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
WITH EFFECT FROM
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)

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


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


Text Book:

Reference Book :
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:
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.

Unit 3: 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.


Text Books:
2. Fluid Mechanics: Joseph Spurk; Springer.

Reference Books:
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

References Books :
Unit 1: Integer programming.

Unit 2: Queuing theory and sequencing.

Unit 3: Non-Linear programming- one and multi-Variable unconstrained optimization, Kuhn-Tucker conditions for constrained optimization.

Unit 4: Quadratic programming, fraction programming and goal programming.

Text book:

Reference books:
**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:**


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**Paper- VII**

**Algebraic Topology-II**

(Optional)

**Unit 1:** Separation 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.


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:

Reference Books:
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

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Semester</th>
<th>Theory Paper/ Practica</th>
<th>Teaching Scheme (Hrs/ week)</th>
<th>Credits</th>
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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**

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<tr>
<th>Sr. No.</th>
<th>Activities</th>
<th>Max Marks</th>
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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.
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