MA 1101   **Credit: 4 (L-3, T-1, P-0)**
ENGINEERING MATHEMATICS   I

Questions to be set: *Eight (Four from each unit)*
Questions to be answered: *Any five selecting at least two from each unit.*

Objective: This paper contains Differential calculus, Integral Calculus, Analytical Solid geometry and Infinite Series. The objective of teaching this paper is to give idea on these topics which will help the students in studying and understanding the mathematical as well as engineering subjects.
Pre-requisites: Basic knowledge of Differentiation, Integration and coordinate geometry.

UNIT I
Differential Calculus – I

Successive differentiation, Leibnitz's theorem, Polar curves, Tangent and normal of polar curves, Angle between radius vector and tangent, Angle of intersection of two curves, Derivatives of arcs (Cartesian and polar), Asymptotes, Curvature, Radius of curvature and Evolute, Multiple points, Points of inflection, Concavity, Convexity.

Differential Calculus - II
 Rolle's theorem, Mean value theorems, Expansion of functions in Taylor's and Maclaurin's series, Indeterminate forms. Partial differentiation, Euler's theorem, Total differential, Errors and approximation, Differentiation of composite and implicit functions. Tracing of curves: Folium of Descartes, Lemniscate of Bernoulli, Astroid, Catenary, Cardioide, Cycloid.

UNIT II

Integral calculus

Reduction   formulae   for $\int \sin^n x dx$, $\int \cos^n x dx$, $\int \sin^m x \cos^n x dx$.   Evaluation   of $\int_0^{\frac{\pi}{2}} \sin^n x dx$,

$\int_0^{\frac{\pi}{2}} \cos^n x dx$, $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x dx$ where m and n are positive integers. Lengths, Areas and Volumes of revolution involving simple curves.

Analytical solid geometry
 Direction Cosines, Planes, Straight lines, Spheres, Right circular cone and Right circular cylinder.

Infinite series
Convergence, Divergence, Comparison test, Ratio test, Raabe's test, Cauchy's root test, Cauchy's integral test, Alternating series, Leibnitz's test, Absolute and conditional convergence.

Text books
1. Erwin Kreyszig : Advanced Engineering Mathematics , Wiley
2. Shanti Narayan : Differential Calculus, S Chand & Company
3. Shanti Narayan: Integral Calculus, S Chand & Company
4. R.K. Jain & S R K Iyengar, Advanced Engineering Mathematics V Ed, Narosa
Reference books
1.G.B. Thomas, Jr. and R. L. Finney: Calculus and Analytical Geometry
2. B S Grewal, Engineering Mathematics, Khanna Publisher

MA 1201   **Credit: 4 (L-3, T-1, P-0)**
ENGINEERING MATHEMATICS   II

Questions to be set: Eight (Four from each unit)
Questions to be answered: Any five selecting at least two from each unit.

Objective: This paper covers Ordinary differential equation, Laplace transform, linear algebra and calculus. Differential Equation is a tool which is used for modelling of real life problems mathematically. Laplace transforms help in solving complex problem with a very simple approach. Ordinary differential equation, Laplace transform has tremendous applications in electrical engineering; Linear algebra has applications in computer sciences. Linear algebra has applications is different subjects such as Graph theory, Cryptography, Genetics, Economics, Networks etc. Calculus II is prerequisite for many mathematical and engineering subjects.

Pre-requisites: Some prior knowledge of Differential and Integral calculus, Partial fraction, Matrices, Determinants and Set Theory.

UNIT I
Ordinary differential equations (ODE) - I
Formation of ODE, Definition of order, degree and solutions of ODE. Solutions of equations: Homogeneous and non homogeneous equations, exact equations, Linear equations, Bernoulli's equations. Applications: LR, RC circuits.

Ordinary differential equations (ODE)- II
General linear differential equations: Homogeneous equations, Linear equations with constant coefficients, Non homogeneous equations, Method of variation of parameters and Inverse differential operators, Solution of Cauchy's homogeneous linear equations. Solution of simple simultaneous equations. Applications of equations - LRC circuits, string problem, free and forced vibration problems.

Laplace transforms
Transforms of elementary functions, Transforms of derivatives, Inverse transforms, Transforms of periodic functions, Unit step function, Shifting theorems, solutions of differential equations using Laplace transforms

UNIT II

Linear algebra
Concept of vectors and its generalization to higher dimensions, Vector spaces and subspaces, Simple examples. Linear dependence and independence; Basis, Dimension, Matrices, Elementary column and row transformations, Inverse, Rank, System of linear equations, Consistency, Solution by Gauss elimination method.

Calculus –III
Taylor's theorem for a function of two variables. Extreme values of a function of two variables, Lagranges's method of undetermined multipliers- Simple problems. Multiple integrals: Definitions, Evaluation by change of order of integration, Changing of variables. Jacobians. Applications to areas and volumes. Beta and Gamma functions: Definition, elementary properties, simple problems.

Text books
1. Erwin Kreyszig : Advanced Engineering Mathematics , Wiley
2. Shanti Narayan : Differential Calculus , S Chand & Company
3. Shanti Narayan: Integral Calculus, S Chand & Company
4. R.K. Jain & S R K Iyengar, Advanced Engineering Mathematics V Ed, Narosa
Reference books
1. . E.D. Rainville and P. E. Bedient: A short course in differential equation.
2. B S Grewal, Engineering Mathematics, Khanna Publisher