

Fall 2023

ECE 368 - SIGNAL TRANSMISSION

Mohammed Feknous

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**Helen and John C. Hartmann Department of Electrical and Computer Engineering
New Jersey Institute of Technology**

ECE 368 Signal Transmission (3 credits, 3 contact hours, required course)

Instructor: Mohammed Feknous; email: feknous@njit.edu; Tel.: 973-596-6460

Text books S. Rosenstark, "Transmission lines in Computer Engineering," McGraw Hill, 1994
 SBN 0-07-053953-7 (main text)
 A.F. Peterson and G.D. Durgin, Transient signals on Transmission lines, Morgan
 & Claypool, 2009 ISSN 1932-1252

Course Description:

To introduce computer engineering students to fundamental principles of transmission lines in time domain with applications to digital systems, interconnects between line drivers and line receivers and crosstalk in coupled lines. Topics include the telegrapher's equations, wave propagation, lattice diagrams, transients in digital systems, crosstalk, proper termination for high speed logic.

Prerequisite: CoE students - ECE 232 and ECE 251 **Corequisite:** none

Specific course learning outcomes (CLO): The student will be able to

1. understand transmission lines and when they are used as interconnects; understand and minimize propagation delay; provide examples;
2. understand and utilize the basic solutions of transmission lines to transient phenomena in a resistive and reactive loads based on lattice diagrams;
3. utilize graphical solutions due to non-linear source and load terminations of transmission lines;
4. utilize solutions to include crosstalk for multiple coupled transmission lines;
5. utilize solutions to high speed ECL logic and other logic families in the presence of transmission lines.

Relevant student outcomes (ABET criterion 3):

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics (CLO 1-5)
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors (CLO 1, 5)
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions (CLO 2-5)
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies (CLO 1-5).

Computer assisted design and course specific software:

Multisim, Matlab

This course outline serves to provide a big picture of the course. Instructional materials such as textbooks, individual topics, and grading policy are subject to revision and changes by individual instructors.

| Tentative Course Schedule | Weeks |
|--|--------------|
| Transmission Line Fundamentals | 1 |
| Reflections on Transmission Lines | 2-3 |
| Review and examination 1 | 4 |
| Review of Laplace Transform | 5 |
| Transients on Transmission Lines, PSPICE demonstration | 6-7 |
| Nonlinear sources and terminations, Bergeron plots | 8 |
| Review and examination 2 | 9-10 |
| Crosstalk on transmission lines | 11 |
| Interconnecting high speed ECL | 12 |
| Review and examination 3 | 13-14 |

Grading policy: Homework, quizzes class, participation:5%
Three examinations: 20%, 20%, 20%
Final examination: 35%

Homeworks and projects Multisim - based simulations of various transmission line problems

Updates and Assignments to be distributed via e-mail

Office: ECEC 311

Office hours: M 4:00 PM – 4:45 PM
T 4:00 PM – 4:45 PM
R 1:00 PM – 1:45 PM

Other times can be arranged through appointments;

Set up appointment for any office hour meeting through email stating the suitable meeting day and time

Honor Code: The NJIT Honor Code will be upheld; any violations will be brought to the immediate attention of the Dean of Students.

Prepared by: M. Feknous (Niver)

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