EXPANDED COURSE DESCRIPTION
ELECTRICAL ENGINEERING AND COMPUTER SCIENCE
Lassonde School of Engineering
Electrical Engineering Computer Science
LE / EECS 3604 4.0 SECTION Z
ELECTROMAGNETIC THEORY AND WAVE PROP.
FALL 2017 / WINTER 2018

Last Modified Date: 09/05/2017

COURSE CALENDAR DESCRIPTION

This course provides the student with an introduction to partial differential equations and the mathematics of wave propagation. Specific applications to electromagnetic waves are discussed. Guided waves, transmission lines, and antennas are also introduced. Three lecture hours per week. One tutorial hour per week. Two laboratory hours per week. Prerequisites: General Prerequisite; LE/EECS 2030 3.00 or LE/EECS 1030 3.00; SC/MATH 1014 3.00 or SC/MATH 1025 3.00 or SC/PHYS 2020 3.00. (NOTE: The General Prerequisite is a cumulative GPA of 4.50 or better over all major EECS courses. EECS courses with the second digit "5" are not major courses.)

INSTRUCTOR(S)

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ADDITIONAL INFORMATION

Topics for this course include:
- Review of vector calculus operations: grad, div, curl.
- Introduction to partial differential equations.
- The wave equation and its solutions.
- Electric and magnetic fields; Maxwell’s equations.
- Derivation of the wave equation from Maxwell’s
- EM wave propagation in one, two, and three dimensions.
- Waveguides; propagation modes.
- Transmission lines.
- Antennas.
- Partial differential equations beyond EM: the diffusion equation.

Laboratory experiments for this course include:
- Lab introduction.
- Numerical solutions to partial differential equations using MATLAB.
- The wave equation in MATLAB.
- Experimental evaluation of Maxwell’s equations. (Lab equipment or MATLAB.)
- Experimental evaluation of EM wave propagation. (Lab equipment or MATLAB.)
- Waveguides, transmission lines, and antennas. (Lab equipment or MATLAB.)
- Extra tutorial for course review.

Course Learning Objectives:
Upon successful completion of the course, the student:
1. Comprehends the meaning of a partial differential equation (PDE) in a mathematical expression;
2. Recognizes the wave equation as a type of PDE in a mathematical expression;
3. Applies the travelling wave as a solution to the wave equation in a mathematical expression, and produces this solution numerically in the laboratory;
4. Comprehends Maxwell’s equations as physical phenomena, in mathematical expressions and in written descriptions, and identifies the effects of Maxwell’s equations in the laboratory;
5. Computes the wave equation from Maxwell’s equations in one, two, and three dimensions, and applies the travelling wave solution, in a mathematical expression;
6. Computes the travelling wave solution in a conducting waveguide and in a transmission line, and applies these solutions in the laboratory;
7. Analyzes the operation of EM antennas in mathematical expressions, and in the laboratory; and
8. Differentiates between the wave equation and the diffusion equation in a mathematical expression.

Course Evaluation:
Evaluation will be based on laboratory assignments, problem sets, a midterm examination, and a final examination.
- Problem sets: 5%
- Laboratory assignments: 15%
- Midterm examination: 30%
- Final examination: 50%

Textbook:
This book is in the York University Science and Engineering Library. The library also has several other useful titles on electromagnetism, wave propagation, and antennas

ACADEMIC INTEGRITY LINKS
- Senate Policy on Academic Honesty - http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/
- Academic Integrity - http://lassonde.yorku.ca/academic-integrity

STUDENT LINKS
- Student Rights and Responsibilities - http://oscr.students.uit.yorku.ca/student-conduct
- Religious Observance - https://w2prod.sis.yorku.ca/Apps/WebObjects/cdm.woa/woa/regobs
- Counselling and Disability Services - http://cds.info.yorku.ca/

Many courses utilize Moodle, York University's course website system. If your course is using Moodle, click here to access it.
Moodle @ York University