EE-575

Wave propagation along transmission lines

Rachidi-Haeri Farhad

Cursus	Sem.	Type
Electrical and Electronical Engineering	MA1, MA3	Opt.

Language of teaching	English
Credits	2
Session	Winter
Semester	Fall
Exam	During the semester
Workload	60h
Weeks	14
Hours	**2 weekly**
Lecture	2 weekly
Number of positions	

Summary

In this lecture, we will describe the theoretical models and computational methods for the analysis of wave propagation along transmission lines.

Content

1. Transmission Line Theory
Hypotheses, overview of models, Transmission Line and Antenna Mode Responses, derivation of telegrapher's equations

2. Transient analysis for lumped source excitation
Transmission of a pulse on an ideal line, multiple reflections, Bergeron diagram, reflections for different types of loads

3. Wave propagation on multiconductor systems
Determination of line inductance parameters, determination of line capacitance parameters, incorporation of losses. Modal analysis.

4. Transient analysis for distributed source excitation : field-to-transmission line coupling
Derivation of generalized Telegrapher's equations for field-excited lines. Representation of source terms. Different formulations of field-to-transmission line coupling equations. Plane wave excitation.

Learning Prerequisites

Recommended courses

Electromagnetics I, II

Learning Outcomes

By the end of the course, the student must be able to:

- Analyze transmission lines in the frequency domain
- Analyze transmisssion lines in the time domain
- Be able to match a multiconductor transmission lines
- Analyze transmission lines excited by external electromagnetic fields
- Compute/measure parameters of a transmission line

Teaching methods

Ex cathedra and integrated exercices

Assessment methods

Continuous control

Resources

Bibliography

Analysis of multiconductor transmission lines, C.R. Paul, Wiley, 1994.
Interaction of electromagnetic fields generated by lightning with overhead electrical networks, C.A. Nucci, F. Rachidi, in "The Lightning Flash", IEE Press, 2003.

Ressources en bibliothèque

- Analysis of multiconductor transmission lines / Paul