ECE 391 Winter 2020 – Transmission Lines

Instructor:	Tejasvi Anand
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Office Hours:	Tuesday 1:00 pm-2:00 pm
Webpages:	1. **https://web.engr.oregonstate.edu/~anandt/ECE391_Wint_2020** 2. **Canvas**
TA/Office Hours:	Siddarth Mahendra (mahendrs@oregonstate.edu) Monday: 4:00pm - 5:00pm Dyuti Sengupta (senguptd@oregonstate.edu) Thursday 3:00pm - 4:00pm **Location: Kelley Atrium**
Course Objective:	Transient and steady-state analysis of transmission line circuits with application to engineering problems.
Grading:	Homework 10% (Online Canvas submissions) Test-1 30% (Wed 02/05/20) Test-2 30% (Wed 03/04/20) Comprehensive Final Exam 30% (will be decided soon by the school)
Homework:	**Individual submission is required.** **Late homework will not be accepted.** **Submission: Online – Canvas**
Tests/Final Exam:	The tests will be **closed book/notes**. Calculators are allowed. There will be **no makeup exam** unless there is a medical emergency and a doctor's note is provided to the instructor.
Cheating Policy:	DO NOT copy someone else's work. **Cheating is unacceptable. Swift disciplinary action will be taken for cheating**.
Text Book:	Umran S. Inan, Aziz S. Inan, *Engineering Electromagnetic*, ISBN 0-8053-4423-3, Prentice Hall, 1998
References:	Howard Johnson, Martin Graham, *High-Speed Digital Design: A Handbook of Black Magic*, ISBN 0-13-395724-1
Class Notes	PDF will be posted online.

Prerequisite: ENGR-203, MTH-254, MTH-256, ECE-322

Course Outline

- Introduction to traveling waves, guided electromagnetic waves
- Wave propagation on infinite lossless line, wave equation, characteristic impedance, sinusoidal and non-sinusoidal waves
- Step waves and pulses on finite lossless line: reflection coefficient, single and multiple reflections, delay time, lattice diagram.
- Simulation and modeling of transmission line environments with SPICE analog simulator.
- Sinusoidal waves on infinite lossy line: general telegraphist's equations and Helmholtz equation, characteristic impedance, propagation constant, wavelength and electric length, general traveling wave solutions, phasor representation
- Sinusoidal waves on finite lossy line: reflection coefficient, voltage and current on line, standing waves, standing wave ratio, input impedance along line, quarter wave transformer
- Derivation and application of Smith Chart; impedance along terminated line, lines in tandem, stub matching designs, lossy lines

Student Learning Outcomes

At the completion of the course, students will be able to…

- **Identify** the characteristics of ideal transmission lines and transmission line circuits.
- **Analyze** lossless transmission line circuits with linear terminations.
- **Apply** the lattice diagrams to **determine** voltage step response of lossless transmission line circuits.
- **Determine** steady-state response of lossless and lossy transmission line circuits with different linear terminations.
- **Apply** the Smith chart to **analyze and design** transmission line matching circuits.

Statement Regarding Students with Disabilities:

Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS) with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 541 - 737 - 4098

Expectations for Student Conduct:

Student conduct is governed by the university's policies, as explained in the Office of Student Conduct and Community Standards. In an academic community, students and faculty, and staff each have responsibility for maintaining an appropriate learning environment, whether online or in the classroom. Students, faculty, and staff have the responsibility to treat each other with understanding, dignity and respect. Disruption of teaching, administration, research, and other institutional activities is prohibited by Oregon Administrative Rule 576 - 015 - 0015 (1) and (2) and is subject to sanctions under university policies, Office of Student Conduct and Community Standards.