Spring 2013

ENGR 5022
Engineering Analysis and Applications (3 s.h.)

Catalog Data: Vector space, basis, projection, null space, function space, L_2 and space of continuous functions, Hilbert space, orthogonality, generalized Fourier series, linear transformation, adjoint transformation, eigenvalue problem, linear functional, Gateaux and Frechet differential, constrained optimization, infinite dimensional systems, complex analysis.

Prerequisite: Graduate Admission in Engineering, Math 3041- Differential Equations.

Textbook: Classnotes

Instructor: Saroj K. Biswas, 215-204-8403, sbiswas@temple.edu

Course Topics:

1. Linear Vector Space
   Vector space, Metric space, norm, scalar product, manifold, linear independence, subspace, projection, basis, orthogonality, null space, linear transformation, change of basis, minimum norm solution, minimum error solution, least square estimation.

2. Functions and Function Spaces
   Space of continuous functions, L_2 space, metric space, Hilbert space, norm and scalar product, orthogonality, generalized Fourier series.

3. Eigenvalue Problem
   Eigenvalues and eigenvectors, generalized eigenvectors, diagonalization, Jordan canonical form, left eigenvectors, spectral decomposition, functions of matrices, eigenvalue sensitivity.

4. System Response
   Systems representation in finite dimensional state space, response of linear systems, time varying systems, properties of solution, dependence of solution on system parameters, sensitivity.

5. Operators
   Differential operators, eigenvalues and eigenfunctions, solution of partial differential equations, EM fields, heat transfer and vibration problems.

6. Complex Analysis
   Analytic functions, conformal mapping, complex integration, Cauchy theorem, contour integral, Laurent series, Taylor series, residue theorem, Nyquist criterion, applications.

Schedule: The course meets for Lecture three hours per week for the semester.

Grading: Grading of the course will be based upon the following:

Term Tests	60%
Final Exam	40%

Computer Usage: The use of Matlab is required for course activities. There will be several projects that will require numerical work using Matlab.

Academic Rights and Responsibilities: Freedom to teach and freedom to learn are inseparable facets of academic freedom. The freedom to learn depends upon appropriate opportunities and conditions in the classroom, on the campus, and in the larger community. The university and the faculty have a responsibility to provide students with opportunities and protections that promote the learning process in all its aspects. Students similarly should exercise their freedom with responsibility.
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Accessibility: Any student who has a need for accommodation based on the impact of a disability should contact me privately to discuss the specific situation as soon as possible. Contact Disability Resources and Services at (215) 204-1280 in 100 Ritter Annex to coordinate reasonable accommodations for students with documented disabilities.

Academic Integrity: This course is conducted under the policies and procedures concerning Academic Honesty as published in the Undergraduate Handbook.