Department of Mathematics
Faculty of Natural Science, Jamia Millia Islamia, New Delhi-25

Structure of B. Sc. (General) (CBCS Courses) with core as Mathematics

Semester – I

S. No.	Code	Title of paper	Unit	Credit	Internal Assessment	Semester Examination	Total Marks
1	BPM-1.2C	Geometry of Two and Three Dimensions	4	4	25	75	100

Semester – IV

S. No.	Code	Title of paper	Unit	Credit	Internal Assessment	Semester Examination	Total Marks
1	BPM-4.3C	Logic and Sets	4	4	25	75	100

Semester – V

S. No.	Code	Title of paper	Unit	Credit	Internal Assessment	Semester Examination	Total Marks
1	BPM-5.3C	Operations Research and Linear Programming	4	4	25	75	100

Semester – VI

S. No.	Code	Title of paper	Unit	Credit	Internal Assessment	Semester Examination	Total Marks
1	BPM-6.2C	Mathematical Modelling	4	4	25	75	100

B. Sc. (General) (CBCS Courses) , Semester – I

BPM-1.2C	Geometry of Two and Three Dimensions	Unit	Credit	Lecture/ week
Internal Assessment: 25 Marks End Semester Examination: 75 Marks Duration of Examination: 2 Hrs.		4	4	4

Unit-I General equation of second degree, Pair of lines, Parabola, Tangent, normal. Pole and polar and their properties. Ellipse, Hyperbola, Tangent, normal, pole and polar. Conjugate diameters, Asymptotes, Conjugate hyperbola and rectangular hyperbola.

Unit-II Polar equation of a conic, Polar equation of tangent, normal, polar and asymptotes, General equation of second degree, Tracing of parabola, Ellipse and hyperbola.

Unit-III Equation of sphere, Tangent plane, Plane of contact and polar plane, Intersection of two spheres, radical plane, Coaxial spheres, Conjugate systems, Equation of a cone, Intersection of cone with a plane and a line, Enveloping cone, Right circular cone

Unit-IV Equation of cylinder, Enveloping and right circular cylinders, Equations of central conicoids, Tangent plane, Normal, Plane of contact and polar plane, Enveloping cone and enveloping cylinder, Conjugate diameters and diametral planes, Equations of paraboloids and its simple properties.

Books Recommended:

1. S. L. Loney: *The elements of coordinate geometry*, by Michigan Historical Reprint Series.
2. Ram Ballabh: *Text book of Coordinate Geometry*.
3. Shanti Narayan, *Analytical Solid Geometry*, S. Chand and Company.
4. P.K. Jain and Khalil Ahmad: *Textbook of Analytical Geometry*, New Age International (P) Ltd. Publishers.

B. Sc. (General) (CBCS Courses) , Semester – IV

BPM-4.3C	Logic and Sets	Unit	Credit	Lecture/ week
Internal Assessment: 25 Marks End Semester Examination: 75 Marks Duration of Examination: 2 Hrs.		4	4	4

Unit-I Introduction, Propositions, Truth table, Negation, Conjunction and Disjunction, Implications, Biconditional propositions, Converse, Contra positive and Inverse propositions and Precedence of logical operators.

Unit-II Propostional equivalence: Logical equivalences, Predicates and Quantifiers: Introduction, Quantifers, Binding variables and Negations, Sets, Subsets, Set operations and the laws of set theory and Venn diagrams, Examples of finite and infinite sets.

Unit-III Finite sets and counting principle, Empty set, Properties of empty set, Standard set operations, Classes of sets, Power set of a set, Difference and Symmetric difference of two sets, Set identities, Generalized union and intersections.

Unit-IV Relation: Product set, Composition of relations, Types of relations, Partitions, Equivalence Relations with example of congruence modulo relation, Partial ordering relations, n-ary relations.

Books Recommended:

1. R.P. Grimaldi, Discrete Mathematics and Combinatorial Mathematics, Pearson Education, 1998.
2. P.R. Halmos, Naive Set Theory, Springer, 1974.
3. E. Kamke, Theory of Sets, Dover Publishers, 1950.

B. Sc. (General) (CBCS Courses) , Semester – V

BPM-5.3C	Operation Research and Linear Programming	Unit	Credit	Lecture/ week
Internal Assessment: 25 Marks End Semester Examination: 75 Marks Duration of Examination: 2 Hrs.		4	4	4

Unit-I Linear Programming Problem: Definition, mathematical formulation, standard form, Solution space, solution – feasible, basic feasible, optimal, infeasible, multiple, redundancy, degeneracy, Solution of LP Problems - Graphical Method, Integer programming, Branch and Bound method.

Unit-II Simplex Method, Degeneracy in Simplex method, Duality in LP, Dual Simplex Method, Economic interpretation of Dual, Transportation Problem, Basic feasible solution using different methods (North-West corner, Least Cost, Vogel's Approximation Method), Stepping stone method, modified distribution method, Unbalanced transportation problem, Degeneracy in transportation problems.

Unit-III Assignment Problem, Hungarian Method for Assignment Problem, Elementary inventory models, EOQ model with or without shortages, Replacement models, Individual replacement policy, Group replacement problem.

Unit-IV Sequencing problem, *m* machines *n* jobs problem, Graphical method for sequence problem. Game Theory, pure and mixed strategies, Saddle point, Two-Persons-Zero-Sum Game, Game with mixed strategies, Dominance rule, Graphical Method, Inter - relation between the theory of games and linear programming, Solution of game using Simplex method.

Books Recommended:

1. A. H. Taha, *Operations Research – An Introduction*. Prentice Hall
2. J. K. Sharma, *Operations Research – Theory and Application*, Macmillian Pub.
3. J. K. Sharma, *Operations Research – Problems and Solutions*, Macmillian Pub.
4. G. Hadly, *Linear Programming*, Narosa Publishing House
5. S. D. Sharma, *Operations Research*, KNRN Publications.

B. Sc. (General) (CBCS Courses) , Semester – VI

BPM-6.2C	Mathematical Modelling	Unit	Credit	Lecture/ week
Internal Assessment: 25 Marks End Semester Examination: 75 Marks Duration of Examination: 2 Hrs.		4	4	4

Unit-I Introduction- Definition & Simple situations for Mathematical Modelling, Technique of Mathematical Modelling, Classification of Mathematical Models, Some characteristic of Mathematical Models. Mathematical models based on Geometry, Algebra and Calculus. Limitations of Mathematical Modelling.

Unit-II Mathematical Models through ODE: Linear Growth and Decay Models, Non-linear Growth and Decay Models, Compartmental Models, M.M. in Population Growth, Epidemics through Systems, Compartment Models through system of ODE, Modelling in Economics through systems of ODE. MM for planetary motions, MM for Circular motion and motion of satellites.

Unit-III Difference Equations with Applications: Formation of diff. equations. First order difference equations: Homogeneous, Non-homogeneous, The equations of the form $xx_{n+1} - bx_n = a$, method of Undetermined Coefficients. Second order linear difference equations: Homogeneous equations, Auxiliary equation, non-homogeneous equations. Applications of difference equations (Models).

Unit-IV Integral Equations: Definition of Integral equation. Fredholm and Volterra integral equations. Conversion of linear diff. equation to an integral equation and vice versa with examples. Conversion of boundary value problems to integral equations using Green's Function. Integral equations of the convolution type. Integro-diff. equations. Solution of Fredholm equations with separable kernels.

Books Recommended:

1. Mathematical Modelling by J. N. Kapur New Age Publications.
2. UMAP-Module 322: Published in cooperation with the Society for Industrial and Applied Mathematics
3. Higher Engineer Mathematics by B. S. Grewal, Khanna Publication.