Course code	Course name	Course credit
MTMPCOR01T	Algebra	4
MTMPCOR02T	Linear Algebra	4
MTMPCOR03T	Real Analysis	4
MTMPCOR04T	Complex Analysis	4
MTMPCOR05T	Mechanics	4
MTMPAEC01M	Computational Techniques and Introduction to LATEX	2

MTMPCOR06T	Topology	4
MTMPCOR07T	Functional Analysis	4
MTMPCOR08T	ODE and Special Functions	4
MTMPCOR09T	Numerical Analysis & Integral Transforms	4
MTMPCOR10T	Differential Manifold	4
MTMPSEC01M	Computer Aided Numerical Analysis	2

MTMPCOR11T	PDE and Calculus of Variations	4
MTMPCOR12T	Nonlinear Differential Equations and Dynamical Systems	4
MTMPCOR13T	Electromagnetic Theory & Integral Equations	4
MTMPCOR14T	Measure and Integration	4
MTMPDSE01T	Operator Theory and Banach Algebra	4
MTMPDSE01T	Number Theory and Equations over Finite Fields	4

MTMPGEC01T	Mathematics and Some Applications - I	4
MTMPCOR15T	Graph Theory / Operations Research / Fuzzy sets & Their applications	4
MTMPDSE02T	Advanced Topology I	4
MTMPDSE02T	Advanced Real Analysis	4
MTMPDSE03T	Advanced Functional Analysis	4
MTMPDSE03T	Advanced Topology II	4
MTMPDSE04T	Advanced Complex Analysis	4

MTMPDSE04T	Commutative Algebra	4
MTMPCOR16M	Project Work	8

Course_OutCome

On completion of this course, the students will be able to identify, analyze, classify, demonstrate and explain the acquired knowledge mainly on the following : i) Sylow's theorems and its applications, ii) Jordan Holder Theorem, Solvable groups, iii) Prime, primary and maximal ideals, iv) Jacobsons radical, semisimple ring, Hilbert Basis Theorem, Unique Factorization Domain, v) Basics of Field extension & Galois theory.

On completion of this course, the students will be able to identify, analyze, classify, demonstrate and explain the acquired knowledge on the following : i) Modules with chain conditions (Noetherian and Artinian), Dual Modules, Free Modules, ii) Dual Spaces, Dual Basis, Dimension of Quotient space, iii) Minimal Polynomial, Diagonalization of Matrices, Reduction to Triangular Forms, iv) Jordan Canonical Forms, Rational Canonical Forms, Smith Normal Form, v) Bilinear Forms , Quadratic Forms, Hermitian Forms, vi) Direct sum decomposition theorem, Pricipal Minor Criteron, vii) Sylvester Law Of Inertia, Simultaneous Reduction of Pair of Forms

Upon completion of this course, the student will be able to understand the basics of Real Analysis and improve the logical thinking..

On completion of this course, the students will be able to identify, analyze, classify, demonstrate and explain the acquired knowledge mainly on the following : i) Stereographic Projection, Riemann's sphere, point at infinity, extended complex plane, ii) Cauchy-Goursat Theorem, Cauchy's integral formulas, Morera's theorem, Liouville's theorem, iii) Fundamental theorem of classical algebra, Schwarz Reflection Principle, Maximum Modulus Principle, iv) Cauchy-Hadamard Theorem, Taylor's theorem and Laurent's theorem, v) Riemann's Removal singularity thorem, Weierstrass-Casorati, vi) The Cauch's Residue Theorem, Argument principle and their applications, vii) Conformal mapping, Bilinear transformation, Idea of analytic continuation.

Students will be able to apply the equations of motion to solve analytically the problems of motion of a single particle/a system of particle or rigid body under conservative force fields. Use the Hamilton's principle for deriving the equations of motion of a system. Gain knowledge of Hamiltonian system and phase planes from the point of view of mechanics. Use the theory of normal modes for solving problems related to oscillations and vibrations. Students will learn the basics of classical mechanics and STR required for further studies in solid and quantum mechanics.

At the end of this course a student should be able to: i) understand the purpose of basic omputer programming language, ιι) understand and apply control statements, implementation of arrays, functions, etc., iii) enhance ability to program writing skills for solving several real life and Mathematical problems, iv) use LaTeX and develop typeset documents containing tables, figures, formulas, common book elements like bibliographies, indexes etc. and modern PDF features.

On completion of this course, the students will be able to identify, analyze, classify, demonstrate and explain the acquired knowledge on the following : i) Axiom of choice, Continuum hypothesis, Cardinal and Ordinal numbers, ii) Basics of Topological spaces, Relative topology, homeomorphism and topological properties , iii) Alternative methods of defining a topology in terms of Kuratowski closure operator, interior operator and neighbourhood systems, iv) Countability axioms, Heinei's continuity criterion, v) Lower & higher separation axioms, Urysohn's lemma and Tieze's extension theorem (statement only) and their applications, vi) Connected and disconnected spaces, path connected spaces, Compactness, Alexander subbase theorem, equivalence of various compactness in metric spaces, vii) Product and box topology, Tychonoff product theorem, viii) Quotient spaces, Local Connectedness, Path- connectedness, Total disconnectedness,

On successful completion of this course, students will be able to appreciate how functional analysis uses and unifies ideas from vector spaces, the theory of metrics, and complex analysis. Moreover, students will be able to understand and apply fundamental theorems from the theory of normed and Banach spaces, Hilbert spaces.

1. Students will learn about existence and uniqueness of solutions and Picard's method of approximation . This can be directly applied for a numerical approximation. 2. Knowledge of the properties of eigenvalues and eigenfunctions will be useful in studying Mathematical physics. 3. An acquaintance with special functions will be useful for students interested in research in continuum mechanics or theoretical physics. 4. An acquaintance with special functions will be useful for students interested in research in continuum mechanics or theoretical physics. 5. Introductory ideas of phase plane analysis and stability can be utilised by students while studying dynamical systems or mathematical biology. 6. Students will be able to solve/analyse odes arising in different areas of physics.

After completion of the course, the student is expected to : i) understand basic theories of numerical analysis, ιι) formulate and solve numerically problems from different branches of science, iii) grow insight on computational procedures, iv) learn theory and properties of Fourier transform, Laplace Transform and Z-Transform and their applications to relevant problems.

On completion of this course, the students will be able to identify, analyze, classify, demonstrate and explain the acquired knowledge mainly on the following : i) tangent and cotangent spaces; submanifolds, ii) vector fields and their flows; the Frobenius Theorem, iii) multilinear algebra, differential forms, the Lie derivative, iv) Lie groups and Lie algebras, v) Integration on anifolds, theorems of Stokes, integration on a Lie group, vi) de Rham cohomology.

At the end of this course a student should be able to : i) solve different type of numerical problems, ii) understand better relevant theoretical concepts, iii) apply programming skills in interdisciplinary areas such as biological system, physical system etc., iv) analyze data set of various size and interpret outcomes helping her/him to compete in the financial sector. v) apply programming skills in graphics animation, computerized abstract art.

At the end of this course a student should be able to : i) learn to solve different types of PDE, ιι) test the stability of the solution, iii) apply PDE to problems of geometry and physics, iv) understand basic theories of calculus of variations, v) formulate and solve problems from allied branches of science

On the completion of this course students will be able to study the nature linear stability and general stability of critical points and solutions ; also investigate the existence of periodic solutions ; and identify a bifurcation through change of parameters ; further, have a basic idea of perturbation methods. 2. These methods can be applied by the students to study problems of population biology and nonlinear wave propagation.

After completing this course, the student will be able to: i) build up strong application capability of graduate level mathematics, ii) understand and apply the basic theories of electromagnetism, iii) get an exposure to the Einstein's Theory of Relativity, iii) grow interest in electrical engineering, iv) distinguish between differential and integral equations, v) understand the theory of existence and uniqueness of solutions of linear integral equations, vi) find solutions of linear integral equations of first and second type (Volterra and Fredhlom) and singular integral equations using several techniques.

On completion of this course, the students will be able to identify, analyze, classify, demonstrate and explain the acquired knowledge mainly on the following : i) Lebesgue measure, Vitali's heorem concerning existence of non-measurable sets, ii) measurable functions, Theorem relating to non negative μ-measurable function as a limit of a monotonically increasing sequence of non negative simple μ-measurable functions, iii) Lebesgue's monotone convergence theorem and its applications, Fatou's lemma, Lebesgue's dominated convergence Theorem, iv) Interrelation etween Riemann & Lebesgue integration, v) Concept of L_p-spaces and its completeness, vi) Characterizations of Convergence in Measure, Almost Uniform Convergence, Egoroff heorem, vii) Product Measure. Fubini's Theorem, viii) Signed Measure and the Hahn Decomposition, Radon-Nikodym Theorem.

Students will be able to understand the fundamentals of spectral theory, and appreciate some of its power. Students will have the knowledge and skills to apply problem solving using functional analysis techniques applied to diverse situations in physics, engineering and other mathematical contexts.

On completion of this course, the students will be able to identify, analyze, classify, demonstrate and explain the acquired knowledge mainly on the following : i) Wilsons Theorem, Linear congruence; $ax \equiv b(\text{mod } n)$, ii) Chinese Remainder Theorem, Euler's Theorem, iii) applications of primitive roots, Structure of U(Z/nZ), iv) law of quadratic reciprocity, v) Equations over Finite Fields: Chevalley-Warning Theorem, vi) Quadratic Forms over finite fields, vii) p-adic numbers and its applications.

On completion of this course, the students will be able to identify, analyze, demonstrate and pply the acquired knowledge of the following : i) Basics of Group, Subgroups, Normal ubgroups, Abelian Groups, Cyclic groups, ii) Symmetric Groups, Lagrenge's Theorem, Cayley's Theorem, iii) Ring, Sub Ring, Field, Sub Field, iv) Basic game theory and graph theory, v) Inner Product Space, Orthogonal sets and Bases, Eigenvalues, Eigenvectors, Diagonalization of matrices and metric spaces, vi) Solve partial differential equations and its application to physical problems. vii) Laplace transforms and its application in differential equations.

After the course the student will have a strong background of graph theory. The students will be able to apply principles and concepts of graph theory in practical situations such as computer science, physical and engineering sciences.

On completion of this course, the students will be able to identify, analyze, classify, demonstrate and explain the acquired knowledge on the following : i) Inadequacy of sequences, Nets and Filters , Chracterizations of compactness and continuity and adherent point in terms of nets and filters, ii) Local Compactness and One Point Compactification, Stone- Cech Compactification, Extension property of βX and Cardinality of βN, iii) The Urysohn Metrization Theorem. The Nagata – Smirnov Metrzation Theorem, iv) Paracompacntess, Partition of unity, A. H. Stone's Theorem, v) Uniform spaces and Uniform topology, uniform continuity and product uniformity, Uniformity generated by a family of pseuometrics, Completion of uniform spaces, vi) Inductive and projective limits, Function spaces.

After completing the course, the students should be able to recognize, understand and apply concepts and methods in advanced real analysis. Also, they will be able to apply the acquired knowledge in signals and Systems, Digital Signal Processing etc. and conduct researches on high international level in advanced real analysis.

Upon successful completion, students will have the knowledge and skills to explain the fundamental concepts of functional analysis and their role in modern mathematics and applied contexts. Moreover, students will be able to demonstrate accurate and efficient use of functional analysis techniques.

On completion of this course , the students will be able to identify , analyze, classify, emonstrate and explain the acquired knowledge mainly on the following : i) Covering spaces and covering maps,Path lifting property and Homotopy lifting, ii) Monodromy theorems, Deck transformation, Van Kampen's theorem, iii) Singular Homology, Mayer-Vietoris sequence, Idea of Cohomology, iv) C-embedding & C -embedding and their relation, Urysohn's extension theorem, v) maximal ideals, prime ideals, Z- ideals; Z-filters, Z-ultrafilters, vi) fixed maximal ideals of C (X) and C (X), their haracterizations,Structure spaces. vii) Topological groups

On completion of this course, the students will be able to identify, analyze, classify, demonstrate and explain the acquired knowledge mainly on the following : i) Basic properties of holomorphic functions, ii) The Phragmen- Lindeloff Method, a converse of Maximum Modulus Theorem, iii) the Mittag-Leffler's theorem for Meromorphic function, iv) the Weierstrass Factorization Theorem, Jensen's formula, The Muntz-Szasz theorem, v) Monodromy theorem and its consequence, the Little Picard Theorem, vi) the Riemann mapping Theorem, vii) multilinear algebra, differential forms, the Lie derivative..

On successful completion of this course, students will be able to apply its methods in related subjects of Mathematics. Moreover, they should be able to participate in scientific discussions and begin with own research in commutative algebra.

Students will obtain first hand experience of pursuing research during the postgraduate course and will be able to choose independently a research problem and try to solve it successfully