University of Science & Technology Meghalaya

Department of Mathematics

<u>MSc Mathematics</u>

<u>POs , PSOs, COs</u>

SCHOOL OF APPLIED SCIENCES

PROGRAMME OBJECTIVES (POS):

The M.Sc. Mathematics programme's main objectives are

PO1: To inculcate and develop mathematical aptitude and the ability to think abstractly in the student.

PO2: To develop computational abilities and programming skills.

PO3: To develop in the student the ability to read, follow and appreciate mathematical text.

PO4: Train students to communicate mathematical ideas in a lucid and effective manner.

PO5: To train students to apply their theoretical knowledge to solve problems.

PO6: To encourage the use of relevant software such as MATLAB and MATHEMATICA.

PROGRAMME   SPECIFIC   OUTCOMES   (PSO):
PSO1. Understand notion and concepts of set, function, real and complex number system.

PSO2. Understand the concepts of continuous function, limit, continuity, vector space, metric space, normed space, inner product space, topology, group theory, system of linear equation etc.

PSO3. Understand the concept of ordinary and partial differential equation and can solve both ODE and PDE by using different methods.

PSO4. Increase problem solving technique by using the concept of numerical analysis, complex analysis, graph theory, number theory, fluid dynamics, mathematical methods.

PSO5. Understand the recent development in universe and cosmology by using the concepts of theory of relativity.

PSO6. Programming in C and Mathematica helps in building technical, computing web services, including numerical, symbolic, and graphical applications that solve technical problems quickly and easily

COURSE CODE	NAME OF THE COURSE	COURSE OUTCOME(COs)
MSM 101	Real Analysis	CO1. Introduction to the notion of set and functions
		CO2. Understand the properties of real number system
		CO3. Introduction to the concept of sequence and limit, cantor set, Metric space.
		CO4.Understand the concepts of continuous and discontinuous function.
		CO5.Introduction and applications of Mean value theorem.
		CO5. Understand the properties of Heine-Borel theorem, Cantors theorem
MSM 102	Differential Equations I	CO1.Concept of Differential Equation
		CO2. Classification of differential equation according to linearity and order.
		CO3. Solution of Differential equation interpretation.
		CO4. Using integrating factor, Separable and Homogeneous equations can be convert to exact differential Equation.
MSM 103	Abstract Algebra	CO1.Understand definition and example of group, some special groups, subgroups, normal subgroup and their properties, center and normalizer of a group, cyclic group, class equation of a group, Sylow's theorems and their applications and classification of groups.
		CO2. They will learn about Simple group, separable and non-separable group.
		CO3. They will learn Definition and example of Ring, Ideal, prime and maximal ideal, integral domain, Euclidian domain, PID, UFD, reducibility of polynomial ring etc.
		CO4. They will learn the basic concept and properties of finite field.
MSM 104	Numerical Analysis	CO1. Problem solving using numerical methods
		CO2. Graphical representation of complex problems to solve accurately
		CO3.Simulation with the help of numerical analysis can be done accurately and easily
		CO4. Helps in multidisciplinary fields like electronics and electrical engineering to design complex circuits using finite difference equations.
MSM 105	Linear Algebra	CO1. Introduction to basic concepts of system of linear Equations.
		CO2. Understand the concepts of vector space, basis and dimension.
		CO3. Study of linear transformation, representation of linear transformation by matrices.
		CO4. Introduction to canonical product, Diagonalization, orthogonality , inner product space etc.
		CO5. Increase problem solving technique like finding eigen value, eigen vectors, linear dependence, independence, rank and nullity etc.
MSM 201	Topology	CO1.They will learn about countable and uncountable sets, Cantor's theorem and continuum hypothesis, Zorn's lemma and well ordering theorem and definition and examples of topology.
		CO2. They will learn about base and sub base of topology, ordered, product and subspace topology and their relation.
		CO3. They will learn about the closed set, closure, derive set, limit point and boundary of a set.

		CO4. They will learn the countable and separation axioms of topology.
		CO5. Understand about the basic properties of compactness.
		CO6. Learn about connected space and component.
MSM 202	Differential Equations II	CO1. We can solve Boundary value problem. With this study we have discussed about wave problem, Heat problem etc.
		CO2. Using Monge's method we will solve special type of non linear partial differential equation.
		CO3. Calculus of variations helps to understand what functional are and their application.
		CO4. Study Euler-Lagrange equation to find differential equation for stationary paths.
MSM 203	Complex Analysis	CO1. Introduction to the basic concept and properties of complex numbers.
		CO2. Study of differentiability, limit, continuity of a complex number.
		CO3. Introduction to analytic function, C-R equation, harmonic function, harmonic conjugate etc.
		CO4. Study of complex Integration, Cauchy Integral theorem, Lioville's theorem power series etc.
		CO5. Understand the concept of singularity
		CO6. Increase problem solving method.
MSM 204	Mechanics and Tensor	CO1. Understand motion in three dimension and motion in spherical and conical surface.
		CO2. Study of motion of a rigid body in 2-D, compound pendulum, D'Alembert's Principle, motion under impulsive forces.
		CO3. Understand the application of principle of virtual work in impulsive forces, Carnot's theorem, Kelvin's theorem and Bertrand's theorem.
		CO4. Study of generalized coordinates and Lagrange's equation of motion for finite and impulsive forces in holonomic systems.
		CO5. Understand the concepts of Transformation of coordinates, Kronecker delta, outer and inner product of tensors, Christoffel's three-index symbols etc.
MSM 205	Programming with C& Mathematica	CO1.As a middle level language ,C program combines both high level and low level languages.
		CO2.It can be used for scripting for drivers and software applications and kernels.
		CO3. Companies like Facebook, Google, etc use C for operating systems, games, embedded technology, etc.
		CO4. Mathematica helps in building technical, computing web services, including numerical, symbolic, and graphical applications that solve technical problems quickly and easily
MSM 301	Number Theory	CO1. Will learn about division, division algorithm, Euclidian algorithm, gcd, lcm etc.
		CO2. Understand about the congruence and its properties and applications, order of an element, primitive element etc.
		CO3. Understand about quadratic residues, Legendre and Jacobi symbols, higher power residues, Fermat's Little theorem, Euler theorem, necessary and sufficient condition for the existence of primitive root.

		CO4. They will learn about Fibonacci sequence and its properties, Continued fraction and its properties etc
MSM 302	Functional Analysis	Co1.Understand the basic principles of functional analysis
		Co2. Understand the concept of Banach spaces, linear operators and continuous linear functional.
		Co3. Introduction to Hilbert space, operators on Hilbert space.
		Co4. Understand the concept of Representation Theorems and Hahn –Banach extension theorem.
		Co5.Understand the principles of Spectral theory.
MSM 303	Mathematical Methods	CO1. Understand the concepts of convolution theorem, inverse Laplace transform, laplace transform with application to the solution of differential equations
		CO2. Understand the concept of Fourier transform and its applications.
		CO3. Introduction to integral equation and finding solution.
		CO5. Maline Transform and Hankel Transforms and their application
		CO4. Increase problem solving technique.
MSM 304	Continuum Mechanics & Hydrodynamics	CO1. The theory of continuum is useful to geometrical deformation analysis obtained from repeated positional survey in geodesy.
		CO2. It serves as a technological and scientific communication basis in different areas like geophysics, etc.
		CO3. Hydrodynamics help in the smooth running of cooler fans because there is less friction and mainly viscous loss to the oil.
		CO4. Helps in the lowering of wear between metal bearings and race components giving them longer life to sustain.
MSM 305A(Optional)	Special Theory of Relativity	CO1.Study about failure of Galilean Transformation
		CO2.Understand Lorentz Transformation
		CO3. Understand Space and Time in Relativity
		CO4.Study about momentum and energy in Relativity
MSM 401	Graph theory	CO1. Student will learn the definition and example of graphs, various operation on graphs, homomorphism and isomorphism of graphs.
		CO2.They will learn about graph connectivity and complete graph.
		CO3. They will learn various properties of Tree, types of tree and some algorithms. And also cycle and co-cycle space.
		CO4. They will learn basic concept and properties of Eulerian, Hamiltonian and Planer graph.
		CO5. They will learn the basic concept of coloring and covering of graphs and their applications
MSM 402	Advanced Partial Differential Equation	CO1. Partial differential equations have a remarkable ability to predict the world around us.
		CO2. They can describe exponential growth and decay.
		CO3. Partial differential equation helps in calculating the population growth of a species or the change in investment return over time.
		CO4.They are also used in medicine estimation for modeling cancer cells growth
MSM 403A (Optional)	Fluid Dynamics	CO1. Bernoulli's principle in Fluid Dynamics helps in the design of airplane's wings, which helps in maintaining the pressure over the plane.

		CO2.Fluid Dynamics is used in turbines for the generation of power from hydroelectric dams.
		CO3. Fluid dynamics help in the design of pumps, compressors, and piping used in air conditioning system of homes.
		CO4. The fundamental principles of fluid dynamics are used to explain the mechanisms of biological flows and their interrelationships with physiological processes in health and disease disorder
MSM 403B (Optional)	Space Dynamics	CO1. Space Dynamics educate students at undergraduate,Post graduate to perform challenging engineering and managerial jobs in industryDoctoral and post Doctoral levels
		CO2. Space Dynamics provide excellent research and development facilities to take up Ph.d programmes and Research projects.
		CO3. Space Dynamics helps to develop effective teaching and learning skills.
		CO4. Space Dynamics helps to build nationl capabilities in technology,education and Research in emerging areas.
MSM-404A (Optional)	Dynamical Systems	CO1: Dynamical system undergo bifurcations,where a small in a system parameter such as the temperature leads to a large and qualitative change in the system behaviour.
		CO2:Detrministic dynamical systems can behave randomly.
		CO3. Using dynamical system disordered behaviour can be stable.
		CO4. Using dynamical system complex behaviour can arise from simple rules.
MSM-404B (Optional)	General Theory of Relativity and Cosmology	CO1.Study about fundamental principles of the General Theory of Relativity
		CO2. How gravity is main cause of a curved space time
		CO3. Study about Gravitational Waves
		CO4. Understand Cosmological models and cosmological principle
MSM 404C (Optional)	Advanced algebra	CO1.The advanced Algebra course covers in a clear and easy manner.
		CO2. The advanced Algebra helps for understanding highly important topics equations,inequalities,functions etc.including linear
		CO3. The advanced Algebra helps for understanding Probability and Sequence.
		CO4. advanced Algebra helps for understanding the higher class Mathemtics.
MSM-405	Project	CO1.The students take up research work applying the knowledge and experience acquired during the course.
		CO2. Increase problem solving technique and get the idea to write a research paper or article.
		CO3.Will help in their future research work.
		CO4. Introduce to new dimension of knowledge with better understanding of the subject.
HVP 740	Human values & Professional Ethics	CO1. To critically understand ethical issues as they pertain to professional and personal identity.
		CO2. To learn to consider oneself and the world around from these basic ethical positions.
		CO3. To develop sharpened analytic faculties for oral and written expression.