DEPARTMENT OF MATHEMATICS

PG Programme

Courses offered 2017 - 2020

Semester	Course code	Title of the paper	Hours/week	Credit
I	PM1711	Core I - Algebra I	6	5
	PM1712	Core II - Analysis I	6	4
	PM1713	Core III - Probability and Statistics	6	4
	PM1714	Core IV - Ordinary Differential Equations	6	4
	PM1715 PM1716	Elective I - (a) **Numerical Analysis** (b) Fuzzy sets and Fuzzy logic	6	4
II	PM1721	Core V- Algebra II	6	5
	PM1722	Core VI - Analysis II	6	4
	PM1723	Core VII - Partial Differential Equations	6	4
	PM1724	Core VIII - Graph Theory	6	4
	PM1725 PM1726	Elective II - (a) **Classical Dynamics** (b) Differential Geometry	6	4
	LST172	Life Skill Training (LST) - I	-	1
III	PM1731	Core IX - Algebra III	6	5
	PM1732	Core X - Topology	6	5
	PM1733	Core XI - Measure Theory and Integration	6	4
	PM1734 PM1735	Elective III - (a) **Algebraic Number Theory** (b) Stochastic Processes	6	4
	PM17PR	Project	6	4
IV	PM1741	Core XII - Complex Analysis	6	5
	PM1742	Core XIII **-** Functional Analysis	6	5
	PM1743	Core XIV **-** Operations Research	6	5
	PM1744	Core XV - Algorithmic Graph Theory	6	4
	PM1745 PM1746	Elective IV - (a) **Combinatorics** (b) Coding Theory	6	4
	LST174	Life Skill Training (LST) - II	-	1
	STP171	Summer Training Programme	-	1
		TOTAL	**120**	**90**

Programme Outcomes (POs)

PO No.	Upon completion of M.Sc. Degree Programme, the graduates will be able to :
PO - 1	Recognize the scientific facts behind natural phenomena.
PO - 2	Relate the theory and practical knowledge to solve the problems of the society.
PO - 3	Prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms
PO - 4	Face and succeed in high level competitive examinations like NET, GATE and TOFEL.
PO - 5	Carry out internship programmes and research projects to develop scientific skills and innovative ideas.
PO - 6	Utilize the obtained scientific knowledge to create eco-friendly environment.
PO - 7	Prepare expressive, ethical and responsible citizens with proven expertise

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSOs	Upon completion of M.Sc. Mathematics, the graduates will be able to :	PO addressed
PSO - 1	Have a strong base in theoretical and applied mathematics.	PO - 2
PSO - 2	Sharpen their analytical thinking, logical deductions and rigor in reasoning.	PO - 4
PSO - 3	Understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information.	PO - 7
PSO - 4	Write proofs for simple mathematical results.	PO - 5
PSO - 5	Acquire knowledge in recent developments in various branches of mathematics and participate in conferences / seminars / workshops and thus pursue research.	PO - 3
PSO - 6	Utilise the knowledge gained for entrepreneurial pursuits	PO - 3
PSO - 7	Understand the applications of mathematics in a global, economic, environmental, and societal context.	PO - 6
PSO - 8	Use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibility.	PO - 7
PSO - 9	Develop proficiency in analyzing, applying and solving scientific problems.	PO - 5

Course Outcome

Semester : I **Major Core I**

Name of the Course : Algebra I

Course code : PM1711

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Understand the concepts of automorphism, inner automorphism, Sylow P- subgroups, finite abelian groups, characteristic, subgroups of groups	PSO - 7	U
CO - 2	Analyze and demonstrate examples of various Sylow P-subgroups, automophisms	PSO - 9	An
CO - 3	Develop proofs for Sylow's theorems , Fundamental theorem of finite abelian groups, direct products, Cauchy's theorem, automorphisms of groups.	PSO - 4	C
CO - 4	Understand various definitions related to rings and ideals and illustrate	PSO - 4	U, Ap
CO - 5	Develop the way of embedding of rings and design proofs for theorems related to rings	PSO - 3	C
CO - 6	Understand the concepts of Euclidean domain and factorization domain and give illustrations.	PSO - 3	U, Ap
CO - 7	Compare Euclidean and Unique factorization domains and develop the capacity for proving the concepts	PSO - 2	E, An

Semester : I **Major Core II**

Name of the Course : Analysis I

Course code : PM1712

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Explain the fundamental concepts of analysis and their role in modern mathematics.	PSO - 9	U
CO - 2	Deal with various examples of metric space, compact sets and completeness in Euclidean space.	PSO - 3	An
CO - 3	Learn techniques for testing the convergence of sequences and series .	PSO - 8	U
CO - 4	Understand the Cauchy's criterion for convergence of real and complex sequence and series	PSO - 1	U

CO - 5	Apply the techniques for testing the convergence of sequence and series	PSO - 3	An
CO - 6	Understand the important theorems such as Intermediate valued theorem, Mean value theorem, Roll's theorem, Taylor and L'Hospital theorem	PSO - 1	U
CO - 7	Apply the concepts of differentiation in problems.	PSO - 9	Ap

Semester : I **Major Core III**

Name of the Course : Probability and Statistics

Course code : PM1713

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Recall the basic probability axioms,conditional probability, random variables and related concepts	PSO -1	R
CO - 2	Compute marginal and conditional distributions and check the stochastic independence	PSO - 3	U, Ap
CO - 3	Recall Binomial, Poisson and Normal distributions and learn new distributions such as multinomial, Chi square and Bivariate normal distributions.	PSO - 2	R,U
CO - 4	Learn the transformation technique for finding the p.d.f of functions of random variables and use these techniques to solve related problems	PSO - 8	U, Ap
CO - 5	Employ the relevant concepts of analysis to determine limiting distributions of random variables	PSO - 5	Ap
CO - 6	Design probability models to deal with real world problems and solve problems involving probabilistic situations.	PSO - 7	C,Ap

Semester : I **Major Core IV**

Name of the Course : Ordinary differential equations

Course code : PM1714

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Recall the definitions of degree and order of differential equations and determine whether a system of functions is linearly independent using the Wronskian definition.	PSO - 1	R,U
CO - 2	Solve linear ordinary differential equations with constant coefficients by using power series expansion	PSO - 9	Ap

CO - 3	Determine the solutions for a linear system of first order equations	PSO - 3	U
CO - 4	Learn Boundary Value Problems and find the Eigen values and Eigen functions for a given Sturm Liouville Problem	PSO - 3	U
CO - 5	Analyze the concepts of existence and uniqueness of solutions of the ordinary differential equations	PSO - 9	An
CO - 6	Create differential equations for a large number of real world problems	PSO - 7	C

Semester : I **Elective I**

Name of the Course : Numerical Analysis

Course code : PM1715

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Recall the methods of finding the roots of the algebraic and transcendental equations.	PSO - 1	R
CO - 2	Derive appropriate numerical methods to solve algebraic and transcendental equations.	PSO - 5	Ap
CO - 3	Understand the significance of the finite, forward, backward and central differences and their properties.	PSO - 3	U
CO - 4	Draw the graphical representation of each numerical method.	PSO - 5	Ap
CO - 5	Solve the differential and integral problems by using numerical methods. (Eg. Trapezoidal rule, Simpson's rule etc.)	PSO - 5	Ap
CO - 6	Solve the problems in ODE by using Taylor's series method, Euler's method etc.	PSO - 5	Ap
CO - 7	Differentiate the solutions obtained by Numerical methods and exact solutions.	PSO - 3	C
CO - 8	Compute the solutions of a system of equations by using appropriate numerical methods.	PSO - 9	Ap

Semester : I **Elective I (b)**

Name of the Course : Fuzzy Sets and Fuzzy Logic

Course code : PM1716

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Recall the definition of fuzzy subsets and operations on fuzzy subsets	PSO - 2	U
CO - 2	Understand fuzzy arithmetic and operations on fuzzy numbers	PSO - 1	R
CO - 3	Distinguish between crisp sets and fuzzy subsets at the conceptual level.	PSO - 3	U
CO - 4	Become familiar with fuzzy relations and the properties of these relations.	PSO - 9	An
CO - 5	Apply fuzzy relations and binary fuzzy relations in solving problems	PSO - 5	Ap

Semester : II **Major Core V**

Name of the Course : Algebra – II

Course code : PM1721

CO	Upon completion of this course the students will be able to :	PSOs addressed	CL
CO - 1	Recall finite and infinite dimensional vector spaces and subspaces and their properties	PSO - 1	R
CO - 2	Compute inner products and determine orthogonality on vector spaces, including Gram-Schmidt Orthogonalization.	PSO - 5	U
CO - 3	Use the definition and properties of Linear transformation and matrices of Linear transformation and change of basis including kernel and range.	PSO - 5	Ap
CO - 4	Compute the characteristic polynomial, eigen vectors, eigen values and eigen spaces as well as the geometric and the algebraic multiplicities of an eigen value	PSO - 6	Ap
CO - 5	Analyse invariant subspaces, cyclic subspaces and T-annihilator.	PSO - 3	An
CO - 6	Cite examples of roots of polynomials and splitting fields	PSO - 9	C

Semester : II **Major Core VI**

Name of the Course : Analysis-II

Course code : PM1722

CO	Upon completion of this course the students will be able to :	PSOs addressed	CL
CO - 1	Recall the definition of continuity, boundedness and some results on uniform convergence	PSO - 1	R
CO - 2	Recognise the differences between pointwise and uniform convergence of a sequence of functions and Riemann Stieltjes integrals.	PSO - 2	An
CO - 3	Understand the close relation between equicontinuity and uniform convergence of sequence of continuous function and rectifiable curves	PSO - 3	U
CO - 4	Learn Parseval's theorem, Stone Weierstrass theorem and know about its physical significance in terms of the power of the Fourier components.	PSO - 7	U
CO - 5	Utilize the definition of differentiation and partial derivative of function of several variables to solve problems	PSO - 9	Ap
CO - 6	Interpret the concept of the contraction principle and the inverse function theorem	PSO - 2	U

Semester : II **Major Core VII**

Name of the Course : Partial Differential Equations

Course code : PM1723

CO	Upon completion of this course the student will be able to :	PSOs addressed	CL
CO - 1	Recall the definitions of complete integral, particular integral and singular integrals.	PSO - 1	R
CO - 2	Learn some methods to solve the problems of non-linear first Order Partial Differential Equations	PSO - 3	U
CO - 3	Analyze homogeneous and non-homogeneous linear partial differential equations with constant coefficients and solve related problems	PSO - 9	An
CO - 4	Solve the boundary value problems for the heat equations and the wave equations	PSO - 7	Ap
CO - 5	Apply the concepts and methods in physical processes like heat transfer and electrostatics	PSO - 8	Ap

Semester : II **Major Core VIII**

Name of the Course : Graph Theory

Course code : PM1724

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Recall the basic definitions and fundamental concepts of graph theory	PSO - 1	R
CO - 2	Identify cut vertices and understand various versions of connectedness of a graph	PSO - 2	U
CO - 3	Solve problems involving connectivity and colorings of vertices and edges	PSO - 5	Ap
CO - 4	Understand the concepts of Digraphs, Geodetic Sets, Matchings, Factorization, Hamiltonoian, decompositions and Graceful labelling of a graph	PSO - 4	U
CO - 5	Cite examples of planar and nonplanar graphs, learn necessary conditions for planar graphs	PSO - 8	Ap
CO - 6	Determine the Ramsey number of certain graphs and identify the center of a graph	PSO - 3	U, Ap
CO - 7	Modify the methods involved in the proof of certain theorems	PSO - 4	C

Semester : II **Elective II (a)**

Name of the Course : Classical Dynamics

Course code : PM1725

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Recall the concepts of Newton's laws of motion, momentum, acceleration, motion of a particle.	PSO - 1	R
CO - 2	Understanding the generalized co-ordinates of the Mechanical system.	PSO - 3	U
CO - 3	Apply D'Alembert's Principle to solve the problems involving system of particles.	PSO - 5	Ap
CO - 4	Solve the Newton's equations for simple configuration using various methods.	PSO - 4	C
CO - 5	Transforming the Lagrangian equations to Hamiltonian equations.	PSO - 2	U
CO - 6	Define the canonical transformations and Lagrange and Poisson brackets.	PSO - 1	R
CO -7	Evaluate the system of particles by deriving the Jacobi equation and Jacobi's theorem.	PSO - 7	E
CO - 8	Understand the foundation of Hamilton's Principle and differential forms.	PSO - 2	U

.

Semester : II **Elective II (b)**

Name of the Course : Differential Geometry

Course code : PM1726

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Recall the concepts of curvature, normal, tangent, binormal and the relevant formulae	PSO - 1	R
CO - 2	Analyze differential equations using Families of curves, Geodesics on a surface and orthogonal trajectories.	PSO - 9	An
CO - 3	Calculate the curvature , torsion of curves and surfaces and also calculate involutes, evolutes of osculating circle, osculating sphere etc.	PSO - 5	Ap
CO - 4	Explain the concepts of curves and surfaces in first and second fundamental form and Developable surfaces at high level.	PSO - 7	U
CO - 5	Obtain the family of curves such as parabola general equation, circles general equation etc	PSO - 5	Ap
CO - 6	Articulate the connections between geometry and other disciplines, possibly including topology, algebra, analytical geometry and applied mathematics.	PSO - 9	U

Semester : III **Major Core IX**

Name of the Course : Algebra-III

Course code : PM1731

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Recall the definitions and basic concepts of field theory and lattice theory	PSO - 1	U
CO - 2	Express the fundamental concepts of field theory, Galois theory and theory of modules	PSO - 1	U
CO - 3	Demonstrate the use of Galois theory to construct Galois group over the rationals and modules	PSO - 9	U
CO - 4	Distinguish between free modules , quotient modules and simple modules .	PSO - 2	Ap
CO - 5	Interpret distributivity and modularity and apply these concepts in Boolean Algebra	PSO - 3	E
CO - 6	Understand the theory of Frobenius Theorem ,four square theorem and Integral Quaternions	PSO - 7	U
CO - 7	Develop the knowledge of lattices and establish new relationships in Boolean Algebra	PSO - 8	C

Semester : III **Major Core X**

Name of the Course : Topology

Course code : PM1732

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Understand the definitions of topological space, closed sets, limit points, continuity, connectedness, compactness, separation axioms and countability axioms.	PSO - 3	U
CO - 2	Construct a topology on a set so as to make it into a topological space	PSO - 5	C
CO - 3	Distinguish the various topologies such as product and box topologies and topological spaces such as normal and regular spaces.	PSO - 3	U, An
CO - 4	Compare the concepts of components and path components, connectedness and local connectedness and countability axioms.	PSO - 2	E, An
CO - 5	Apply the various theorems related to regular space, normal space, Hausdorff space, compact space to other branches of mathematics.	PSO - 1	Ap
CO - 6	Construct continuous functions, homeomorphisms and projection mappings.	PSO - 5	C

Semester : III **Major Core XI**

Name of the Course : Measure theory and Integration

Course code : PM1733

CO	Upon completion of this course the students will be able to :	PSOs addressed	CL
CO - 1	Define the concept of measures and Vitali covering and recall some properties of convergence of functions,	PSO - 1	R
CO - 2	Cite examples of measurable sets , measurable functions, Riemann integrals, Lebesgue integrals.	PSO - 3	U
CO - 3	Apply measures and Lebesgue integrals to various measurable sets and measurable functions	PSO - 9	Ap
CO - 4	Apply outer measure, differentiation and integration to intervals , functions and sets.	PSO - 8	Ap
CO - 5	Compare the different types of measures and Signed measures	PSO - 3	An
CO - 6	Construct L^p spaces and outer measurable sets	PSO - 5	C

Semester : III **Elective III (a)**

Name of the Course : Algebraic Number Theory

Course code : PM1734

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Recall the basic results of field theory	PSO - 1	R
CO - 2	Understand quadratic and power series forms and Jacobi symbol	PSO - 7	U
CO - 3	Apply binary quadratic forms for the decomposition of a number into sum of sequences	PSO - 6	Ap
CO - 4	Determine solutions of Diophantine equations	PSO - 2	An
CO - 5	Detect units and primes in quadratic fields	PSO - 3	An
CO - 6	Calculate the possible partitions of a given number and draw Ferrer's graph	PSO - 8	An
CO - 7	Identify formal power series and compare Euler's identity and Euler's formula	PSO - 3	U

Semester : III **Elective III (b)**

Name of the Course : Stochastic Processes

Course code : PM1735

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Recall the concept of the theory of probability	PSO - 1	R
CO - 2	Understand the definitions and specification of stochastic processes	PSO - 2	U
CO - 3	Differentiate between different states of Markov system	PSO - 3	U
CO - 4	Categorize different stochastic processes such as Poisson processes, Yule- Fury processes, birth and death processes	PSO - 3	An
CO - 5	Calculate residual and current life times using renewal processes	PSO - 2	An
CO - 6	Select the suitable queuing model in real life situations	PSO - 7	E
CO - 7	Apply the theory to create the correct stochastic model for a given problem	PSO - 8	Ap

Semester : III

Name of the Course : Project

Course code : PM17PR

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Become aware of current research topics in mathematics and choose a new Research topic.	PSO - 1	R
CO - 2	Create the habit of studying Research articles in depth	PSO - 6	C, An
CO - 3	Submit a formal report to document the outcome of the project and get practice in writing projects.	PSO - 9	U, C
CO - 4	Understand and develop mathematical concepts effectively and correlate the same to other disciplines	PSO - 6	U,C
CO - 5	Present papers in Conferences/Workshops/Seminars.	PSO - 5	U, Ap
CO - 6	Apply mathematics creatively and think critically	PSO - 8	U, Ap

Semester : IV **Major Core XII**

Name of the Course : Complex Analysis

Course code : PM1741

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Understand the fundamental concepts of complex variable theory	PSO - 1	U
CO - 2	Effectively locate and use the information needed to prove theorems and establish mathematical results	PSO - 6	R
CO - 3	Demonstrate the ability to integrate knowledge and ideas of complex differentiation and complex integration	PSO - 9	U
CO - 4	Use appropriate techniques for solving related problems and for establishing theoretical results	PSO - 8	Ap
CO - 5	Evaluate complicated real integrals through residue theorem	PSO - 9	E

Semester : IV **Major Core XIII**

Name of the Course : Functional Analysis

Course code : PM1742

CO	Upon completion of this course the students will be able to :	PSOs addressed	CL
CO - 1	Learn and understand the definition of linear space , normed linear space, Banach Space and their examples	PSO - 1	R
CO - 2	Explain the concept of different properties of Banach Spaces, Hahn Banach theorem	PSO - 7	U
CO - 3	Compare different types of operators and their properties, Natural imbedding	PSO - 2	Ap
CO - 4	Explain the ideas needed for open mapping theorem , Open	PSO - 1	C

	Mapping theorem		
CO - 5	Construct the idea of projections , the spectrum of an operator and develop problem solving skills , Matrices, Determinants	PSO - 5	Ap
CO - 6	Learn and understand the definition of Hilbert Spaces ,Orthogonal Complements	PSO - 1	R
CO - 7	Explain the concept of the adjoint of an operator, Normal and Unitary operators, Spectral Theory	PSO - 2	An

Semester : IV **Major Core XIV**

Name of the Course : Operations Research

Course code : PM1743

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Explain the fundamental concept of DP model , Inventory model and Queuing model	PSO - 2	U
CO - 2	Relate the concepts of Arrow (Network)diagram representations, in critical path calculations and construction of the Time chart	PSO - 3	U
CO - 3	Distinguish deterministic model and single item	PSO - 3	U
CO - 4	Interpret Poisson and Exponential distributions and apply these concepts in Queuing models	PSO - 6	R
CO - 5	Solve life oriented decision making problems by optimizing the objective function	PSO - 7	C

Semester : IV **Major Core XV**

Name of the Course : Algorithmic Graph Theory

Course code : PM1744

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Write algorithms for basic computing and analyse the efficiency of the algorithm	PSO - 1	R E
CO - 2	Use effectively algorithmic techniques to study basic parameters and properties of graphs	PSO - 4	U
CO - 3	Use effectively techniques from graph theory, to solve practical problems in networking and communication	PSO - 6	Ap
CO - 4	Apply the Algorithms in computer science , biology, chemistry, physics, sociology and engineering	PSO - 9	Ap

Semester : IV **Elective IV (a)**

Name of the Course : Combinatorics

Course code : PM1745

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Discuss the basic concepts in permutation and combination, Recurrence Relations	PSO - 3	U
CO - 2	Distinguish between permutation and combination	PSO - 9	An
CO - 3	Correlate recurrence relation and generating function	PSO - 2	U
CO -4	Solving problems by the technique of generating functions	PSO - 7	Ap
CO - 5	Interpret the principles of inclusion and exclusion	PSO - 2	U
CO - 6	Develop the concepts of Polya's fundamental theorem and apply in Polya's theory of counting	PSO - 6	C

Semester : IV **Elective IV (b)**

Name of the Course : Coding Theory

Course code : PM1746

CO	Upon completion of this course the students will be able to :	PSOs addressed	CL
CO - 1	Explain the fundamental concepts of coding theory	PSO - 1	U
CO - 2	Analyze the fundamental problems of coding theory and the properties of specific codes	PSO - 3	An
CO - 3	Translate the fundamental problems to mathematical problems	PSO - 4	C
CO - 4	Construct codes by various methods for the chosen problem	PSO - 4	C
CO - 5	Solve the problems by recalling the concepts of finite field, polynomial rings and finite groups	PSO - 8	R
CO - 6	Apply coding theory in transmission of information in telecommunication (cell phones, data modems etc,.)	PSO - 8	Ap
CO - 7	Design simple cyclic codes with given properties	PSO - 4	C