Syllabus

B.Sc. Second Year (Mathematics) with effect from June 2009.

Total Periods: 100.

Marks: 100.

Paper-III ALGEBRA

Prerequisite: Set Theory

1. **Mappings, The integers.** **(Periods-10)**
2. **Group Theory:** Definition of a Group, Some examples of Groups, Some preliminary lemmas, Subgroups, Normal subgroups and Quotient groups, Homomorphisms, Automorphisms, Another Counting Principle. **(Periods-30)**
3. **Ring Theory:** Definition and Examples of Rings, Some Special classes of Rings, Homomorphisms, Ideals and Quotient Rings, More Ideals and Quotient Rings, Polynomial Rings. **(Periods-30)**
4. **Vector Spaces and Modules:** Elementary Basic concepts, Linear Independence and Bases, Inner Product Spaces, Modules. **(Periods-30)**

Text Book:

I. N. Herstein, Topics in Algebra, *John Wiley and Sons (Second Edition)2006*

Scope:

Chapter 1: Articles 1.1, 1.2, 1.3\\

Chapter 2: Articles 2.1, 2.2 , 2.3 , 2.4 , 2.6 , 2.7 (up to theorem2.7.1), 2.8 (only definition and lemma 2.8.1) 2.11 (only definitions and Lemma 2.11.1& 2.11.2)\\

Chapter 3: Articles 3.1, 3.2 , 3.3 , 3.4, 3.5 , 3.9 \\

Chapter 4: Articles 4.1, 4.2, 4.4, 4.5 (Theorem 4.5.1 without proof).\\

Reference Books:

1. **A. R. Vasishtha and A. K. Vasishtha,** Modern Algebra, Krishna Prakashan, Meerut.
2. **P. B. Bhattacharya, S.K. Jain and S. R. Nagpal,** Basic Abstract Algebra, Second Edition, Cambridge University Press, Indian Edition, 1997.

Note: Questions on prerequisite may not be asked.

Syllabus

B. Sc Second year (Mathematics) with effect from June 2009

Paper IV: Differential Equations

Marks: 100

Total Periods: 100

1. Special Functions :

Special functions , power series solution of differential equations , ordinary point ; Solution about singular points , Frobenius method ,. Bessel's equation, solution of Bessel's equation, Bessel's functions Jn(x), Recurrence Formulae, Equations reducible to Bessel's equation, orthogonality of Bessel's Functions , A generating function for Jn(x). Legendre's equation, Legendre's polynomial Pn(x), Legendre's function of the second kind [Qn(x)], General solution of Legendre's equation, Rodrigue's formula, Legendre polynomials,A generating function of Legendre's polynomial , Orthogonality of Legendre polynomials, Recurrence formulae for Pn(x). [1] (25 Periods)

2. Laplace Transformation :

Introduction, Laplace Transform , Important formulae, Laplace Transform of the derivative of f(t), Laplace Transform of derivative of order n . Laplace Transform of integral of f(t). Laplace transform of t.f(t) , f(t)/t, Unit step function, Second shifting Theorem , Periodic Functions , convolution Theorem , Evaluation of integrals , Inverse Laplace Transforms , Multiplication by s , Division by s , First shifting property ,

Second shifting property , Inverse Laplace transform of Derivatives , Inverse Laplace transform of integrals , Partial fraction method , Inverse Laplace transform by convolution , Solution of differential equations by Laplace transforms , Solution of Simultaneous differential equations by Laplace Transforms. [1] (25 Periods)

3. Linear Partial Differential Equations of the First Order

Solution of partial differential equations, Lagrange's linear equation, Method of grouping., Method of Multipliers. [2] (5 Periods)

4. Non –Linear Partial Differential Equations of the First Order

Introduction , Equations of the type f(p,q)=0 ,Equations of the type z=px+qy+f(p,q) ,Equations of the type f(z,p,q)=0 , Equations of the type f(x,p)=g(y,q) ,Equations reducible to standard forms , General method of solution , Charpit's method , Jacobi's method.[2] (10 Periods)

5. Partial Differential Equations of the Second Order

Introduction, Classification of linear partial differential equation of second order , Canonical forms . [2] (10 Periods)

6. Linear Partial Differential Equations of Higher Order

Introduction, Homogenous linear partial differential equation with constant coefficients, solution of partial differential equation ,complementary function, Particular integral ,exceptional case when f(a,b) =0, short method for particular integral, General method of finding

particular integral, Non-homogeneous linear partial differential equations ,particular integrals , Equations reducible to linear form case when f(D,D') does not have linear factors. [2] (20 Periods)

7. <u>Non-linear Partial Differential Equations of Second Order</u>

Introduction, Monge's method of solving Rr + Ss + Tt =V. [2]

(5 Periods)

<u>Text Book :</u>

[1]. **H.K.Dass** : Advanced Engineering Mathematics ,2004 . S. Chand and Company Ltd., New Delhi.

<u>Scope :</u>

Chapter-8 : 8.1 To 8.12 , 8.17 , 8.17.1 , 8.18 to 8.24

Chapter-13 : 13.1 to 13.12 , 13.14 , 13.15 , 13.17 to 13.31.

[2]. N.Ch.S.N.Iyengar: Differential Equations, First Edition 2000, Anmol Publications Pvt .Ltd, New Delhi.

<u>Scope</u>:

Chapter-14:14.7, 14.8, 14.9, 14.9.1, 14.10, 14.11

Chapter-15:15.1, 15.2, 15.3, 15.4, 15.5, 15.6, 15.7, 15.8, 15.9, 15.9.1

Chapter-16:16.1, 16.2, 16.3

Chapter 17:17.1,17.2,17.3,17.4,17.5,17.6,17.6.1,17.7, 17.7.1,17.8, 17.9,17.10,17.11, 17.12

Chapter-18:18.1, 18.2

Reference Books:

1) **P. P. Gupta, G .S. Malik, & S.K.Mittal**: Partial Differential Equations, second revised and Enlarged Edition 2003 Pragati Prakashan Meerut (U.P.)
2) **S .S .Chandhary, Hari Kishan, & R. K. Shrivastav**: Differential Equations, Ram Prasad and Sons, Educational Publishers.
3) **Daniel A.Murray**: Introductory Course in Differential Equations. Khosla Publishing House, New Delhi.
3) **B.S. Grewal**: Higher Engineering Mathematics, Khanna Publishers Delhi.

Syllabus

B.Sc Second year (Mathematics), with effect from June 2009

Paper V: Mechanics and Differential Geometry

Maximum marks: 100

Total periods: 100

1. Equilibrium of Forces Acting on a Particle

Triangle law of forces, converse of the triangle law of forces, Lami's theorem, conditions of equilibrium of forces acting on a particle. (8 periods)

2. Forces Acting on a Rigid Body

Introduction, Moment of force, Sum of the vector moment of forces, Couples, Equivalent couples, Sum of the vector moments of the couples, conditions of equilibrium of forces acting on a rigid body, Trignometrical theorems. (12 periods)

3. Centre of Gravity:

Centroid of weighted points, centre of gravity, centre of gravity of some uniform bodies. (10 periods)

4. Kinematics and Dynamics of a Particle in Two Dimensions:

Introduction , Definitions ,Velocity and acceleration in terms of vector derivatives, Tangent and unit vector along the tangent , rate of change of unit vector moving in a plane ,curvature and principle normal, tangential

and normal components of velocity and acceleration ,angular speed and angular velocity ,radial and transverse components of velocity and acceleration, areal speed and areal velocity . (12 periods)

5. Kinetics of a Particle

Introduction ,Newton's laws of motion , Matter ,linear momentum ,Angular momentum ,An impulsive force and its impulse ,conservation of linear momentum, impact of two bodies, work, energy, scaler point function, vector point function ,field of force ,conservative field of force.

(12 periods)

6. Motion of a Projectile and Motion in a Resisting Medium:

Rectilinear motion ,motion under gravity ,projectile ,motion of projectile ,range on an inclined plane ,parabola of safety ,projectile to pass through a given point, motion in a resisting medium ,motion of a body moving under gravity and in a medium whose resistance varies as velocity. (16 periods)

7. Central Orbits

Definitions, areal velocity in central orbit, differential equation of central orbit, apses, law of force, pedal equation of some curves.

(10 periods)

8. Differential Geometry:

Introduction, curves in space ,tangent line ,equation of tangent line to the curve, osculating plane at a point on the curve , Normals at any point of the curve, orthonormal triad at a point of the curve, Three fundamental planes at the point of the curve ,curvature and torsion , Frenet –Serret formulae ,curvature and torsion of the plane curve ,Radius of curvature of the plane curve in polar form and in intrinsic form.

(20 periods)

Text Book:

V. Tulsani, T .V .Warhekar & N .N .Saste : Mechanics and Differential Geometry, S.Chand & Company.(pvt.), Ltd,New Delhi,
Second Edition :1987

Scope:

Part -1 Statics

Chapter 2: Complete

Chapter 3: Complete

Chapter 4: Articles 4.1 to 4.7

Part -2: Dynamics of a Particle

Chapter 1: Complete

Chapter 2: Complete

Chapter 3; Complete

Chapter 4: Articles 4.01 to 4.10

Part 3: Differential Geometry

Chapter 2: Complete

Reference Books:

1) **B. R. Thakur & G. P. Shrivastava**: Mechanics, Ram Prasad & Sons,Agra-3, New Edition 2004-2005 Delhi.

2) **S. L. Loney**: An Elementary Treatise on the Dynamics of a Particle and of Rigid Bodies, A.I.T.B.S. Publishers & Distributers 2004, Delhi.

3). **S. L. Loney**: An Elementary Treatise on the Statics, A.I.T.B.S. Publishers & Distributers 2003, Delhi.

4). **S. C. Mittal & D. C. Agarwal**: Differential Geometry of Three **D**imensions, Krishna Prakashan Mandir Meerut (U.P.).

5). **C. E. Weatherburn**: Differential Geometry of Three Dimensions, Cambridge, University press.