

M. Sc. Semester-II

Compulsory Papers

1. Paper I Algebra-II
2. Paper II Real Analysis-II
3. Paper III Topology-II
4. Paper-IV Differential geometry

Optional Papers (Any One)

5. Paper-V Classical Mechanics
6. Paper VI Mathematical Methods
7. Paper VII Fuzzy Mathematics-II

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Total Marks : 2500

Each Paper : 100 marks theory + 25 marks sessional

Periods Allotted per week per paper : 05 Hrs.

M. Sc. Semester-III

Compulsory Papers

1. Paper I Complex Analysis
2. Paper II Functional Analysis

Optional Papers (Any three)

3. Paper-III Fluid Dynamics-I
4. Paper- IV General Relativity
5. Paper-V Operations Research-I
6. Paper VI Algebraic Topology-I
7. Paper- VII Operator Theory
8. Paper –VIII Non-linear programming
9. Paper IX MATLAB Programming

M. Sc. Semester-IV

Compulsory Papers

1. Paper-I Dynamical Systems
2. Paper-II Partial Differential Equations

Optional Papers (Any three)

3. Paper-III Fluid Mechanics-II
4. Paper-IV Cosmology
5. Paper V Operations Research-II
6. Paper VI Advanced Algebra
7. Paper VII Algebraic Topology-II
8. Paper- VIII Banach Algebras
9. Paper – IX Computational Fluid Dynamics

Semester- IV

Paper-I

Dynamical Systems

Unit1: Dynamical systems and vector fields. The fundamental theorem. Existence and uniqueness. Continuity of solutions in initial conditions. On extending solutions. Global solutions. The flow of a differential equation.

Unit2: Nonlinear sinks. Stability. Liapunov function. Gradient systems. Gradients and inner products.

Unit3: Limit sets, local sections and flow boxes, monotone sequences in planar dynamical systems. The Poincare- Bendixson theorem, Applications of Poincare-Bendixson theorem; one species, predator and prey, competing species. 17

Unit4: Asymptotic stability of closed orbits, discrete dynamical systems. Stability and closed orbits. Non Autonomous equations and differentiability of flows. Persistence of equilibria, persistence of closed orbits. Structural stability.

Text Book:

Differential equations, dynamical systems & linear algebra: M.W. Hirsch & S. Smale, Academic Press, 1975.

Reference Book :

Dynamical systems: V.I. Arnold, Springer Verlag, 1992.

Paper II

Partial Differential Equations

Unit 1: First order partial differential equations in two independent variables and the Cauchy problem. Semilinear and quasi linear equations in two independent variables. First order non linear equations in two independent variables. Complete integral.

Unit 2: Classification of second order partial differential equations. Potential theory and elliptic differential equations (sections 2.1-2.5).

Unit 3: The diffusion equation and parabolic differential equations (sections 3.1-3.4).

Unit 4: The Wave equation (sections 4.1, 4.2, 4.4, 4.8, 4.9)

Text Book :

Partial Differential Equations: Phoolan Prasad and Renuka Ravindran; New Age International(P) Limited.

Paper-III

Fluid Dynamics-II

(Optional)

Unit 1: Stress components in a real fluid, relation between Cartesian components of stress translation motion of fluid elements, the rate of strain quadric and principal stresses, some further properties of the rate of the strain quadric, stress analysis in fluid motion, relation between stress and rate of strain, the coefficient of viscosity and laminar flow, the Navier-Stokes equations of motion of a viscous fluid, some solvable problems in viscous flow, diffusion of vorticity, energy dissipation due to viscosity, steady flow past a fixed sphere.

Unit 2: Nature of magnetohydrodynamics, Maxwell electromagnetic field equations; Motion at rest, Motion in medium , Equation of motion of conducting fluid, Rate of flow of charge, Simplification of electromagnetic field equation. Magnetic Reynold number; Alfven's theorem, The magnetic body force. Ferraro's Law of Isorotation. 18

Unit3: Dynamical similarity, Buckingham Theorem. Renold number. Prandtl's boundary layer, Boundary layer equation in two dimensions, Blasius solutions, Boundary layer thickness, Displacement thickness. Karman integral conditions, Separation of boundary layer flow.

Unit4: Turbulence: Definition of turbulence and introductory concepts. Equations of motion for turbulent flow. Reynolds Stresses Cylindrical coordinates. Equation for the conservation of a transferable scalar quantity in a turbulent flow. Double correlations between turbulence-velocity components. Change in double velocity correlation with time. Introduction to triple velocity correlations.Features of the double longitudinal and lateral correlations in a homogeneous turbulence. Integral scale of turbulence.

Text Books :

1. Text book of Fluid Dynamics: F. Chorlton; CBS Publishers, Delhi 1985.

2. Fluid Mechanics: Joseph Spurk; Springer.

3. Turbulence: J. O. Hinze, Second edition, Mc Graw-Hill, chapter 1 sections 1.1 to 1.7

Reference Books :

1 An Introduction to fluid Mechanics: G.K. Batchelor; Foundation Books, New Delhi, 1994.

2. Boundary Layer Theory: H. Schichting; Mc Graw Hill Book Company, New York 1971

Paper-IV

Cosmology

(Optional)

Unit 1: Static cosmological models of Einstein and de Sitter and their derivation and its Properties: (i) The geometry of the Universe (ii) Density and pressure (iii) Motion of test particle (iv) Doppler shift (v) comparison with actual universe, Comparison between Einstein and de-Sitter models.

Unit 2: Cosmological principle, Hubble law, Weyl's postulate,Derivation of Robertson Walker Metric and its properties, Motion of a particle and light rays in FRW model, Red shift, Deceleration parameter and Hubble's constant, Matter Dominated era.

Unit 3: Friedman Model, Fundamental equation of dynamical cosmology, density and pressure of the present universe, Matter dominated era of the universe, critical density, flat, closed and open universe, age of the universe, 19

Unit 4: Steady state cosmology, Distance measure in cosmology, Comoving distance, Apparent luminosity and luminosity distance, Angular diameter and Lookback time, Galaxy count

Text Books :

1. Relativity, Thermodynamics and Cosmology: Richard C. Tolman, Oxford Press
2. Gravitation and Cosmology : Principles and Applications of the General Theory of Relativity. By Steven Weinberg.

References Books :

1. The Classical Theory of Fields, By Landau I.D. and Lifshitz E.M., Pub. Pergamon Press(1978).
2. The Theory of Relativity Moller C, Pub. Oxford University Press(1982).
3. Introduction to theory of relativity , Rosser W.G.V., ELBS(1972).
4. Relativity Special, General and Cosmology, Rindler W., Pub. Oxford University Press(2003).
5. Relativity: The General Theory, Synge J.L., North Holland Pub. Comp.(1971).

Paper-V

Operations Research–II

(Optional)

Unit1: Integer programming.

Unit2: Queuing theory and sequencing.

Unit3: Non- Linear programming- one and multi- Variable unconstrained optimization, Kuhn-Tucker conditions for constrained optimization.

Unit4: Quadratic programming, fraction programming and goal programming.

Text book:

Kanti-Swarup P.K. Gupta and Man Mohan: Operations Research, Sultan Chand and Sons New Delhi.

Reference books :

1.G. Hadley: Linear programming, Narosa Publishing House1995.

2.F.S. Hillier and G.J.Lieberman: Introduction to operations Research (Sixth Edition) Mc Graw Hill

International Edition 1995.

3.H.A Taha: Operations Research – In Introduction, Macmillan publishing company inc, New York

Paper- VI

Advanced Algebra

(Optional) 20

Unit1: Noetherian Rings and Affine algebraic sets. Radicals and affine varieties. Integral extensions and Hilbert Nullstellensatz..

Unit2: Localization. The prime spectrum of a ring.

Unit3: Artinian rings.Discrete valuation rings. Dedekind domains.

Unit4: Representation theory and character theory. Characters of groups of small order.

Text Book:

Abstract Algebra: David S. Dummit and Richard M. Foote; second edition, John Wiley.

Paper- VII

Algebraic Topology-II

(Optional)

Unit 1: Seaparation theorems in the plane

Unit 2: The Seifert-van Kampen theorem.

Unit 3 : Classification of surfaces.

Unit 4 : Classification of covering spaces, applications to Group theory.

Text Book: Topology: James R Munkres, 2nd Edition, Prentice-Hall of India.

Reference Book: Topology: J.G. Hocking and G.S. Young : Addison Wesley, 1961

Paper- VIII

Banach Algebras

(Optional)

Unit 1 : Fundamental algebraic concepts, Topological algebras, Normed algebras

Unit 2 : Symmetric algebras, Realisation of a commutative normed algebra in the form of an algebra of functions.

Unit 3 : Homomorphism and isomorphism of commutative algebras, Completely symmetric commutative algebras, Regular algebras, Completely regular commutative algebras.

Unit 4: Fundamental concepts and propositions in the theory of representations, Embedding of a symmetric algebra in an algebra of operators, In decomposable functionals and irreducible representations. 21

Text Book :

M.A.Naimark, Normed Algebras, Noordhoff, Groningen, Netherlands, 1972.

Reference Books :

1.General Theory of Banach Algebras : C.E.Rickart, Von Nostrand, 1960,

2. Banach Algebras , Vol. I: T.W.Palmer ; Cambridge University Press, 1994

Paper- IX

Computational Fluid Dynamics

(Optional)

Unit 1: Analytic aspects of PDE. Finite volume and finite difference methods on non uniform grids.

Unit 2: Stationary convection- diffusion equation (Finite volume discretization, schemes of positive type, upwind discretization)

Unit 3: Non Stationary convection- diffusion equation: Satbility, discrete maximum principle.

Unit 4: Incompressible Navier Stokes Equation- Boundary conditions, Spatial and temporal discretization on collocated and staggered grids.

Text Book:

Principles of Computational Fluid Dynamics: P Weaseling; Springer-Verlag.

Reference Books:

1. Computational Fluid Dynamics- An Introduction: J.E. Wendt, J.D. Anderson, G. Degrez, E Dick; Springer-Verlag

2. Computational Fluid Dynamics: J.D. Anderson; Mc Graw Hill, 1995

Scheme of teaching and examination under credit based semester pattern for
M.Sc. Programme in Mathematics

Sr. No.	Semester	Theory Paper/ Practica	Teaching Scheme (Hrs/ week)	Credits			Examination Scheme					
			Theory	Theory	Int. Asses.	Total	Duration (Hrs)	Max. Marks		Total Marks	Mon. Passing Marks	
								Theory	Internal Asses.		Theory	Internal Asses.
1	I	I	5	4	1	5	3	100	25	125	40	10
2	I	II	5	4	1	5	3	100	25	125	40	10
3	I	III	5	4	1	5	3	100	25	125	40	10
4	I	IV	5	4	1	5	3	100	25	125	40	10
5	I	V	5	4	1	5	3	100	25	125	40	10
		Total	25	20	5	25		500	125	625	200	50

Sr. No.	Semester	Theory Paper/ Practica	Teaching Scheme (Hrs/ week)	Credits			Examination Scheme					
			Theory	Theory	Int. Asses.	Total	Duration (Hrs)	Max. Marks		Total Marks	Mon. Passing Marks	
								Theory	Internal Asses.		Theory	Internal Asses.
1	II	I	5	4	1	5	3	100	25	125	40	10
2	II	II	5	4	1	5	3	100	25	125	40	10
3	II	III	5	4	1	5	3	100	25	125	40	10
4	II	IV	5	4	1	5	3	100	25	125	40	10
5	II	V	5	4	1	5	3	100	25	125	40	10
		Total	25	20	5	25		500	125	625	200	50

Sr. No.	Semester	Theory Paper/ Practica	Teaching Scheme (Hrs/ week)	Credits			Examination Scheme					
			Theory	Theory	Int. Asses.	Total	Duration (Hrs)	Max. Marks		Total Marks	Mon. Passing Marks	
								Theory	Internal Asses.		Theory	Internal Asses.
1	III	I	5	4	1	5	3	100	25	125	40	10
2	III	II	5	4	1	5	3	100	25	125	40	10
3	III	III	5	4	1	5	3	100	25	125	40	10
4	III	IV	5	4	1	5	3	100	25	125	40	10
5	III	V	5	4	1	5	3	100	25	125	40	10
		Total	25	20	5	25		500	125	625	200	50

Sr. No.	Semester	Theory Paper/ Practica	Teaching Scheme (Hrs/ week)	Credits			Examination Scheme					
			Theory	Theory	Int. Asses.	Total	Duration (Hrs)	Max. Marks		Total Marks	Mon. Passing Marks	
								Theory	Internal Asses.		Theory	Internal Asses.
1	IV	I	5	4	1	5	3	100	25	125	40	10
2	IV	II	5	4	1	5	3	100	25	125	40	10
3	IV	III	5	4	1	5	3	100	25	125	40	10
4	IV	IV	5	4	1	5	3	100	25	125	40	10
5	IV	V	5	4	1	5	3	100	25	125	40	10
		Total	25	20	5	25		500	125	625	200	50

Paper Pattern and Evaluation Scheme

Theory- Five theory papers for every Semester each of 100 Marks and time duration is of three clock hours.

Internal Assessment- Total marks 125 per semester 25 on each paper considering students attendance, class performance, unit test, home assignments, class seminar

Question Paper Pattern:

Time 3 Hours All questions are compulsory Total Marks: 100

Question I (20 Marks)

Unit I	A)		10 Marks
	B)		10 Marks
		OR	
Unit I	C)		10 Marks
	D)		10 Marks

Question II (20 Marks)

Unit II	A)		10 Marks
	B)		10 Marks
		OR	
Unit II	C)		10 Marks
	D)		10 Marks

Question III : (20 Marks)

Unit III	A)		10 Marks
	B)		10 Marks
		OR	
Unit III	C)		10 Marks
	D)		10 Marks

Question IV: (20 Marks)

Unit IV	A)		10 Marks
	B)		10 Marks
		OR	
Unit IV	C)		10 Marks
	D)		10 Marks

Question V : (20 Marks)

Unit V - Four Short Questions one from each unit, with each of five marks

Evaluation Scheme

1. Theory and Internal Assessment will be separate heads of passing.
2. To pass the internal assessment, student must secure at least 10 marks out of 25 in each paper. In case a student fail in internal assessment he/she will have to submit the same before the commencement of next examination.

3 In case a student fails in theory but passes in IA, the marks of these carried over in each paper.

4 Total marks must be 40 percent in aggregate for a student to be declared pass.

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Distribution of Marks for Internal Assessment

Sr. No.	Activities	Max Marks	Min. Passing
1	Attendance	03	**10**
2	Seminar	07	
3	Unit Test – 2	08	
4	Home Assignment	07	
Total Marks		**25**	

1. Theory and Internal Assessment will be separate heads of passing.
2. To pass the internal assessment, student must secure at least 10 marks out of 25 in each paper.
3. In case a student fail in internal assessment he/she will have to submit the same before the commencement of next examination.
4. In case a student fails in theory but passes in IA, the marks of these carried over in each paper.