Module Code: MATH-417
Module Title: **Methods of Mathematical Physics**
Module Rating: 3 Cr. Hours

Fourier Methods

- The Fourier transform
- Fourier analysis of generalized functions
- The Laplace transform
- Hankel transforms for the solution of PDE and their application to boundary value problems

Green's Functions and Transform Methods

- Expansion for Green's functions
- Transform methods
- Closed form Green's functions

Perturbation Techniques

- Perturbation methods for algebraic equations
- Perturbation methods for differential equations

Variational Methods

- Euler-Lagrange equations
- Integrand involving one, two, three and n variables
- Special cases of Euler-Lagranges equations
- Necessary conditions for existence of an extremum of a functional
- Constrained maxima and minima

Recommended Books

1. D. L. Powers, *Boundary Value Problems and Partial Differential Equations*, 5th edition (Academic Press, 2005)
2. W. E. Boyce, *Elementary Differential Equations,* 8th edition, (John Wiley and Sons, 2005)
3. M. L. Krasnov, G. I. Makarenko and A. I. Kiselev, *Problems and Exercises in the Calculus of Variations*, (Imported Publications, Inc., 1985)
4. J. W. Brown and R. V. Churchill, *Fourier Series and Boundary Value Problems* (McGraw Hill, 2006)
5. A. D. Snider, *Partial Differential Equations: Sources and Solutions* (Prentice Hall Inc., 1999)