B. Sc. Honourse in Mathematics

Programme Specific Outcome (PSO)

After the end of the program UG in mathematics, student should able to:

- Have a wide area in mathematics an affection of how its different type of disciplines are related, ability to use techniques from different areas, and an in depth knowledge about topics chosen from those offered through the department.

- By using numerical, graphical and symbolic representation, mathematical ideas would be communicated.

- Form independent verdict and analysis, test, and explain technical arguments.

- Solved complex problem by identifying the difficult portion convert into the easy sub problems.

- Construct abstract models using appropriate mathematical and statistical tools.

- Collect and organize the qualitative and quantitative information such as related problems, example and counter example.

- To improve the performance in general mathematical skill for the student who don't have any interest for higher studies and also improve the higher mathematics for competitive exam like IIT-JAM, NBHM, TIFR, ISI, CMI, NET, GATE etc.

COURSE OUTCOME (CO)

Course Code: MTMHCC01

Course Name: Calculus, Geometry and Differential Equation

Outcomes:

- Students will learn about the hyperbolic function, concavity, inflection points, asymptotes, L'Hospital's rule and its application.
- Students will be able to differentiate the function successively and integrate the function using reduction formula.
- Students will learn how to draw graph of various type of curve.
- Students will learn how to classify the conic.
- Students will learn about the equation of conic in polar co-ordinate system and different type of properties.
- Student will have clear concepts about the conicoids and how to classify different conicoids.
- Students will know how to form differential equation from a family of curve and also how to solve a differential equation and many applications of differential equation.

Course Code: MTMHCCO2

Course Name: Algebra

Outcomes:

- Student will learn how to determine polar form of a complex number and also know about De Moiver's theorem and its Applications.
- Students will have clear concepts relation between and coefficients and able to determine number positive real roots and negative real roots

- Students will know about various type of inequality and its application.
- Student will learn about equivalence relation, class, function, invertible function, one-one correspondence, and cardinality of set.
- Student will learn about Well Order Property and its application, division algorithm, Euclidian algorithm, Fundamental theorem of arithmetic and Congruence relation.
- Student will learn how to solve the system of linear equation, and know about linear transformation and relation between matrix and linear transformation.

Course Code: MTMHCC03

Course Name: Real Analysis

Outcomes:

- Student will know about the topological properties of set on R.
- Student will learn about sequence, series and convergency of sequence and series.

Curse code: MTMHCC04

Course Name: Differential Equation and Vector Calculus

Outcomes:

- Students will learn about the existence of solution and uniqueness of solution of differential equation and able to solve second order differential equation.
- Students will deal how to find solution of power series solution from differential equation.
- Students will know about the vector triple product, vector function, and limit, continuity, differentiability, integration of vector function.

Course Code: MTMHCC05

Course Name: Theory of Real Function and Introduction to metric space

Outcomes:

- Students will learn about limit, continuity, differentiability of real valued function and its application.
- Students will learn about metric space and topological property on metric space.

Course Code: MTMHCC06

Course Name: Group Theory

Outcomes:

- Student will learn about basic concept of group and some impotent group like Dihedral Group, Quaternion Group.
- Students will have clear concept on subgroup, centralizer, normalize, center of group, intersection union of groups, cyclic group and its property.
- Student will easily deal with external direct product of finite group, normal subgroup, factor group, group homomorphism and its application.

Course Code: MTMHCC07

Course Name: Numerical Methods

Outcomes:

- Students will learn about different type of error.
- Students will know how to find appropriate root of algebraic and transcendental equation and system linear equation.
- Student will able to find the appropriate value of a function at points which are not known explicitly.

- Students will able to find appropriate result of function integration with numerical approach.
- Students will learn how to solve non linear differential equation numerically.
- Students will able to solve the numerical problems by MATLAB programming in department lab.

Course Code: MTMHCC08

Course Name: Riemann Integration and Series of Function

Outcomes:

- Students will learn about Riemann integration, improper integral and on its theorem.
- Student will able to deal with sequence of function, series of function, power series.

Course Code: MTMHCC09

Course Name: Multivariate Calculus

Outcomes:

- Students will know about function of two or more variable and limit, continuity, differentiability of function of two or more variable and on its theorem.
- Students will learn about how to find area and volume using double and triple integrals respectively.
- Students will know about divergence, curl and on its physical meaning and also know on line integrals, surface integral.

Course Code: MTMHCC10

Course Name: Ring theory and linear algebra

Outcomes:

- Students will know about Ring, Ideal of ring, factor ring, ring homomorphism, isomorphism.
- Students will learn vector space, vector subspace, quotient space, linear spam, linear independence, basis and dimension.
- Student will be expert on linear transformation.

Course Code: MTMHCC11

Course Name: Partial differential Equations and Application

Outcomes:

- Students will know different type of partial differential equation (like Linear, semi-linear quasi-linear pde) and on geometrical interpretation of pde.
- Students will learn about canonical form of first and second order linear pde.
- Students able to solve the first and second order pde .

Course Code: MTMHCC12

Course Name: Group theory

Outcomes:

- Student will know about automorphism groups of finite and infinite cyclic groups, application of factor groups to automorphism groups.
- Students will learn about external direct products, internal direct products and fundamental theorem on finite abelian group.
- Students will know about group actions, application of group actions, sylow p-group, and application on sylow p-group.

Course Code: MTMHCC13

Course Name: Metric space and complex analysis

Outcomes:

- Students will expert on sequence on metric space, complete metric space, continuity check using sequential criteria, compactness and on homeomorphism.
- Student will know about complex valued function of complex variable and on its limit, continuity, differentiability.
- Student will have clear concepts on analytic functions and its application on integration, fundamental theorem of algebra, convergence of series and sequence, Laurent series, power series.

Course Code: MTMHCC14

Course Name: Ring theory and linear algebra

Outcomes:

- Students will get very clear concepts on Euclidean domain, principal idea domain, unique factorization domain and on polynomial ring.
- Students will learn about dual space, inner product space and their properties.

Course code: MTMHGE01

Course Name: Calculus, Geometry and Differential Equation

Outcomes:

- Students will learn about the hyperbolic function, concavity, inflection points, asymptotes, L'Hospital's rule and its application.
- Students will be able to differentiate the function successively and integrate the function using reduction formula.

- Students will learn how to draw graph of various type of curve.
- Students will learn how to classify the conic.
- Students will learn about the equation of conic in polar co-ordinate system and different type of properties.
- Student will have clear concepts about the conicoids and how to classify different conicoids.
- Students will know how to form differential equation from a family of curve and also how to solve a differential equation and many applications of differential equation.

Course code: MTMHGE02

Course Name: Algebra

Outcomes:

- Student will learn how to determine polar form of a complex number and also know about De Moiver's theorem and its Applications.
- Students will have clear concepts relation between and coefficients and able to determine number positive real roots and negative real roots
- Students will know about various type of inequality and its application.
- Student will learn about equivalence relation, class, function, invertible function, one-one correspondence, and cardinality of set.
- Student will learn about Well Order Property and its application, division algorithm, Euclidian algorithm, Fundamental theorem of arithmetic and Congruence relation.
- Student will learn how to solve the system of linear equation, and know about linear transformation and relation between matrix and linear transformation.

Course code: MTMHGE03

Course Name: Differential Equation and Vector Calculus

Outcomes:

- Students will learn about the existence of solution and uniqueness of solution of differential equation and able to solve second order differential equation.
- Students will deal how to find solution of power series solution from differential equation.
- Students will know about the vector triple product, vector function, and limit, continuity, differentiability, integration of vector function

Course code: MTMHGE04

Course Name: Numerical methods

Outcomes:

- Students will learn about different type of error.
- Students will know how to find appropriate root of algebraic and transcendental equation and system linear equation.
- Student will able to find the appropriate value of a function at points which are not known explicitly.
- Students will able to find appropriate result of function integration with numerical approach.
- Students will learn how to solve non linear differential equation numerically.
- Students will able to solve the numerical problems by MATLAB programming in department lab.

Course code: MTMHSE01

Course Name: Logic and Set

Outcome:

- Students will learn about the truth table, negation, conjunction, disjunction, implication, bioconditional proposition, converse, contra positive, inverse proposition and precedence of logical operator.
- Students will know about sets, subsets, set operation, laws of theory, venn diagrams, finite set, infinite set, class of set and power set.
- Students will able to learn difference, symmetric difference of two set, union, intersection, relation, composition relation, equivalence relation, congruence modulo relation, partition, partial ordering relation and n-ary relation.

Course code: MTMHSE02

Course Name: Graph theory

Outcomes:

- Students will able to learn basic properties of graph, pseudo graph, complete graph, bipartite graph isomorphism of graph.
- Students will have clear concepts on Eulerian circuits, Eulerian graph, semi-Eulerian graph, Hamiltonian cycles, weighted graph.
- Students will know about Travelling salesman's problem, shortest path, tree.

Course code: MTMHDS01

Course Name: Linear programming

Outcomes:

- Students will learn about simplex method, graphical solution, complex set, optimality and unboundedness, simplex algorithm, artificial variables, two phase method, Big-M method.

- Students will expert on dual problem, Transportation problem, north-west corner method, least cost method, vogel approximation method, Hungarian method.
- Students will have the clear concepts on game theory.

Course code: MTMDS02

Course name: Probability and Statistics

Outcomes:

- Students will know about sample space, probability axioms, random variables, cumulative distribution function, probability mass function, mathematical expectations, moment generating function, characteristic function, discrete function, continuous function.
- Students will expert on joint cumulative function, joint probability density function, marginal and conditional distributions, expectation of function of two random variable, conditional expectations, independent random variable, bivariate normal distribution, correlation coefficient, joint moment generating function, linear regression for two variables.
- Students will easily understand Chebyshev's inequality, central limit theorem, Markov chains, Chapman-Kolmogorov equations.
- Student will know what is statistics, random samples, sampling distributions, estimation of parameter, testing of hypothesis.

Course code: MTMDS03

Couse name: Mechanics

Outcomes:

- Students will learn about co-planer force, static equilibrium, friction, equilibrium of particle on rough curve, virtual work, force in three-dimension, general conditions on equilibrium, center of gravity for different bodies, stable and unstable equilibrium.
- Student will know about equation of motions, motion of projectile in resisting media, stability near circular orbit, motions under inverse square law, motion of artificial satellites, motion of particle in three-dimension, motion on smooth sphere, cone and on any surface revolution.
- Students will have clear concepts on degree of freedom, moments and product of inertia, momental ellipsoid, principal axes, D'Alembert's principal, motion about fixed axis, compound pendulum, motion of rigid body in two dimensions under finite impulsive force, conservation of momentum and energy.

Course code: MTMDS04

Course name: Mathematical modelling

Outcomes:

- Student will able to solve the Bessel's equation, Legendre's equation, Laplace transformation and inverse transformations.
- Students will expert on Monte Carlo simulation modelling, middle square method, linear congruence, queuing model, harbor system, morning rush hour, overview of optimization problem, linear programming model, geometric solution, algebraic solutions, simplex method, sensitivity analysis.