**2.6.1**

**NAME OF THE DEPARTMENT: MATEMATICS**

**NAME OF THE PROGRAMME: MSc MATHEMATICS PROGRAMME CODE: 620**

### PROGRAMME SPECIFIC OUTCOMES (PSO)

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| **Intended outcomes** |
| PSO1: Interconnect concepts in various fields of Mathematics. |
| PSO2: Enrich mathematical concepts and encourage research. |
| PSO3: Knowledge about scientific method and skills in mathematical computations. |
| PSO4: Utilize the domain knowledge to face real life problems. |
| PSO5: Enhancement of critical thinking skills and attitudes to become a thinker and professional. |
| PSO6: Creating academic excellence in mathematics and allied subjects. |
| PSO7: Explore and discover new fields in different dimensions. |

**COURSE OUTCOMES (CO)**

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| **Semester** | **Course name and course code** | **Indented outcomes** |
| 1. | LINEAR ALGEBRAMM211 | CO1: Understand the concepts of vector spaces, subspaces, bases, dimension and their properties. |
| CO2: Relate matrices and linear transformations |
| CO3: Acquire the skill in matrix manipulation and linear modeling problems |
| CO4: Compute eigenvalues and eigenvectors of linear transformations and use them in applications. |
| CO5: Enhance the ability to reason mathematically and prepare them for research. |
| CO6: Apply the knowledge to many fields in engineering, statistics and computer science |
| 1. | REAL ANALYSIS-IMM212 | CO1: Understand the concepts and results in analysis and apply these results to other branches of mathematics and real world applications. |
| CO2: Demonstrate the importance of Riemann Stieltjles Integrals, Riemann condition, sufficient condition for the existence of Riemann Stieltjes integrals . |
| CO3: Understanding of the concepts of sequence of functions, its properties and to what extent this property is transferred to its limit functions. |
| CO4: Demonstrate an understanding of the concepts of multivariable differential calculus. |
| 1. | Ordinary Differential EquationsMM213 | CO1: To understand the concepts of Ordinary Differential Equations. |
| CO2: Classify the problems and recognize appropriate methods to solve differential equations. |
| CO3: Apply the methods of solving differential equations to real world problems. |
| 1. | Topology-IMM 214 | CO1: Understand the concepts of point set topology and relate topology as an extension of real analysis |
| CO2: To develop the students ability to handle abstract ideas of mathematics and mathematical proofs. |
| 2. | Abstract AlgebraMM 221 | CO1: Understand Fundamental Theorem of finitely generated abelian groups and list abelian groups of finite orders. |
| CO2: Apply Sylow’s Theorems to classify simple groups. |
| CO3: Discuss different field extensions and examine the existence of zeros of irreducible polynomials over extension fields. |
| CO4: Solve polynomial equations by radicals along with the understanding of ruler and compass constructions. |
| CO5: Establish the connection between the concept of field extensions and Galois Theory |
| 2. | Real Analysis-II MM 222  | CO1: Understand why and for what the theory of measures was introduced. |
| CO2: Formulate complex problems using appropriate measure theory techniques |
| CO3: Apply the theory of measures to solve a variety of problems at an appropriate level of difficulty.. |
| CO4 : Apply the theory of measures in probability theory |
| 2. | Topology-IIMM 223 | CO1: Understand more about point-set topology and the concepts of algebraic topology |
| CO2: Application of point-set topology towards extension of the study of algebra.. |
| CO3: Apply the concepts and ideas to other branches of mathematics and to carry out advanced research work in pure mathematics |
| 2. |  Partial differential Equations and Calculus of VariationMM 224 | CO1: To understand the concepts of PDE’s |
| CO2: To solve the real world problems using PDE’s. |
| 3. | Complex AnalysisMM 231 | CO1: Establish relationship between analytic functions and power series and to evaluate the radius of convergence of the power series. |
| CO2: Solve problems related to integrals. |
| CO3: Classify singularities and to find residues. |
| CO4: Characterize the conformal maps using Mobius transformations |
| 3. | Functional Analysis-IMM 232 | CO1: Understand the basics of normed linear spaces, bounded linear maps |
| CO2: Enable the students to realise different types of spectra and their relevance |
| CO3: Get an idea about different types of convergence of sequences in normed spaces and their relations. |
| CO4: Enable the student to apply his or her knowledge of functional analysis to solve mathematical problems. |
| 3. | Operations Operations Research (ELECTIVE)MM233 | CO1: Understand the characteristics of different types of decision making approaches and tools to be used in each type |
| CO2: Be able to build and solve Transportation Models and Assignment Models. |
| CO3: Apply techniques of PERT and CPM for planning, scheduling and controlling of projects. |
| CO4: Making and develop critical thinking and objective analysis of different game problems. |
| 3. | Graph Theory (ELECTIVE)MM 234 | CO1: Understand the concepts of graph isomorphism, cut-vertices, blocks, connectivity and demonstrate the relation between groups and graphs |
| CO2: Get an idea about the concepts of graph isomorphism, cut-vertices, blocks and connectivity and to to establish the relation between Hamiltonian walks and numbers |
| CO3: Describe the properties of strong digraphs, tournaments, matching and factorizations |
| CO4: Get an idea about vertex coloring, edge coloring and Ramsey number of graphs and apply the concepts of coloring for solving real life problems |
| CO5: Understand the concepts of center of graphs, different distant vertices, locating numbers, Detour and directed distance |
| CO6: Solve real life problems using the concepts of graph theory and use these concepts in research area in related topics |
| 4. | Analytic Number TheoryMM 241 | CO1: Find whether a number is a quadratic residue or non-residue modulo a prime number and an odd number |
| CO2: Acquire knowledge about different arithmetical functions and work with problems related to arithmetical functions |
| CO3: Understand the concept of Diophantine equations and existence of solutions of the Diophantine equation |
| CO4: Get an idea about algebraic numbers, algebraic integers and their properties |
| CO5: Solve problems using the concepts of number theory and use these concepts in research area in related topics |
|  **4.** | Functional Analysis-II MM 242 | CO1: Understand the basic concepts and fundamental principles of functional analysis; |
| CO2: Understand the statements and proofs of important theorems and be able to explain the key steps in proofs, sometimes with variation. |
| CO3: Understand a nice class of operators called compact linear operators stronger than continuous linear operators on a normed space and understand the behavior of spectrum of such operators |
| CO4: Understand the relevance of spectral theorem |
|  **4.** | Difference Equations (ELECTIVE) MM243 | CO1: Understand the concept of difference equations. |
| CO2: Classify difference equations with respect to their order and nature. |
| CO3: Apply solution techniques to autonomous equations. |
| CO4: Analyze the convergence behavior of various difference equations. |
|  **4.** | Representation Representation Theory of Finite Groups (ELECTIVE) MM244 | CO1: Understand G Module, representation of groups reducibility, group characters. |
| CO2: Finding representation of different groups and their characters |
| CO3: Apply representation theory to solve some group theoretical problems. |
| **4.** | Spectral Graph Theory (ELECTIVE) MM244 | CO1: Developing an insight on the interdisciplinary nature of development of knowledge |
| CO2: Associate matrices to graphs and estimate the various parameters of the associated matrices. |
| CO3: Exploring the structural properties of various graphs using the associated matrices |
| **4.** | CODING THEORY (ELECTIVE) MM 243 | CO1: Understand the basics of error detection and correction in communication systems. |
| CO2: Construct and implement algorithms for coding. |
| CO3: Construct efficient codes for error correction. |

**2.6.2. Attainment of PO s and Co s are evaluated.**

Course outcomes and program outcomes (POs) are determined using various methods. Students' knowledge and skills are put to the test right away through their performance in class/assignment exams, internal assessment tests, assignments, semester examinations, seminars, project, and other activities. These approaches provide a sampling of what students know and/or are capable of doing, as well as reliable evidence of student learning.