

TNE071 Microwave Engineering - Autumn 2017 (HT1)

6 hp course at ITN, LiU, Norrköping

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For: Undergraduate students in Electrical and Communication Engineering programs and PhD students.

Introduction

Beyond the first courses in Electromagnetics or your last research article, there is a world of challenging applications, where new ideas become reality. Understanding microwave signals and being skilled to design devices and systems that process them, open the door to all modern technology. It started with Maxwell and his famous equations – I like to mention also Helmholtz - but the question is what can we do today, further, with all our knowledge?

This document presents an overview of the Microwave Engineering course to be given HT1, August – October, 2017.

Course Objectives

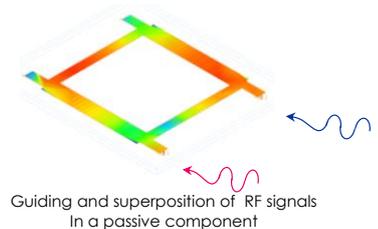
The course provides a thorough coverage of microwave concepts and theory based on fundamental principles of RF and microwave engineering. Key aspects include microwave passive and active circuits and systems, with focus on microwave sensors in form of different types of radars.

The course is given with lectures, seminars and labs. The labs are organized in form of a microwave sensor mini-project.

Course Content

The following topics are covered:

- Introduction of the course, Maxwell's equations review
- Application of transmission lines - passive circuits
- Propagation modes in wave guides,
- Review, impedance matching
- Microwave circuit design using passive components: amplifiers, mixers, oscillators
- Introduction to microwave systems and antennas for microwave systems
- Microwave sensors, modern radar systems and their applications.



Lab Topics

- A mini-project work to demonstrate a microwave sensor design for various applications (Angle-of-Arrival, Range-, Bio-Sign detection, etc.)
- Design methodology for microwave circuits and systems. Demo laboratory on S-parameters measurement
- Advanced electromagnetic simulations using dedicated software tools

Examination

Undergraduate students: Open book examination with final grades A, B and C (5, 4, and 3)

Course Literature

- Microwave Engineering (third or fourth edition), by David Pozar, fourth edition's ISBN 978-0-470-63155-3.
- Several scientific articles will be used in conjunction with different moments of the course.

For PhD Students

Since 2010, the Microwave Engineering course is simultaneously given for PhD students.

Attendance: Lectures and seminars are optional but strongly recommended, laboratory moments are compulsory.

Examination is a seminar specifically adapted to the research field and individual interest. Based on proposed scientific publications, a presentation will be held, followed by discussions. The main goal of the examination is to identify possible ways in which microwave components theory, design approach and dedicated design tools presented in the course can be related to new research fields and new materials. *Presentation form and due time:* TBD - after discussion with you and your supervisor.

Welcome!
Adriana