KARNATAKA STATE WOMEN'S UNIVERSITY, BIJAPUR
DEPARTMENT OF MATHEMATICS

The syllabus of Semester system in Mathematics for B.A. / B.Sc. Degree Course

1. The following table shows the details of number of teaching hours, number of Hours for problem solving, pattern of examination and allotment of marks for each semester.

B.A./ B.Sc Degree Course	**Standards**	**Semesters I, II, III & IV**	**Semester V & VI**
Number of papers in Each Semester		2	3
Teaching Hours Per Paper Per Week	a) Teaching	4 Hours	4 Hours
	b) Problem solving	1 Hour	1 Hour
	Total (a+b)	5 Hours	5 Hours
Examination pattern in each paper in each semester	Duration of Examination	3 Hours	3 Hours
i) Examination marks	a) Maximum	60	80
	b) Minimum for pass	24	32
ii) Internal Assessment marks	a) Maximum	15	20
	b) Minimum for pass	--	--
iii) Total Marks	a) Maximum	75	100
	b) Minimum for pass	30	40

2. Internal assessment marks in each paper shall be awarded by the concerned course teacher based on the two class tests each of one-hour duration conducted during the semester.

3. The internal assessment marks awarded shall be carried on for the repeated examinations.

4. The maximum strength of each semester for each section be restricted to **SIXTY** students.

5. Problem solving classes be conducted in batches of not more than **20** students in each batch.

B.Sc. DEGREE

COURSE STRUCTURE FOR MATHEMATICS SUBJECT

[Duration 6 Semesters (3 Years)]

SEMESTER-I

Paper No.	Paper Title	Content of Topics
1.1	Algebra-I	Mathematical Logic Elements of Set Theory Matrices
1.2	Calculus-I	Limits & Continuity Successive Differentiation Polar Coordinates Theory of Plane Curves

SEMESTER-II

Paper No.	Paper Title	Content of Topics
2.1	Algebra-II	Theory of Equations Sequences Infinite Series
2.2	Calculus-II	Integral Calculus Application of Integral Calculus Functions of Two & Three Variables

SEMESTER-III

Paper No.	Paper Title	Content of Topics
3.1	Vector Algebra and Analytical Solid Geometry	Vector Algebra and Analytical Solid Geometry
3.2	Real Analysis	Differentiability Reimann Integration Line & Multiple Integration

SEMESTER-IV

Paper No.	Paper Title	Content of Topics
4.1	Algebra-III	Abstract Algebra & Linear Algebra
4.2	Differential Equations-I	Ordinary Differential Equations

SEMESTER-V

Paper No.	Paper Title	Content of Topics
5.1	Vector Analysis & Laplace Transform	Vector Analysis, Fourier Series and Laplace Transforms
5.2	Differential Equations-II	Series Solution Partial Differential Equations
5.3	Optional-I	

SEMESTER-VI

Paper No.	Paper Title	Content of Topics
6.1	Numerical Analysis	Numerical Analysis
6.2	Complex Analysis	Complex Analysis and Improper Integrals
6.3	Optional-II	

Students have to select **ONE** of the optional papers listed below during V Semester and corresponding paper during VI Semester (depending upon the teaching staff available and infrastructure available in the college).

Optionals for Fifth Semester:

- 5.3(a) Mechanics-I
- 5.3(b) Graph Theory-I

Optionals for Sixth Semester:

- 6.3(a) Mechanics-II
- 6.3(b) Graph Theory-II

PAPER 1.1: ALGEBRA-I

Mathematical Logic:

Revision of symbolic logic of simple and compound propositions, tautology, contradiction, valid arguments, the structure of mathematical systems. Direct and indirect proofs. Disproof by a counter example. Quantifiers, universal quantifiers, existential quantifiers and negation containing quantifiers. 10 Hrs

Elements of Set Theory:

Existence of inverse of a function and properties of inverse functions. Composition of functions. Associativity of inverse of composition. Countable and uncountable sets. 5 Hrs

Matrices:

Recapitulation of matrix algebra, rank of matrix, elementary operations, equivalent matrices, invariance of rank under elementary operation, inverse of a non-singular matrix by elementary operations.

System of m-linear equations in n unknowns, matrices associated with linear equation, criterion for existence of non-trivial solution of homogeneous and non-homogeneous system, criterion for uniqueness of solutions.

Eigen values and eigen vectors of a square matrix upto third order standard properties, Cayley-Hamilton theorem – Applications. 30 Hrs

References:

1. F.J. Noronha, et al: Introduction to Mathematical Logic, (Bangalore University Publication).
2. F.Ayres: Matrices (Schaum Publishing Co.)
3. Y.F. Line and S.Y. Lio: Set Theory, Intuitive Approach (Houghton Mifflin Co.)
4. S.Lipschutz: Set Theory & Related Topics (Schaum Publishing Co.)
5. Rudraiah et al: College Mathematics, Vol. I, (Sapna, Bangalore).
6. G.K.Ranganath: College Mathematics, Vol. I (Part-I), S.Chand & Co. Ltd.

PAPER 1.2: CALCULUS-I

Limits & Continuity:

Recapitulations, algebra of continuous functions. Properties of continuous functions, differentiability, Rules of differentiation. 04 Hrs

Successive Differentiation:

n^{th} derivative of the functions $(ax+b)^m$, log (ax+b), e^{ax}, sin (ax+b), cos (ax+b), e^{ax} sin (bx+c), e^{ax} cos (bx+c), Leibnitz theorem and applications. 06 Hrs

Polar Coordinates:

Angle between the radius vector and the tangent. Angle of intersection of curves (polar form). Perpendicular from pole on to the tangent. Pedal equations. Derivative of an arc in Cartesian & parametric and polar forms 10 Hrs

Theory of Plane Curves:

Points of inflection, concavity and convexity of curves. Curvature of plane curves. Formula for radius of curvature in Cartesian, parametric, polar and pedal form. Centre of curvature, evolutes and involutes. Envelopes, asymptotes, singular points, cusp, node and conjugate points. Tracing of standard curves in Cartesian, parametric and polar forms (cissoid, strophoid, Astroid, Folium of Descaries, Cycloid & Cardiod). 25 Hrs

References:

1. Shanthi Narayan: Differential Calculus (S.Chand & Co.).
2. Murray R. Spiegel: Advanced Calculus (Schaum Series).
3. L.Bers: Calculus, Vol. I & II (IBM).
4. Rudraiah et al, College Mathematics, Vol. I, (Sapna, Bangalore)
5. F.Ayres Jr: Calculus, Schaum Series.
6. G.K.Ranganath: College Mathematics, Vol. I (Part-II), S. Chand & Co. Ltd.

PAPER 2.1: ALGEBRA-II

Theory of Equations:

Relation between the roots and coefficients of general polynomial equation in one variable. Transformations of equations. Descartes' rule of signs. Solutions of equations for multiple roots (Cardons method). 15 hrs

Sequences:

Sequences, sub-sequences, bounded and unbounded sequences. Convergence and divergence of sequences and subsequences, monotonic sequences, algebra of convergent sequences, limit superior and limit inferior of sequences, limit points as limit of convergent, subsequences. Cauchy sequences, Cauchy's criterion for convergence. 15 hrs

Infinite Series:

Oscillation of series, properties of convergent series, properties of series of positive terms, geometric series, harmonic series. Test for convergence of series: p-series, comparison test, Cauchy's root test, D'Alemberts' ratio test, Raabe's test, absolute and conditional convergence, D'Alembert's test for absolute convergence – Alternating series, Leibnitz's test. 15 hrs

References:

1. Uspenskey: Theory of Equations.
2. C.C.Macduffee: Theory of Equations (John Wiley).
3. Ray & Sharma: Higher Algebra (S.Chand & Co.)
4. Burnside and Porton: Theory of Equations (S.Chand & Co.)
5. S.C.Malik: Mathematical Analysis (Wiley-Eastern).
6. Earl D.Rainville: Infinite Series, McMillan Co.
7. OE Stanaitis: An Introduction to Sequences, Series and Improper Integrals, Holdan-Dey Inc.
8. G.K.Ranganath: College Mathematics, Vol. I, S. Chand & Co. Ltd.

PAPER 2.2: CALCULUS-II

Integral Calculus:

Recapitulation of definition of integration. Integrals of algebraic, trigonometric, rational and irrational functions. Definite integrals. Definite integral as limit of sum with examples. Standard reduction formulae

($\int \sin^m x\,dx$, $\int \cos^m x\,dx$, $\int \tan^m x\,dx$, $\int \cot^m x\,dx$, $\int \mathrm{Sec}^m x\,dx$, $\int \mathrm{cosec}^m x\,dx$,

$\int \sin^m \cos^n x\,dx$) with examples

Applications of Integral Calculus:

Computation of areas, surface areas and volumes of solids of revolution. Lengths of arcs for standard curves in Cartesian and polar forms. 30 hrs

Functions of Two and Three Variables:

Continuity, partial derivatives, Euler's theorem for homogeneous functions (2-variables). Maxima and minima of functions of two variables. Total derivative. Total differential, differentiation of implicit functions. Change of variables. Dependent and independent functions. Jacobian's properties and functional relations. 15 hrs

References:

1. Shanthi Narayan: Integral Calculus (S.Chand & Co.).
2. Murray R. Spiegel: Advanced Calculus (Schaum Series).
3. L.Bers: Calculus, Vol. I & II (IBM).
4. Shanti Narayan: Differential Calculus (S.Chand & Co.).
5. Rudraiah et al: College Mathematics, (Sapna, Bangalore).
6. G.K.Ranganath: College Mathematics, Vol. I, S. Chand & Co. Ltd.

PAPER 3.1: VECTOR ALGEBRA AND ANALYTICAL SOLID GEOMETRY

Vector Algebra:

Recapitulation of vector algebra. Vector triple product. Product of four vectors. Reciprocal vectors. 10 hrs

Analytical Solid Geometry:

Cartesian coordinates in three-dimensional space. Relation between Cartesian coordinates and position vectors. Distance and division formulae (in vector and Cartesian form). Direction cosines of a line (as components of a unit vector). Direction ratios of the join of two points. Projection on a straight line (vector and Cartesian form), angle between two lines (dot product and Cartesian forms). Area of a triangle and volume of a tetrahedron with given vertices (vector and Cartesian forms).

Equation of a plane in the form: (i) $(\vec{r}-\vec{a})\hat{n}=0$ (ii) $\vec{r}=\vec{c}+l\vec{a}+m\vec{b}$

(iii) $\left[\vec{r}-\vec{a}\ \vec{b}-\vec{a}\ \vec{c}-\vec{a}\right]=0$ and their Cartesian equivalence. Plane through three points. Angle between planes. Equation of plane in the form (i) $\vec{r}=\vec{a}+\vec{b}$; (ii) $\vec{r}=[1-t]\vec{a}+t\vec{b}$ and their equivalent Cartesian forms. Angle between line and plane (vector and Cartesian forms). Condition for a line to lie in a plane (vector and Cartesian forms). Planes coaxial with given planes. Equation of the line of intersection of two planes. Perpendicular distance of a point from a line and plane. Planes bisecting the angle between two given planes co-planarity of two lines. Shortest distance between two lines (all these results are to be obtained in both vector and Cartesian forms). 35 hrs

References:

1. S.L.Loney: Coordinate Geometry, Part-I (MacMillan)
2. Shanti Narayan: Elements of Analytical Solid Geometry (S.Chand & Co.)
3. Khanna M.L.: Analytical Solid Geometry.
4. Bill R.J.T.: Coordinate Geometry of 3-Dimensions, McMillan India.
5. Spiegel M.R.: Vector Analysis (Schaum Series).
6. Shanti Narayan: Vector Algebra and Linear Algebra (S.Chand & Co.)
7. G.K.Ranganath: College Mathematics, Vol. II, S. Chand & Co. Ltd.

PAPER 3.2: REAL ANALYSIS

Differentiability:

Rolle's theorem, Lagrange's and Cauchy's mean value theorem. Taylor's theorem with Lagrange's form of the remainder. Taylor's and Maclaurin's series. Problems on transcendental functions. Indeterminate forms, L'Hospital rules. 15 Hrs

Reimann Integration:

Recapitulation of real number system, postulates and their consequences, inequalities and absolute values, lower and upper bounds.

The upper and lower sums, necessary and sufficient conditions for integrability. Algebra of integrable functions. Intergrability of continuous and monotonic functions. Fundamental theorem of calculus, change of variables. Integration by parts. The first and second mean value theorems of integral calculus. 10 Hrs

Line and Multiple Integrals:

Definitions of a line integral, basic properties. Examples on evaluation of line integrals. Examples on differentiation under integral sign and integration under differential sign.

Definitions of double integral: its conversion to iterated integrals. Evaluation of double integrals (i) under given limits (ii) in regions bounded by given curve – change of variables. Surface areas as double integrals.

Definition of a triple integral and evaluation. Change of variables. Volume as a triple integrals. 20 Hrs

References:

1. Shanti Narayan: Differential Calculus (S.Chand & Co.)
2. Murray R. Spiegel: Advanced Calculus (Schaum's Series).
3. Sokoilnikoff I.S.: Advanced Calculus (McGraw Hill).
4. S.C.Malik: Mathematical Analysis (Wiley-Eastern)
5. Sharma and Vasistha: Real Analysis (Krishna Prakashan Mandir, Meerut).
6. G.K.Ranganath: College Mathematics, Vol. II, S. Chand & Co. Ltd.

PAPER 4.1: ALGEBRA-III

Abstract Algebra:

Cyclic groups, cosets, Lagrange's, Fermat's and Eular's thermos. Normal sub-groups, Homorphism, Kernel of Homorphism, fundamental theorem of Homomorphism, Isomorphism. Permutation groups, rings, sub-rings, Integral domains, fields and their simple properties with examples.

Linear Algebra:

Vector space examples Including R^n and C^n. Properties of vector space: Sub-spaces. Criteria for a subset to be a subspace. Linear combination concepts of linearly independent and dependent subsets. Basis and dimension of a vector space and standard results related to a basis. Examples illustrating concept and results (with emphasis on R^3). Linear transformations: Properties of linear transformations, matrix of a linear transformation, change of basis, range and Kernel of a linear transformation, rank nullity theorem. 25 hrs

References:

1. Herstein I.N.: Topics in Algebra (Vikas)
2. Fraleigh J.B.: A first course in Abstract Algebra (Addison – Wesley).
3. Lipschitz S.: Linear Algebra (Schaum Series).
4. Shepherd G.C.: Vector space of Finite Dimension (Oliver and Boyed).
5. N.Jacobson: Basic Algebra, Vol. I & II, Hindustan Pub. Co.
6. G.K.Ranganath: College Mathematics, Vol. II, S. Chand & Co. Ltd.

PAPER 4.2: DIFFERENTIAL EQUATIONS-I

Formation of differential equations, equations of first order and first degree (Homogeneous, Non- Homogeneous, exact, Non –Exact, Linear, Non- Linear) equations of first order and higher degree equations, solvable for p, x, y. Clairaut's equations. Singular solutions. Linear equation with n^{th} order and constant coefficients. Particular integral when RHS is of the form e^{ax}, x^n sin ax, cos ax, e^{ax} V, xV where V is a function of x. Cauchy Euler differential equations of order two. Simultaneous differential equations (two variables) with constant coefficients. Solution of ordinary second order linear differential equations by the following methods:

1. When a part of complementary function is given
2. Changing the independent variable
3. Changing the dependent variable.
4. When a first integral is given (exact equation).
5. Variation of parameters 45 hrs

References:

1. Daniel Murray: Introductory Course in Differential Equations (Orient Longman).
2. Chorlton F: Ordinary Differential & Difference Equations (Van Norstrand).
3. Ayres F: Differential Equations (Schaum's Series).
4. Simmons G.F.: Differential Equations (T.M.H.)
5. Pisggio H.T.H.: Differential Equations (Orient Longmans)
6. Willim E. Boyce and Richard C.Diprima: Elementary Differential Equations and BVP (John Wiley & Sons).
7. Rudraiah et al: College Mathematics, Vol. I & II, (Sapna, Bangalore).
8. G.K.Ranganath: College Mathematics, Vol. II, S. Chand & Co. Ltd.

PAPER 5.1: VECTOR ANALYSIS AND LAPLACE TRANSFORMS

Vector Analysis:

Scalar field, gradient of a scalar field, geometrical meaning, directional derivatives. Vector field, divergence and curl of a vector field. Solenoidal and irrotational fields. Laplacian of a scalar field. Vector identities. Expressions for $\nabla\phi$, div $\vec{f}$ and curl $\vec{f}$ in orthogonal, curvilinear coordinates and specialization to Cartesian, cylindrical and spherical coordinates. Greens, Gauss and Stokes theorems (Statements only) simple examples. 15 hrs

Fourier Series:

Periodic functions. Fourier series of functions with period 2π and period 2L. Half range cosine and sine series. 10 hrs

Laplace Transform:

Definition and basic properties. Laplace transform of some common functions. Laplace transforms of the derivatives and the integral of a function. Laplace transform of the Heaviside and Dirac delta function – Convolution theorem. Inverse Laplace transforms: Application to ordinary linear differential equation of first and second order with constant coefficients. 20 hrs

References:

1. Murray R, Spiegel L: Vector Analysis (Schaum Series).
2. Spain B: Vector Analysis (ELBS)
3. Murray R, Spiegel L: Laplace Transforms (Schaum Series).
4. Spain B and Smith M.G.: Functions of Mathematical Physics (Van-Norstrand).
5. Churchill RV and Brown JW: Fourier Series & Boundary Value Problems (McGraw Hill).
6. G.K.Ranganath: College Mathematics, Vol. III, S. Chand & Co. Ltd.

PAPER 5.2: DIFFERENTIAL EQUATIONS-II

Series Solution:

Legendre differential equation. Legendre polynomails P_n (x) as a solution, Rodrigue's formula, generating polynomials theorem, orthogonal property and basic recurrence relations. Bessel differential equation. Bessel function $J_n(x)$ as a solution – generation formula – integral formula for J_n (x): orthogonal property. Basic recurrence relations – problems there on.

Total Differential Equation:

Necessary condition for the equation Pdx+Qdy+Rdz=0 to integral – problems there on. Solution of equation of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$.

Partial Differential Equations:

Formation of partial differential equations, Lagrange's linear equations Pp+Qq=R. Standard types of first order linear partial differential equations and equations reducible to standard form. Charpit's method. 45 hrs

References:

1. Boyce and Diprima Elementary Differential Equations and BVP (John Wiley & Sons).
2. Simmons G.F.: Differential Equations (TMH).
3. Cholton F.: Ordinary Differential Equations (Von-Norstand).
4. Ayres F.: Differential Equations (Schaum Series)
5. Ian N.Sneddan: Elements of Partial Differential Equations, McGraw Hill.
6. Stephenson G: An introduction to Partial Differential Equations (ELBS).
7. G.K.Ranganath: College Mathematics, Vol. III, S. Chand & Co. Ltd.

PAPER 6.1: NUMERICAL ANALYSIS

Errors: Classification of errors (absolute, rounding, relative and percentage errors). Relations connecting the errors with illustrations.

Solution of non-linear equations: method of successive bisection, method of false position, Newton-Raphson's iterative method, the secant method.

Solution of system of equations: Gauss elimination method, Jacobi method, Gauss-Seidel method.

Finite Differences: Definition and properties of Δ, ∇ and E and relations between them. The n^{th} differences of a polynomial.

Interpolation: Newton-Gregory forward and backward interpolation formulae, Lagrange's and Newton's interpolation formula for unequal intervals, inverse interpolation.

Numerical differentiation using forward and backward difference formulae. Computation of first and second derivatives.

Numerical integration: General Quadrature formula. Trapezoidal rule, Simpsons $1/3^{rd}$ and $3/8^{th}$ rules, Weddles rule, Problems thereon. Solution of initial value problem for ordinary linear first order differential equations by Picard's, Taylor's, Euler's and Euler's modified method and Fourth Order Runge – Kutta Methods. 45 Hrs

References:

1. Scheild P: Numerical Analysis (Schaum Series)
2. Sastry S.S.: Numerical Analysis (Prentice Hall of India).
3. Rajaram V.: Computer Oriented Numerical Method (Prentice Hall of India).
4. Balaguruswamy E.: Numerical Methods (Tata McGraw Hill).
5. M.K.Jain, S.R.K. Iyangar and R.K. Jain: Numerical Methods (New Age Int.)
6. G.K.Ranganath: College Mathematics, Vol. III, S. Chand & Co. Ltd.

PAPER 6.2: COMPLEX ANALYSIS AND IMPROPER INTEGRALS

Trigonometry:

Expression of sine and cosines using De-Moiver's theorem. Series of sines and cosines. Hyperbolic functions. Logarithm of a complex number (Simple examples) Summation of trigonometric series (simple problems). 10 hrs

Complex Analysis:

Recapitulation of Complex numbers, the complex plane, conjugate and modulus of a complex number. The polar form, geometrical representation, Euler's formula $e^{i\theta} = \cos\theta + i \sin\theta$. Functions of complex variables: Limit, continuity and differentiability.

Analytic functions, Cauchy-Reimann equations in Cartesian and polar forms. Sufficient conditions for analyticity (in Cartesian form). Real and imaginary parts of analytic function which are harmonic. Construction of analytic function, given real and imaginary parts.

The complex line integral: Examples and properties (definitions of the concepts like neighborhood of a point, closed contour, etc. at appropriate places should be mentioned).

Cauchy integral theorem (statement) and its consequences. The Cauchy's integral formulae for the function and derivatives. Applications to the evaluation of simple line integrals. Cauchy's inequality. Liouille's theorem-Fundamental theorem of algebra Residue theorem with examples. 20 hrs

Improper Integrals:

Improper integrals of the first and second kinds. Convergence-Gamma and Beta functions, normal probability integral and error functions, results following the definitions – connection between two functions, applications to evaluation of integrals. Duplication formulae, Sterling formulae (Statements). 15 hrs

References:

1. Churchill R.V.: Introduction to Complex Variables and Applications (McGraw Hill).
2. Murray R. Spiegel: Complex Variables (Schaum Series).
3. Choudhary B.: The Elements of Complex Analysis (Wiley Eastern).
4. L.V. Ahifors: Complex Analysis (McGraw Hill).
5. Murray R.Spiegel: Advanced Calculus (Schaum Series).
6. Sokoilnikoff I.S.: Advanced Calculus (McGraw Hill).
7. G.K.Ranganath: College Mathematics, Vol. III, S. Chand & Co. Ltd.

OPTIONALS

PAPER 5.3(a): MECHANICS-I

Dynamics of a Particle and System of Particles:

Conservation principle. Mechanics of particle-conservation of linear momentum, angular momentum and energy. Mechanics and system of particles – conservation of linear momentum, angular momentum and energy.

Tangential and normal components of velocity and acceleration. Constrained motion of a particle under gravity along, inside and outside of a circle and a cycloid. Radial and transverse compounds of velocity and acceleration. Motion of a particle in a central force field, determination of orbit from central forces and vice versa, Kepler's law of planetary motion. 23 hrs

Dynamics of Rigid Bodies:

Centre of mass of a rigid body, static equilibrium of rigid body, rotation of rigid body about a fixed axes. Moment of inertia. Laminar motion of a rigid body, body rolling down an inclined plane. Angular momentum of a rigid body. Product of intertia, moment of intertia of a rigid body, about an arbitrary axes, momental ellipsoid. D'Alembert's principle, General equation of motion of a rigid body, motion of centre of inertia, motion relative to centre of inertia. 22 hrs

References:

1. S.L.Gupta, V.Kumar and H.V.Sharma: Classical Mechanics, Pragati Prakashan, Meerut.
2. F.Chorlton: Textbook of Dynamics, CBS Publishers, New Delhi.
3. Murray R Spiegel: Theoretical Mechanics, Schaum Series.
4. S.L.Loney: An Elementary treatise on the dynamics of a particle and of rigid bodies, Cambridge University Press, 1958.
5. Grant R.Fowles: Analytical Mechanics, Holt, Rinehart and Winston Inc.

PAPER 5.3(b): THEORY OF GRAPHS-I

Introduction, graphs, finite and null graphs. Connectedness and component, degree of vertex, minimum and maximum degree, $\Sigma \deg \nu_i = 2\nu$. The number of vertices of odd degree is even. Isomorphism, complete graph, line graph, total graph. 20 hrs

Sub-graph, spanning and induced sub-graphs, walk, trail, path, cycle, the shortest path problems, bipartite graph. Characterization of bipartite graph in terms of its cycles. 10 hrs

Matrix representation: Incidence, adjacency, rank of a matrix, cyclic matrices, some applications. 15 hrs

References:

1. Robin J. Wilson: Introduction to Graph Theory, Longman (London), UK.
2. Narsing Deo: Graph Theory & Applications (PHI), India.
3. Frank Harrary: Graph Theory Narosa Publications, India.

PAPER 6.3(a): MECHANICS-II

Analytical Statics:

Resolution of forces in two and three-dimensions, parallelogram law, triangular law of forces, Lamis theorem. Resultant of parallel forces, couples, moment of a couple, Varignan's theorem and theorem of couples.

A system of forces acting in one plane at different points of a body be reduced to a single force through a given point and couple. A static equilibrium, General conditions of equilibrium, common catenary. 20 hrs

Hydrostatics:

Pressure equation, condition of equilibrium, lines of force, surface of equal pressure, pressure in fluids, centre of pressure, resultant pressure on plane and curved surfaces.

Equilibrium of floating bodies, curves and surfaces of buoyancy, stability of hydrostatic equilibrium of floating bodies, meta centre, work done in producing a displacement, vessel containing liquid. 25 hrs

References:

1. S.L. Loney:Statics, McMillan & Co. London.
2. R.S. Verma: A Textbook on Statics, Pothishala Publ. Allahabad.
3. M.Ray and P.T. Chandi: Statics.
4. W.H. Besant & A.S. Ramsey: A Treatise on Hydromechanics: Part-I Hydrostatics, ELBS & G Bell & Sons Ltd., London.

PAPER 6.3(b): THEORY OF GRAPH-II

Cut vertex, bridge, block, tree, spanning tree, rooted and binary trees, forest. Some properties of trees, characterizations and some examples. 15 hrs

Connectivity:

Vertex and edge connectivity. Separability, Whitney's inequality $K(G) \leq \lambda(G) \leq \delta(G)$. Menger's theorem statement. 10 hrs

Eulerian and Hamiltonian Graphs:

Introduction. The Konigsberg Bridge (new name as Kaliningrad) problem and travelling salesmen problem.

Characterization of Eulerian graphs and properties of Hamiltonian graphs. Some applications of graphs in electronic network. 20 hrs

References:

1. Robin J. Wilson: Introduction to Graph Theory, Longman (London), UK.
2. Narsing Deo: Graph Theory & Applications (PHI), India.
3. Frank Harrary: Graph Theory, Narosa Publications, India.

KARNATAKA STATE WOMEN'S UNIVERSITY, BIJAPUR
DEPARTMENT OF MATHEMATICS

Question Paper Pattern for B.Sc. Mathematics Subject
(Semester Scheme)

SEMESTER-I

Paper 1.1: Algebra-I:

Section-A **Marks**

Answer any **Ten** of the Following 10x2=20

1-3 Mathematical Logic

4-6 Elements of Set Theory

7-12 Matrices

Section-B **Marks**

Answer any **Three** of the Following 3x5=15

1-4 Mathematical Logic

Section-C **Marks**

Answer any **One** of the Following 1x5=5

1-2 Elements of Set Theory

Section-D **Marks**

Answer any **Four** of the Following 4x5=20

1-5 Matrices

Paper 1.2: Calculus-I:

Section-A **Marks**

Answer any **Ten** of the Following 10x2=20

1-2 Limit & Continuity

3 Successive Differentiation

4-6 Polar Coordinate

7-12 Theory of Plane Curves

Section-B

Answer any **Four** of the Following 4x5=20

1-2 Up to Successive Differentiation

3-5 Polar Coordinate

Section-C

Answer any **Four** of the following 4x5=20

1-5 Theory of Plane Curves

SEMESTER-II

Paper 2.1: Algebra-II

Section-A:

Answer any **Ten** of the following 10x2=20

1-4 Theory of Equation

5-8 Sequences

9-12 Infinite Series

Section-B:

Answer any **Two** of the following: 2x5=10

1-3 Theory of Equations

Section-C:

Answer any **Three** of the following: 3x5=15

1-4 Sequences

Section-D:

Answer any **Three** of the following: 3x5=15

1-4 Infinite Series

Paper 2.2: Calculus-II:

Section-A:

Answer any **Ten** of the following 2x10=20

1-4 Integral Calculus

7-9 Applications of Integral Calculus

10-12 Functions of Two and Three Variables

Section-B:

Answer any **Five** of the following: 5x5=25

1-3 Integration

4-6 Applications of Integral Calculus.

Section-C:

Answer any **Three** of the following: 5x3=15

1-4 Functions of two and three variables

SEMESTER-III

Paper 3.1: Vectors and Solid Geometry

Section-A:

Answer any **Ten** of the following: 2x10=20

1-3 Vector Algebra

4-12 3-D Geometry

Section-B:

Answer any **Two** of the following: 2x5=10

1-3 Vector Algebra

Section-C:

Answer any **Three** of the following: 3x5=15

1-4 Portion before equation of planes

Section-D:

Answer any **Three** of the following: 3x5=15

1-4 Equation of Planes, etc.

Paper 3.2: Real Analysis:

Section-A:

Answer any **Ten** of the following: 2x10=20

1-5 Differentiability

6-8 Riemann Integration

9-12 Line and Multiple Integrals

Section-B:

Answer any **Two** of the following: 5x2=10

1-3 Riemann Integration (Portion from upper and lower sums)

Section-C:

Answer any **Three** of the following: 5x3=15

1-4 Differentiability

Section-D:

Answer any **Three** of the following: 5x3=15

1-4 Line & Multiple Integrals

SEMESTER-IV

Paper 4.1: Algebra-III

Section-A:

Answer any **Ten** of the following: 10x2=20

1-4 Group Theory

5-7 Rings & Others

8-12 Linear Algebra

Section-B:

Answer any **Three** of the following: 3x5=15

1-4 Groups

Section-C:

Answer any **Two** of the following: 2x5=10

1-3 Rings & Others

Section-D:

Answer any **Three** of the following: 3x5=15

1-4 Linear Algebra

Paper 4.2: Differential Equations-I

Section-A:

Answer any **Ten** of the following: 10x2=20

1-4 Ordinary Differential Equations (up to Singular Solution)

5-8 Linear Differential Equation & Cauchy Euler Equation

9-12 Second Order Linear Differential Equations

Section-B:

Answer any **Three** of the following: 3x5=15

1-4 Up to Singular Solution

Section-C:

Answer any **Three** of the following: 3x5=15

1-4 Linear Equations, Cauchy's Euler Equation & Simultaneous differential equations

Section-D:

Answer any **Two** of the following: 2x5=10

1-3 Second Order Linear Differential Equations (One on each method)

SEMESTER-V

Paper 5.1: Vector Analysis & Laplace Transforms:

Section-A:

Answer any **Ten** of the following: 10x2=20

1-4 Vector Analysis

5-7 Fourier Series

8-12 Laplace Transformation

Section-B:

Answer any **Five** of the following: 5x6=30

1-3 Vector Analysis

4-6 Fourier Series

Section-C:

Answer any **Five** of the following: 5x6=30

1-4 Laplace Transformation

5-6 Including applications

Paper 5.2: Differential Equations-II

Section-A:

Answer any **Ten** of the following: 10x2=20

1-5 Series Solutions

6-7 Total Differential Equations

8-12 Partial Differential Equations

Section-B:

Answer any **Five** of the following: 5x6=30

1-3 Series Solutions

4-6 Total Differential Equations

Section-C:

Answer any **Five** of the following: 5x6=30

1-6 Partial Differential Equations

SEMESTER-VI

Paper 6.1: Numerical Analysis:

Section-A:

Answer any **Ten** of the following: 10x2=20

1-4 Errors, Solution of Non-Linear Equations & System of Equations

5-7 Finite Difference, Interpolation, Numerical Differentiation

8-12 Numerical Integration, Solution of IVP.

Section-B:

Answer any **Five** of the following: 5x6=30

1-3 Errors, Solution of Non-linear Equations, System of Equations

4-6 Finite Differences, Interpolation

Section-C:

Answer any **Five** of the following: 5x6=30

1-2 Numerical Differentiation

3-4 Numerical Integration

5-6 Solution of IVP

Paper 6.2: Complex Analysis and Improper Integrals

Section-A:

Answer any **Ten** of the following: 10x2=20

1-4 Trigonometry

5-8 Analytic Function and Complex Line Integrals

9-12 Improper Integrals

Section-B:

Answer any **Five** of the following: 5x6=30

1-6 Analytic Functions, Complex Line Integrals

Section-C:

Answer any **Five** of the following: 5x6=30

1-2 Trigonometry

3-6 Improper Integrals

Note: Similar Pattern of Question Papers should be set for the Papers 5.3(a), 5.3(b), 6.3(a) and 6.3(b).