MATH 302: Engineering Mathematics

(Required)

Course Description:

MATH 302: Engineering Mathematics LT:2 LB: 0 CR: 2

The aim of this course is to cover advanced topics in mathematics which are applicable to engineering problems. The course covers vector analysis including vector fields, gradient, divergence, curl, line and surface integrals, and Green' Gauss' and Stokes' theorems; complex variable analysis including power series, differentiation and integration of complex functions; and Cauchy' and residue theorems, and Fourier analysis including complex Fourier series, complex Fourier integral, Fourier transforms, discrete Fourier transform, and fast Fourier transform. Application problems will be solved during problem solving sessions (one tutorial hour per week).

Prerequisite: MATH – 301 : CALCULS - III

Textbook: Advanced Engineering Mathematics by Peter V. O'Neil, New Thomson Learning, International student edition, 2007 – ISBN: 0-495-08237-6

References: Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, Inc. New York, 8th Edition, 1999 – ISBN: 0-471-15496-2

Course Learning Objectives:

To enable the students to:

1. Define vector field functions and evaluate their derivatives.
2. Define and interpret gradient, divergence and curl.
3. Evaluate line integrals of both vector and scalar fields.
4. Transform integrals (line, area, surface and volume) from one to another.
5. Define and interpret differentiation and integration of complex functions.
6. Describe the complex Fourier series of a function
7. Determine the complex Fourier integral of a function.
8. Find Fourier transforms of a function.
9. Describe the discrete Fourier transform
10. Define fast Fourier transform

Course Outline:

[I] Modules:

Module	Topic	Duration
1.	Vector Analysis	1-5 weeks
2.	Complex Analysis	6-10 weeks
3.	Fourier Analysis	11-14 week

Evaluation Methods:

1. Major exams and a final exam.
2. Assignments and quizzes

Course Learning Outcomes:

The expected learning outcome is that the students will be able to:

1. Define vector functions of one variable
2. State Green's theorem and apply it to solve the related problems
3. Evaluate the surface integrals
4. State integral theorem of Stokes and apply it to solve the related problems.
5. Define the complex plane and complex functions
6. State and verify Cauchy – Riemann equations.
7. Expand complex logarithmic functions.
8. Evaluate the real integrals by the residue theorem.
9. Find the complex Fourier series of a function.
10. Describe the discrete Fourier transform.
11. Define Fast Fourier transform

Prepared by:

GS curriculum committee March 2009