## MA1505 – Mathematics I

This is an introductory course in advanced calculus. After a brief review of elementary calculus, we will study in some details the basic computational techniques in Fourier series, multi-variable calculus and vector calculus.

**Syllabus**

Brief review of elementary calculus:

- differentiation,
- integration,
- Taylor series,
- vectors in space.

Fourier series:

- trigonometric series,
- Fourier series,
- Euler's formulas,
- convergence properties,
- half-range expansions.

Partial differentiation:

- partial derivatives,
- chain rule for partial derivatives,
- directional derivatives,
- gradient of differentiable functions,
- maximum and minimum values of functions of several variables,
- Lagrange multiplier method.

Multiple integration:

- double integrals,
- iterated integrals,
- change of order of integration for double integrals,
- transformation of double integral using polar coordinates,
- finding volumes and surface areas using double integrals,
- triple integrals.

Line integrals:

- vector fields,
- conservative vector fields and potential functions,
- piece-wise smooth curves in space,
- parametric representation of curves in space,
- line integrals for scalar valued functions,
- line integrals for vector fields, orientation of curves,
- line integrals in component form,
- fundamental theorem of line integrals,
- Green's Theorem.

Surface integrals:

- piece-wise smooth surfaces in space,
- parametric representation of surfaces in space,
- surface integrals for scalar valued functions,
- surface integrals for vector fields,
- orientation of surfaces,
- the del operator,
- divergence and curl of a vector field,
- Stokes' Theorem,
- Divergence Theorem.

Recommended Texts:

- Main Reference: Thomas' Calculus by Weir, Hass and Giordano; $12^{th}$ edition; Pearson.
- Supplementary Reference: Calculus by James Stewart; $7^{th}$ edition; Brooks Cole.
- Supplementary Reference: Advanced Engineering Mathematics by Erwin Kreyszig; $10^{th}$ edition; Wiley.