CH201 August 3:0

Chemical Engineering Mathematics

Instructor

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Department: Chemical Engineering

Course Time: Tue., Thu., 11:30 AM - 1:00 PM

Lecture venue: Chemical Engineering Class Room

Detailed Course Page: http://chemeng.iisc.ac.in/chemeweb/courses.htm#CH201

Announcements

Brief description of the course

This is a basic Engineering/Applied Mathematics course aimed at post-graduate students entering the Masters and PhD programmes. The course attempts to impart mathematical tools necessary for the analysis of a variety of problems in engineering and applied sciences. It starts with vector spaces and matrix operators, connecting the concepts therein with linear operators. Particular attention is paid to linear ordinary and partial differential operators and their properties, self-adjoint operators, Sturm-Liouville theory and generalized Fourier expansions. Green's functions of linear differential operators, and the solution of inhomogeneous linear differential equations are also discussed.

Prerequisites

Undergraduate level courses in Linear Algebra, Differential Equations, and elementary Real and Complex Analysis

Syllabus

Linear algebraic equations, linear operators, vector and function spaces, metric and normed spaces, existence and uniqueness of solutions. Eigen values and eigen vectors/functions. Similarity transformations, Jordan

forms, application to linear ODEs, Sturm-Liouville problems. PDE's and their classification, initial and boundary value problems, separation of variables, similarity solutions. Laplace and Fourier transforms.

Course outcomes

Students completing this course will be equipped to analyze and solve problems arising in a variety of fields in engineering and science that are of the form of algebraic, differential, or integral equations. They will be able to classify ordinary and partial differential equations, and choose the appropriate method of solution. They will be equipped to obtain series solutions of ordinary differential equations, and solve homogeneous and inhomogeneous partial differential equations. They will learn tools of orthogonal decomposition, and use it for numerical quadrature, and the solution of inhomogeneous initial and boundary value problems.

Grading policy

15% for home assignments, 30% for mid term tests, and 50% for final exam

Assignments

4 to 8 home assignments

Resources

Linear Algebra and its Applications, Gilbert Strang, Thompson (Indian edition).

Mathematical Methods for Physicists, J. B. Arfken and H. J. Weber, Academic Press (Indian reprint).

Mathematical Methods in Chemical Engineering, S. Pushpavanam, Prentice-Hall India.

Advanced Mathematical Methods for Scientists and Engineers, C. M. Bender and S. A. Orszag, McGraw-Hill/Springer-Verlag (Indian/International student edition)