ECE 220 Syllabus

Course: ECE 220

Credit Hours: 3

Course Title: Analytical Foundations of ECE

Course Description:

This course is designed to acquaint the student with the basic mathematical tools used in Electrical and Computer Engineering. The concepts covered in this course will be used in higher level courses and, more importantly, throughout your career as an engineer. Major topics of the course include complex numbers, real and complex functions, signal representation, elementary matrix algebra, solutions to linear systems of equations, linear differential equations, Laplace transforms used for solving linear differential equations, Fourier Series and Transforms and their uses in solving ECE problems.

Prerequisite(s): ECE 200, MA141, MA 241, MA 242, ECE109

Textbook(s) and/or other required material:

Textbook: Analytical Foundations of ECE, Y. Viniotis and H. J. Trussell, 2005
Computer resource: MATLAB

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

(1) Use MATLAB to solve computational problems and generate publishable graphics. (2) Use complex arithmetic and complex functions to describe applied problems. Describe complex numbers and functions in rectangular and exponential forms. Graph the magnitude and phase of complex functions. (3) Use matrix forms to describe and solve linear systems of equations and systems of differential equations. (4) Solve first and second order linear differential equations with constant coefficients both analytically and numerically. Use the analytic methods of undetermined coefficients and Laplace transforms. Use the MATLAB routine ODE23 to solve DEs numerically. (5) Define the Fourier series for a periodic signal. Define the Fourier transform of an aperiodic signal. Compute the Fourier series and transform from their definition as integrals. (6) Determine the Fourier series of the summation of sinusoids directly from the definition by using Euler's formula. (7) Use the properties of linearity, time-shifting and time-scaling to compute the Fourier series/transform of complicated functions from the Fourier series/transforms of simple functions. (8) Use the Fourier series/transforms to find the particular solution to differential equations using the transfer function.

Topics covered:

Function representation and transformations (3)
Complex arithmetic and functions, Euler's formula (6)
Matrices and systems of linear equations, interpolation (6)
Differential equations: method of undermined coefficients (6)
Differential equations: Laplace Transforms (4.5)
Differential equations: Numerical solutions (1.5)

ECE 220 Syllabus

Fourier series: definition, computation, properties (6)
Fourier transforms: definition, computation, properties (4.5)
Transfer functions: solving DEs using Fourier Series methods (2)

Class/laboratory schedule (sessions per week and duration of each session):

Two 75-minutes lectures per week, problem laboratories are optional

Contribution of course to meeting the requirements of Criterion 5 - other:

None

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

3 hours

Contribution of course to meeting the requirements of Criterion 5 - general education:

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	Major	Students must use fundamental principles of math to solve ECE problems. Students select appropriate method to solve a problem that can be solved many ways, e.g., differential equation initial value problem.
Outcome B	N/A	
Outcome C	N/A	
Outcome D	N/A	
Outcome E	Major	Students work independently to solve ECE problems using methods presented in this course
Outcome F	Basic	IEEE Ethics Code is presented
Outcome G	N/A	

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome H	Basic	Students see examples of applications of mathematics that are applied to real problems. Examples are taken from professional magazines, journals and demonstrations using audio signals.
Outcome I	Basic	Students are shown examples where continued learning will benefit them, e. g., they must be able to read professional literature and specifications.
Outcome J	N/A	
Outcome K	Major	Students use Matlab

Person who last prepared this description and date of preparation:

- Ozturk, Hatice Orun (hoo) - Mar 31st, 2009 (04:57pm)