DEPARTMENT OF MATHEMATICS
MODERN COLLEGE, IMPHAL

COURSE OFFER: B.A. / B.Sc. Mathematics Honours

Mathematics is a subject with an overarching scope encompassing science, engineering and social sciences. Algebra, Geometry, Calculus, Analysis, Differential Equations and Mechanics broadly comprise the subject of Mathematics. In abstract words it is the study of quantity, structure, space and change. At the end of the course, students are awarded B.A. / B.Sc. Honours degree based on their understanding of these abstract concepts and ability to apply them while solving any given problem.

PROGRAM OUTCOMES

1. Scientific Knowledge will be developed in students.
2. Students will acquire analytical reasoning skills and hence will have the ability to critically analyse any given problem by applying the tools of Mathematics.
3. Students will have the ability to solve theoretical and applied problems in Mathematics and Statistics.
4. Students will be equipped to undertake further studies in Mathematics or in various other deciplines like Computer Science, Astronomy, Astrology, Accounting, Economics, Statistics and other science and technology related areas.
5. With the analytical and logical reasoning skills acquired through the course of this programme, students will become capable of solving real life problems by recognizing patterns in the issues presented to them. They will also develop the ability to identify multiple perspectives of a problem and apply mathematical language in clarifying vague ideas.
6. Students will become employable after completing the course. They will be eligible for appearing many competitive examinations and will be eligible for teachers in primary and secondary schools.

COURSE OUTCOMES

Course: B:Math – 101(Semester – I)

(Algebra, Modern Algebra and Trigonometry)

After completing this course, the students will be able

1. to learn about inequalities and their properties which are used for finding means.
2. to solve cubic and biquadratic equations by Cardan's and Ferrari's methods.
3. to learn the ideas of convergence of sequence and series and different methods for testing convergence of series.
4. to learn the concepts of mappings, Group and its properties, important theorems like Lagrange's theorem, Fermat's and Wilson's Theorem, Cayley's Theorem etc.
5. to learn the basic Matrix algebra, methods to find eigen values and eigen vectors of matrices.
6. to learn De Moivre's theorem and its applications, standard trigonometric series and hyperbolic functions which are used to solve numerical problems.

Course: B:Math: 202 (Semester – II)

(Calculus and Ordinary Differential Equations)

After completing this course, the students will be able

1. to learn the ideas of limit and continuity, mean value theorems, indeterminate forms and partial derivatives which have applications in Social Science, Physics, Life Science, Economics, Business etc., radius of curvature and asymptotes to understand different geometrical figures.
2. to learn integration as the limit of sums, reduction formulae and applications to find quadrature and rectification, double and triple integration and its applications to find volume and surface areas.
3. to learn the ideas of differential equations of first and second orders and different methods to solve them.

Course: B:Math:303(Semester – III)

(Vector, Geometry and Probability)

After completing this course, the students will be able

1. to learn the concepts of differentiation and integration of vectors and applications of vectors in finding surface area and volume using standard theorems of Gauss, Green and Stokes.
2. to learn the concepts of analytical geometry of two and three dimensions, various co-ordinate systems such as cartesian, polar and spherical which are used in studying straight lines, conics, cone, cylinder and central and confocal coinicoids.
3. to learn the concepts of theory of probability distribution, expectation and moments, convergence in probability and ideas of central limit theorem.

Course: B:Math 404 (Semester – IV)

Mechanics (Dynamics, Statics, Rigid Dynamics)

After completing this course, the students will be able

1. to study the components of velocities and accelerations of moving particles in different directions, simple harmonic motions, motion of a particle on smooth and rough plane curve and projectile, central orbit and Kepler's law.
2. to learn the concepts of equilibrium of coplanar forces, strings and catenary, Central axis, stable and unstable equilibrium, techniques of stability.
3. to learn the concepts of moments and products of inertia, D'Alembert's principle, motion of centre of inertia, compound pendulum and conservation of momentum and energy.

Course: B:Math:505(Semester – V)

(Abstract Algebra and Linear Algebra)

After completing this course, the students will be able

1. to learn the concepts of groups and their properties which is useful in study of Rings, Modules and analysis, significance of cosets, normal subgroups and factor groups, homomorphism and isomorphism between two algebraic structures.
2. to learn the concepts of ring theory which includes ideals, quotient rings, integral domains and fields, polynomial rings and properties of finite fields.
3. to learn the concepts of vector spaces, subspaces, bases, dimension and their properties, relation between matrices and linear transformations, finding of eigen values and eigen vectors, importance of adjoint of a linear transformation and its canonical form, inner product spaces and orthogonality.

Course: B:Math: 506 (Semester – V)

(Real Analysis)

After completing this course, the students will be able to learn the

1. concepts of various types of sets and relations, countable and uncountable.
2. concepts of least upper bound and greatest lower bound.
3. concepts of convergence of sequences and series.
4. concepts of Riemann integral including fundamental theorem of calculus and mean value theorems.
5. different methods for finding improper integrals.
6. concepts of functions of several variables and their properties.
7. concepts of multiple integrals in finding area, surface area and volume by Green's theorem, Stoke's theorem and Gauss's theorem.

Course: B:Math:507(Semester – V)

(Numerical Analysis and Computer Programming in C)

After completing this course, the students will be able to learn

1. various interpolating and extrapolating methods which includes Newton's Forward and backward interpolation formulae, Lagrange's and Hermite interpolation formulae.
2. solving initial and boundary value problems in differential equations using numerical methods which includes Euler's method, Runge-Kurta method, Newton Raphson method and Gauss elimination method.
3. programming concepts of C which is important for mathematical investigations and problem solving.

Course: B:Math:605 (Semester – VI)

(Partial Differential Equations, Laplace Transform, Calculus of Variation)

After completing this course, the students will be able

1. to learn the concepts of partial differential equations of first and second orders.
2. to formulate, classify and transform partial differential equations into canonical form and solve linear and non-linear partial differential equations using various methods and apply these methods in solving some physical problems.
3. to evaluate Laplace, transform and inverse Laplace transform of functions, their derivatives and integrations, applications of convolution theorem and to solve ordinary differential equations with constant co-efficient.
6. to understand functional in calculus of variation, find maxima and minima of functional by using Euler's equation.

Course: B:Math:606 (Semester – VI)

(Metric Space and Complex Analysis)

After completing this course, the students will be able

1. to learn the concepts of open and close sets, continuity, connectedness, compactness, generalize concepts of distance, convergent sequence and continuity of functions.
2. properties of complex numbers, limit and continuity of complex functions, transformation, conformal mappings and various types of bilinear transformations.

Course: B:Math:607 (Semester – VI)

(Spherical Trigonometry and Astronomy)

After completing this course, the students will be able

1. to learn the concepts of great circle, spherical angle, spherical triangle and Euclidean geometry.
2. to understand the different coordinate systems to locate the celestial object in space.
3. to learn the effect of the refraction phenomena for the celestial objects.
4. to learn Kepler's laws of planetary motion.
5. to learn the effect of the refraction phenomena for the celestial objects
6. to understand the phenomenon of parallax in the celestial objects, effect of the aberration in celestial objects, causes of the precessional motion of the earth, the precession and Nutation effect, understand the phenomenon of the solar and lunar eclipses, study of the Binaries.

BMath: G-505 (Semester - V)

Abstract Algebra and Linear Algebra, Real Analysis and computer programming in C

After completing this course, the students will be able

1. to learn the concepts of groups and their properties which is useful in study of Rings, Modules and analysis, significance of cosets, normal subgroups and factor groups, homomorphism and isomorphism between two algebraic structures.
2. to learn the concepts of ring theory which includes ideals, quotient rings, integral domains and fields, polynomial rings and properties of finite fields.
3. to learn the concepts of vector spaces, subspaces, bases, dimension and their properties.
4. concepts of various types of sets and relations, countable and uncountable.
5. concepts of least upper bound and greatest lower bound.
6. concepts of convergence of sequences and series.
7. different methods for finding improper integrals.
8. The Computer system, algorithm and flow chart.
9. Concept of C Programming. Programming concepts of C which is important for mathematical investigations and problem solving.

BMath: G-606 (Semester - VI)

Numerical Analysis, Partial Differential Equation and Metric Spaces.

After completing this course, the students will be able to learn

1. various interpolating and extrapolating methods which includes Newton's Forward and backward interpolation formulae, Lagrange's and Hermite interpolation formulae.
2. solving initial and boundary value problems in differential equations using numerical methods which includes Euler's method, Runge-Kurta method, Newton Raphson method and Gauss elimination method.
3. to learn the concepts of partial differential equations of first and second orders.
4. to formulate, classify and transform partial differential equations into canonical form and solve linear and non-linear partial differential equations using various methods and apply these methods in solving some physical problems.
5. to learn the concepts of open and close sets, continuity, connectedness, compactness, generalize concepts of distance, convergent sequence and continuity of functions.