

Liberal College
Department of Mathematics,
B.A./B. Sc. Degree course in Mathematics

PROGRAM OUTCOMES:

After successful completion of the three years B.A/B. Sc Degree course in Mathematics, students will be able to:

- i. The positive thinking attitude towards Mathematics to formulate real life problems into mathematical models like applied and pure mathematics.
- ii. In the scientific context using perfect technology and new findings related logical thinking in the right way.
- iii. 3. Improving the practical skills and technical knowledge in various field such as Engineer Astronomy, Education, Planning, Accounts Finance, Economies, statistics, Agriculture etc computing and in all science and technology.
- iv. 4. Students overall activity and to equip them with mathematical modelling abilities, problems solving skills, creative talents and power of communications etc.
- v. 5. Mathematics helps the better problem-solving skills and is widely used in science for modelling phenomena. This enables the extraction of quantitative predictions from experimental laws.

COURSE OUTCOMES:

SEMESTER-I

Subject code: **MAT: 101**

Titles of paper: Classical Algebra, Modern Algebra and Trigonometry.

After completion of these courses, Students will be able to:

- i) Plenty of mathematical logic which is very useful for solving mathematical reasoning problems like roots of polynomial over rational applying divergence convergence of an infinite series by the method of Cauchy's D'Alembert's ratio test, Raabe's test etc.
- ii) The solution of cubic equations by Cardan's method, applying Euler-Fermat's theorem to prove relations involving prime numbers.
- iii) Teaching classical Algebra and Modern Algebra it helps the students to solve daily life problems with the greatest speed as well as accuracy and thus equip them for saving their time and energy in this busy world of today.
- iv) Learn the construction of field of quotients of an integral domains, algebraic ring in detail through various examples and creative ideas of unique Factorisation domain, Euclidean domain and related results.

- v) Learn to understand the expansion of trigonometric functions of complex numbers by the De Moivre's theorem and its applications.
- vi) The mathematical logic of Hyperbolic functions summation of series including C + is method are known applying Gregory's series of Pi and problems.

SEMESTER-II

Subject code: **MAT: 202**

Titles of paper: Differential calculus and ordinary differential equation.

After completion of these courses, students will be able to:

- i) From this course some of the concept of the application in physics, chemistry, biology and agriculture.
- ii) Understand the basic properties of Limit and continuity of the functions, Application for successive differentiation, Leibnitz's Theorem, Rolle's Theorem, Lagrange's and Cauchy's Mean value theorems.
- iii) Learning the limitation for Indeterminate forms, L-Hospital's rule. Idea of standard functions exponential function, trigonometrical function, inverse trigonometrical functions etc.
- iv) Develop the application for partial differentiation like curvature, radius of curvature, parametric, implicit polar equations, Asymptotes, Quadrature and rectification.
- v) Learning the knowledge of double integrals, Jacobian change of variable in double integral and its applications.
- vi) Possess a working knowledge of basic application problems described by second order linear differential equations with constant co-efficient. Evaluate the complete solution of non-homogeneous differential equation as a linear combination of the complementary function like complex number and exponential functions.

SEMESTER – III

Subject Code: **MAT: 303**

Titles of paper: Geometry, Vectors and Theory of probability.

After completion of these course, students will be able to:

- i) Concepts of analytical two-dimensional geometry and three-dimensional geometry. The main idea which are at the logical thinking about the straight line, plane, sphere, cone, cylinder and power of point etc.

- ii) Studying by using Green's Theorem, Stoke's Theorem and Gauss's theorem with Vector method.
- iii) Develop the application cylinder, central conicoid and paraboloids equations and simple properties. Determination of volume, surface area of three-dimensional geometry.
- iv) Developing the application of theory of probability like probability distribution, poisson, Geometric, poisson, exponential normal etc. Studying the relative problems of probability inequalities weak and strong convergence of random variables.
- v) Learning how to applied the relative probability of Chebychev's inequality, Laplace theorem and application of CLT. respectively.
- vi) Calculate the analysis of variance, one way and two ways of classification, latin square design.

SEMESTER-IV

Subject code: **MT: 404**

Titles of paper: Dynamics.

After completion of these courses, students will be able to:

- i) How the simple Harmonic motion can perform and mathematical formulation. Determination of the differential equation of central orbit, velocity, acceleration, angular accelerations radial and transverse along tangential.
- ii) Studying the law of force, applying Kepler's Laws of planetary motion to solve the problems. Understand the general principles of dynamics and three kinds of units
- iii) Introduce the concept of the parallelogram of forces, triangle of forces, converse of the triangle of forces.
- iv) Trying to identify and ability the resultant of coplanar couples, equilibrium of couples and the equation to the line of action of the resultant, calculation of centroids, moments of inertia, internal forces and moments of a rigid body
- v) Utilize the equation of linear momentum and angular momentum for a system of particles and how to apply the related problems. The parallel axes theorem for a rigid body and the perpendicular axes theorem for a plain lamina and its application.
- vi) Studying the idea of the equation of motion in rigid bodies and motion relative to centre of inertia D'Alembert's principle of internal forces and application with problems.

SEMESTER- V

Subject code: **MAT: 505 (H)**

Titles of paper: Abstract Algebra, Linear Algebra.

After completion of these course students will be able to:

- i) Understand the properties of groups rings and its kinds homomorphism, Isomorphism, Automorphism, Inner Auto – morphism, etc.
- ii) Develop the Caylry's Theorem, Centralizer Theorem, Cauchy's Theorem, Sylow Theorem p – Sylow subgroups and each application.
- iii) Generalisation of Homomorphism and Isomorphism of Rings, concepts of kernel at a homomorphism and unique Factorization Domain respectively.
- iv) Introduce the concept of vector spaces and linear transformations in their abstract generality and expression for applied mathematics, solving the system of simultaneous linear equations as well as the homogeneous equation.
- v) Idea of one-to-one, onto and bijective characterize in linear transformations. Solving the relative properties of linear transformation to linearity of transformations, Kernel and rank of linear transformation, inverse transformation and change of basis.

SEMESTER – V

Subject Code: **MAT: 506 (H)**

Titles of paper: Analysis – I (Real Analysis).

After completion of this course, students will be able to:

- i) Describe the primary concepts of sequences and series of real numbers.
- ii) Relate the behaviour of monotonic and geometric sequences and series.
- iii) Learn the function of several variables and its applications.
- iv) Study Riemann Integral and its properties in detail, leading to fundamental theorem of calculus Mean value theorem and application for the higher studies.
- v) Study different tests for solving improper integrals of first and second kind.
- vi) Assign integrals by using Beta and Gamma functions.
- vii) Verify the given sequence in convergent and divergent by using behaviours of Monotonic sequence with related problems.

- viii) Prove Bolzano – Weierstrass theorem, Heine – Borel theorem and Newton interval theorem and understand their applications with problems.
- ix) Specify properties of continuous functions on a closed interval, open interval, etc.
- x) Use Green's theorem, Stoke's theorem and Gauss divergence theorem to compute integrals with related problems.

SEMESTER – V

Subject code: **MAT: 507 (H)**

Titles of paper: Numeral Analysis and computer programming

After completion of these courses, of these courses, students will be able to.

- i) Understanding the concept of Archimedean property, limit point, Bolzano – Weierstrass theorem, Heine – Borel theorem with prove. Specify properties of continuous functions on a closed interval, open interval etc.
- ii) Studying the Riemann integral like Darboux theorem with prove, Riemann integrals as a limit of a sum and mean value theorems and understand their applications within problems.
- iii) Study different tests for solving improper integrals of first and second kind. Assign the integrals by using Beta and Gamma functions.
- iv) Learning the function of several variables and its applications using Green's theorem, Stoke's theorem and Gauss divergence theorem to compute integrals with related problems.
- v) Concept of line integrals and its application like surface areas and surface integrals. Triple integrals, Gauss divergence theorem and its application, which is very helpful for the higher study.
- vi) Learning the trace, the execution of programs written in C language and their related problems. Writing the C code for a given algorithm.
- vii) C- language develop confidence for self-education and ability for life – long learning needed for computer language.
- viii) Understand the algorithms and drawing of flow charts for solving mathematical problem. Explain data types and use them in simple data processing applications, students will be able not only to use the concept of array of structures but also to define union and enumeration use defined data types. The humanity activity, programming concept are also very helpful.

SEMESTER – VI

Subject code: **MAT: 608 (H)**

Titles of paper: Partial differential equation, Laplace transform, Calculus of **variation**.

After completion of these courses, students will be able to:

- i) Studying the different methods to solve first order partial differential equation. Numerical methods for solving various problems in partial differential like Cauchy's problems.
- ii) Learning to understand the terms like complete integral, particular integral, singular integral etc. Solving the Lagrange's method in linear PDE of order one.
- iii) Concept for solving the fundamental principles of partial differential equation like hyperbolic parabolic and elliptic equations.
- iv) Giving the knowledge of non – linear PDE of order one like 1 only p and q present.
- v) Analogous to Clairaut's form give us very helpful and easier to solve the PDE. It also gives the knowledge of Charpit's method. It can solve three or more independent variable by the Jacobi's method.
- vi) Learning the methods and properties. They can understand the prospective of Laplace transform and apply them to solve Linear differential equations.
- vii) Explain the properties of Laplace Transform which may be solved by application of special functions. Giving an account of the foundation of calculus of variations and of its application in mathematics and physics. Study the Brachistochron problem mathematically and solve three relative problems.

Subject code: **MAT: 609 (H)**

Titles of paper: Metric space and complex Analysis.

After completion of these courses, students will be able to:

- i) Idea of open sets, closed sets, limit point, adherent point, interior exterior and frontier point, boundary point subspace, product metric space and apply them to study the nature of sets and solving the problems.
- ii) Ideas of compactness, completeness, connectedness and use them to solve the problems.
- iii) Explain the property of Bolzano Weirstrass, Finite intersection, equivalent Ideas of compactness, completeness, connectedness and use them to solve the problems.
- iv) Learn the Jacobian of transformation, necessary and sufficient condition for $W = (Z)$ to represent the conformal mapping. And the most important theorem are

problems of Bilinear transformation and fixed points, studying the preservice of cross ratio, family of circles and straight lines under bilinear transformation.

- v) Describe convergence of sequences in a metric space and determine whether a given sequence in a metric space converges. Examine the significance of differentiability for complex functions and be familiar with the Cauchy – Riemann equations.

Subject Code: **MAT 610 (H) (05)**

Titles of paper: Spherical trigonometry and Astronomy.

After completion of these courses, students will be able to:

- i) Understand the new concept of Spherical trigonometry like sine formula, cosine formula, cotangent formula, Napier's analogies, Delambre's analogies, etc.
- ii) Study the celestial sphere of our universe like rising and setting of stars, Rate of change of zenith distance and Azimuth Twilight, motion for the sun, Vernal and Autumnal equinox, Summer and winter solstice, different kinds of time and seasons etc.
- iii) Full of skill knowledge of discovering of planets in our solar system for the higher studies.
- iv) Concept of sunrise and sunsets, finding the distance between two neighboring stars by the help of calculus and spherical trigonometry
- v) Study the planetary motion like earth moon and sun along their orbital period. Deduction of Kepler's laws from Newton's laws of Gravitation with their relative problems.