Course Objective	This course presents a rigorous treatment of fundamental concepts in analysis. To introduce students to the fundamentals of mathematical analysis and reading and writing mathematical proofs. The course objective is to understand the axiomatic foundation of the real number system, in particular the notion of completeness and some of its consequences; understand the concepts of limits, continuity, compactness, differentiability, and integrability, rigorously defined; Students should also have attained a basic level of competency in developing their own mathematical arguments and communicating them to others in writing.
Course Outcome(s)	Describe the fundamental properties of the real numbers that underpin the formal development of real analysis; demonstrate an understanding of the theory of sequences and series, continuity, differentiation and integration; Demonstrate skills in constructing rigorous mathematical arguments; Apply the theory in the course to solve a variety of problems at an appropriate level of difficulty.

Syllabus:

Real number system and its order completeness. Sequences and series of real numbers. Metric spaces: Basic concepts, continuous functions, Intermediate Value Theorem, Compactness, Heine-Borel Theorem.

Differentiation, Taylor's theorem, Riemann Integral, Improper integrals, Sequences and series of functions, Uniform convergence, power series, Fourier series, Weierstrass approximation theorem, equicontinuity, Arzela-Ascoli theorem.

Text books:

1. W. Rudin, Principles of Mathematical Analysis, McGraw-Hill, 1976.
2. Robert Gardner Bartle and Donald R. Sherbert, Introduction to Real Analysis, 4^{th} Edition,Wiley, 2011.

References:

1. C.C. Pugh, Real Mathematical Analysis, Springer, 2002.
2. T. M. Apostol, Mathematical Analysis, 2nd Edition, Narosa, 2002.
3. G. F. Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill, 1963. 4. Stephen Abbot, Understanding Analysis, Springer, New York, NY, 2015

Code:MAT5102: Elementary Number Theory and Basic Algebra Prerequisites: Number systems.	L	T	P	Credit
	4	1	0	4

Course Category	Core
Course Type	Theory
Course Objective	Introduce the basic concepts of Number theory such as Divisibility, Congruences, Congruences with Prime Modulus, Quadratic reciprocity and some functions of Number Theory; introduce basic structures of algebra like groups, rings, fields and vector spaces which are the main pillars of modern mathematics.
Course Outcome(s)	Generate facility in working with situations involving commutative rings, in particular monogenic algebras of matrices a concept that finds a large number of applications. Students will see and understand the connection and transition between previously studied mathematics and more advanced mathematics. The students will actively participate in the transition of important concepts such homomorphisms & isomorphisms from discrete mathematics to advanced abstract mathematics. The course gives the student a good mathematical maturity and enables to build mathematical thinking and problem solving skill.

Syllabus:

Basic representation theorem, the fundamental theorem of arithmetic; Combinatorial and Computational number theory. Permutations and combinations, Fermat's little theorem, Wilson's theorem. Generating functions; Fundamentals of congruences – Residue systems, Ring; Solving congruences – Linear congruences, Chinese remainder theorem, Polynomial congruences.

Plane Isometries, Direct products & finitely generated Abelian Groups, Binary Linear Codes, Factor Groups, Factor-Group Computations and Simple Groups, Series of groups. Group action on a set, Applications of G-set to counting, Isomorphism theorems: Proof of the Jordan-Holder Theorem, Sylow theorems, Applications of the Sylow theory, Free Groups, Group representations.

Text books:

1. Thomas Koshy, Elementary Number Theory with Applications, Elsevier, 2007. 2.
Joseph Gallian, Contemporary Abstract Algebra, 7th Edition, Cengage Learning, 2009.

References:

1. George E. Andrews: Number Theory, Dover Publications, New York,
1971. 2. Tom M. Apostol, Introduction to Analytic Number Theory,
Springer, 1998. 3. M. Artin: Algebra, Prentice Hall, 1991.
4. I. N. Herstein, Topics in Algebra, John Wiley & Sons; 2nd Edition, 1975.
5. Thomas W. Hungerford, Algebra ,Springer, 2003.

6. John B. Fraleigh, A First Course in Abstract Algebra, 7th Edition, 2002.

Code:MAT5103: Linear Algebra Prerequisites: **Basics in Matrix Theory:**	L	T	P	Credit
	4	1	0	4

Course Category	Core
Course Type	Theory
Course Objective	To provide a solid foundation in the mathematics of linear algebra. To develop problem solving skills To prepare the students for advanced level of Mathematics To discuss some of the applications of linear algebra