

ECE 485 – Microwave Design Techniques

Catalog Description: Introduction to basic techniques required for the design of high-frequency circuits and systems.

Credits: 4 **Terms Offered:** Spring

Prerequisites: ECE 390, ECE 391X

Courses that require this as a prerequisite: None

Structure: Two 80-minute lectures and one 90-minute lab per week

Instructors: A. Weisshaar

Course Content:

- Introduction: course review, transmission line theory, transmission line parameters, wave propagation and reflection, Smith Chart
- Transmission lines and waveguides: general solutions of TEM, TE and TM waves, rectangular and circular waveguides, coaxial line Planar transmission lines effective dielectric constant and characteristic impedance for stripline, microstrip line and coupled line structures
- Microwave Network parameters: matrix representations, impedance and admittance parameters, scattering parameters, ABCD parameters and signal flow graphs
- Analysis and design of passive circuits (Part I): impedance matching networks, stub tuning, quarter wave and multi-section matching transformers
- Analysis and design of passive circuits (Part II): design of power dividers, branch line hybrids, directional couplers and filters
- Analysis and design of active circuits: noise figure definition, characteristics of microwave transistors, single stage amplifier design, design of LNA and broadband amplifier design; basic principle of oscillators
- Introduction to hybrid microwave integrated circuits (MICs) and monolithic microwave integrated circuits (MMICs)

Measurable Student Learning Outcomes:

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

1. **Identify** the characteristics of waveguides and planar transmission line structures such as stripline, microstrip line and coupled line structures (ABET outcomes: A, e, m)
2. **Calculate** the network parameters of microwave networks using microwave network analysis (ABET outcomes: A, E, M)
3. **Design and analyze** impedance matching networks for a given set of specifications (ABET outcomes: A, C, M)
4. **Design and analyze** passive microwave components such as power dividers, hybrids, couplers and filters for a given set of specifications (ABET outcomes: A, B, C, k, M, o)
5. **Design** microwave amplifiers for a given set of specifications (ABET outcomes: A, C, M)

6. Use hp-ADS software to validate the designs and to generate layout for the fabrication of the component (ABET outcomes: B, C, K, o)
7. **Test and obtain** the measured characteristics of the designed component using vector network analyzer (ABET outcome: B, o)

Graduate students must solve more difficult problems that require a higher-level understanding of microwave engineering concepts

Learning Resources:

- David M. Pozar, *Microwave Engineering*, John Wiley & Sons, Inc., 3rd edition, 2005

Students with Disabilities:

Accommodations are collaborative efforts between students, faculty and Services for Students with Disabilities (SSD). Students with accommodations approved through SSD 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 SSD should contact SSD immediately at 737-4098.

Link to Statement of Expectations for Student Conduct:

<http://oregonstate.edu/admin/stucon/achon.htm>

Revised: 5/29/07