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

Course Structure of U.G. under CBCS*
(Only for those students who have not taken mathematics as a core or subsidiary subject)

Semester – I

S. No.	Code	Title of paper	Unit	Credit	Internal Assessment	Semester Examination	Total Marks
1	CBM-1.1	Basic Calculus	4	4	25	75	100

Semester – IV

S. No.	Code	Title of paper	Unit	Credit	Internal Assessment	Semester Examination	Total Marks
1	CBM-4.1	Ordinary Differential Equations	4	4	25	75	100

Semester – V

S. No.	Code	Title of paper	Unit	Credit	Internal Assessment	Semester Examination	Total Marks
1	CBM-5.1	Probability and Statistics	4	4	25	75	100

Semester – VI

S. No.	Code	Title of paper	Unit	Credit	Internal Assessment	Semester Examination	Total Marks
1	CBM-6.1	Numerical Methods	4	4	25	75	100

* For those students who have studied Mathematics at 10+2 level.

U.G. under CBCS, Semester – I

CBM-1.1	Basic Calculus	Unit	Credit	Lecture/ week
Internal Assessment: 25 Marks End Semester Examination: 75 Marks Duration of Examination: 2 Hrs.		4	4	4

Unit-I Function, limit of a function, algebra of limits. Continuity and Differentiability of a function, Successive differentiation, Leibnitz theorem, Rolle's Theorem, Mean value theorems (without proof).

Unit-II Taylor's and McLaurin's series, Maxima and minima of a function of one variable, Indeterminate form, Curvature; Cartesian, polar and parametric formulae for radius of curvature.

Unit-III Partial derivatives, applications of partial derivatives, Euler's theorem on homogeneous functions, Asymptotes, Test of concavity and convexity, Points of inflexion, multiple points. Tracing of curves in Cartesian and polar coordinates.

Unit-IV Integral of irrational and trigonometric functions, properties of definite integrals, Reduction formulae, Quadrature, Rectification, Volumes and surfaces of solids of revolution.

Books Recommended
1. Howard Anton, Calculus, John Wiely & Sons, 2012.
2. George B. Thomas, Ross L. Finney, Calculus 11Ed., Pearson Education, 2008.
3. Gorakh Prasad: *Differential Calculus*, Pothishalas Pvt Ltd, Allahabad.
4. Shanti Narayan: *Differential Calculus*, S. Chand & Co.
5. Shanti Narayan: *Integral Calculus*, S. Chand & Co.
6. Khalil Ahmad: *Text Book of Calculus*, World Education Publishers, 2012.

CBM-4.1	Ordinary Differential Equations	Unit	Credit	Lecture/ week
Internal Assessment: 25 Marks End Semester Examination: 75 Marks Duration of Examination: 2 Hrs.		4	4	4

Unit-I Formation of differential equations, Order and degree of a differential equation, equations of first order and first degree, solutions of equations in which variables are separable, Homogeneous equations, Linear equations and Bernoulli equations, Exact differential equations, integrating factors, Change of variables

Unit-II Equations of the first order and higher degree, Equations solvable for p, y and x, Clairaut equation, Lagrange's equation, Trajectories.

Unit-III Linear differential equations with constant coefficient, Complementary function and particular integral. Particular integral of the forms e^{ax}, $sinax$, $cosax$, x^m , $e^{ax}V$ and xV, Homogeneous linear equations.

Unit-IV Linear differential equations of second order, Complete solution in terms of known integral belonging to the complementary function, Normal form, Change of independent variable, Method of undetermined coefficients, Method of variation of parameters, Simultaneous equations with constant coefficients.

Books Recommended
1. C. H. Edwards and D. E. Penny, Differential Equations and Boundary Value Problems: Computing and Modelling, Pearson education, India 2005.
2. Dennis G. Zill, A first course in Differential Equations,
3. S. L. Ross: Differential equations, John Wiley and Sons, 2004.
4. Zafar Ahsan: Differential Equations and their Applications, Prentice Hall of India, New Delhi (2nd Edition, 13th reprint May 2012).
5. Khalil Ahmad: Text Book of Differential Equations, World Education Publishers, 2012.

U.G. under CBCS, Semester – V

CBM-5.1	Probability and Statistics	Unit	Credit	Lecture/ week
Internal Assessment: 25 Marks End Semester Examination: 75 Marks Duration of Examination: 2 Hrs.		4	4	4

Unit-I   Sample space and events, algebra of events, axiomatic approaches, conditional probability, basic laws of total probability and compound probability, Bayes' theorem, Prior probabilities (priori) and posterior probabilities.

Unit-II   Discrete and continuous random variables, mathematical expectation, variance, moment about a point, central moment, moment generating function, Binomial, Poisson, Normal and Rectangular distributions.

Unit-III   Two-dimensional random variables, joint distribution functions, marginal distributions, covariance, linear regression and correlation, rank correlation, least square method of fitting regression lines.

Unit-IV
Sampling, random sampling, large sample tests of means and proportion. t-student, χ^2 (chi square) and F distributions (without derivation) and testing of hypothesis based on them.

Books Recommended
1. Irwin Miller and Marylees Miller**,** *John E. Freund's Mathematical Statistics with Applications*, Pearson Education.
2. Robert V. Hogg, Allen Craig Deceased and Joseph W. McKean, *Introduction to Mathematical Statistics,* Pearson Education
3. Sheldon M. Ross, *Introduction to probability and statistics for engineers and scientists*, Elsevier Academic Press.
4. J.N. Kapur and H.C. Saxena, *Mathematical Statistics*, S. Chand.
5. P.N.Arora, *Comprehensive Statistical Methods*, S.Chand.

U.G. under CBCS, Semester – VI

CBM-6.1	Numerical Methods	Unit	Credit	Lecture/ week
Internal Assessment: 25 Marks End Semester Examination: 75 Marks Duration of Examination: 2 Hrs.		4	4	4

Unit-I　　Absolute, relative and percentage errors, General error formula. Solution of algebraic and transcendental equations: Bisection method, False position method, Fixed-point iteration method, Newton's method and its convergence. Solution of system of non-linear equations by Iteration and Newton-Raphson method.

Unit-II　　Direct methods to solve the system of linear equations: Gauss elimination method, Gauss Jordan method, LU decomposition method. Indirect methods: Gauss-Jacobi and Gauss-Seidal methods. The algebraic Eigen value problems by Power method.

Unit-III　　Finite difference operators and finite differences, Interpolation and interpolating polynomials: Newton's forward and backward difference formulae. Central differences: Sterling's and Bessel's formula. Lagrange's interpolation formula, Divided Differences, their properties and Newton's general interpolation formula.

Unit-IV　　Numerical differentiation of tabular and non-tabular functions. Numerical integration using Gauss quadrature formulae: Trapezoidal rule, Simpson's rules, Romberg formula. Numerical solution of ordinary differential equations by Picard's method, Taylor series, Euler's method and Runge-Kutta methods.

Books Recommended
1. B. Bradie, A Friendly Introduction to Numerical Analysis, Pearson Education, India, 2007
2. M. K. Jain, S. R. K. Iyengar and R. K. Jain, Numerical Methods for Scientific and Engineering Computation, New age International Publisher, India, 5th edition, 2007
3. C. F. Gerald and P. O. Wheatley, Applied Numerical Analysis, Pearson Education, India,7th edition, 2008.
4. S.S. Sastry, Introductory Methods of Numerical Analysis (Fifth Ed.), Prentice Hall of India (Ltd.) New Delhi-110001, 2012.
5. M. Pal, Numerical Analysis for Scientists and Engineers, Narosa Publisher, 2007.
6. N. Ahmad, Fundamental Numerical Analysis with error estimation, Anamaya Publisher.