Semester	Code	Module Title	Credits	C/E/O	GPA/NGPA
1	MA1014	Mathematics	3	C	GPA

Hours/Week		Pre-requisites/Co-requisites	Evaluation (%)	
Lecture	Tute/Lab		CA	WE
5/2	1/1	None	20	80

Learning Outcomes

After the successful completion of this course, students should be able to
- Identify basic operations and functions of complex variables, explore 3D geometry using vectors and solve basic eigenvalue problems for matrices.
- Use real functions of one real variable up to power series.
- Solve Differential Equations up to second order linear with non-constant coefficients.

Syllabus Outline

Algebra
- **Complex Numbers:** Euler's Identity, complex valued functions and branches.
- **Vectors:** vector algebra, vector product, scalar product, scalar triple product, vector triple product, equations of line and plane, vector norms
- **Matrices:** transpose, adjoint, determinant, inverse and trace of a matrix, system of equations, Cramer's rule, Gaussian elimination, echelon forms, rank, eigen values and eigen vectors, diagonalization, matrix norms.

Real Analysis
- **Sets and Inequalities**: Introduction to quantifiers and sets, real number system, inequalities, supremum and infimum, completeness axioms.
- **Functions, Limits and Differentiability:** relations, functions and their inverses, limit of a function, continuity, differentiability
- **Basic Theorems**: Intermediate value theorem, extremum value theorem, Rolle's theorem, mean value theorem, L' Hopital's rule.
- **Sequences and Series**: Convergence of sequences and series, monotone convergence theorem. Power series, Taylor's series.

Integration and ODE
- **Riemann integration**: integral as an area, First and second fundamental theorems of calculus, Leibniz rule, Integrability of a continuous function, Integration by parts, mean value theorem for integrals, Improper integrals: tests of convergence, gamma function.
- **Ordinary differential equations:** classification of ODEs (Linear and non-linear), First order ordinary differential equations: variable separable, homogeneous, linear, Bernoulli Second order linear differential equations: equations with constant coefficients, Wronskian method