University of Victoria Engineering

Faculty of Engineering

COURSE OUTLINE

ELEC 404 – Microwaves and Fiber Optics

Term – SUMMER 2015 (201505)

Instructor

Dr. Thomas Darcie
Phone: 721-8686
E-mail: tdarcie@uvic.ca

Office Hours

Days: By appointment
Time:
Location: EOW 443

Course Objectives

To introduce students to microwave and fiber optic engineering, including transmission line theory, microwave network analysis, optical fiber, and related components and measurement principles.

Learning Outcomes

Upon completion of this course students should be able to:

- describe basic properties of transmission lines in terms of characteristic impedance, complex propagation constants, transmission and reflection coefficients,
- understand electromagnetic wave propagation in waveguides, including wave impedance, spatial structure of electric and magnetic fields, and mode cutoff condition,
- describe the basic operation of coupled lines in terms of even and odd mode impedances and coupling coefficient,
- describe networks of inter-connected microwave components and ports in terms of network analysis tools and in particular the scattering matrix,
- calculate power flow in transmission lines and waveguides,
- use a variety of techniques to optimize power flow or minimize reflections in transmission line systems and in particular become comfortable with the applications of the Smith Chart,
- calculate basic antenna parameters such as beam width, directivity, gain, radiation loss and resistance and calculate power link budget for a variety of wireless links,
- describe the noise temperature, noise figure, gain, and power available from a microwave amplifier,
- understand basic design and fabrication techniques and mode propagation properties for optical fiber,
- calculate propagation limitations in optical fiber resulting from attenuation and chromatic dispersion, and
- describe basic use of various optical waveguide devices including couplers, circulators, and fiber Bragg gratings in constructing a basic optical communication link.

Syllabus

Introduction and Fundamentals 3

Microwave Engineering:

Transmission Line Theory..... 4.5

Waveguide theory	4.5
Couplers and Coupled Lines	1.5
Network Analysis	3
Smith Chart and Load Matching	3
Antennas	1.5
Impedance Matching and Tuning	3
Amplifier Fundamentals	1.5
Optical Fiber Engineering:	
Optical Fiber Communications	1.5
Modes and Propagation in Optical Fiber	3
Impairments in Optical Fiber	1.5
Optical Waveguide Devices	1.5
Sub Total	33
Test	1.5
Review	1.5
Total	36

Laboratory Experiments (Each experiment is of 3 hours duration)

Experiment 1	Standing Waves and Impedance Measurements Using Slotted Line
Experiment 2	Microwave Couplers and Network Analysis
Experiment 3	Microwave Antennas
Experiment 4	Basic Fiber Optic Measurements and Transmission

Lectures

A-Section(s):	A01 / CRN 30319
Days:	Mondays & Thursdays
Time:	1:00 - 2:20
Location:	ECS 108

Labs **Location: ELW A317**

B01	Wed.	15:00-18:00
B02	Wed.	15:00-18:00
B03	Mon.	16:00-19:00
B04	Mon.	16:00-19:00

Required Text

Title:	Microwave Engineering
Author:	D. M. Pozar
Publisher:	John Wiley & Sons
Year:	2012 (4th ed.)

Optional Text

Title:	Optical Fiber Communications
Author:	G. Keiser
Publisher:	McGraw-Hill
Year:	2011 (4th ed.)

Title: Laboratory Manual for ELEC 404 - Microwave and Fiber Optics (posted online)
Author: T. Darcie, P. Fedrigo, R. Vahldieck, J. Bornemann
Publisher: University of Victoria
Year: April 2011

References:

Assessment:

Assignments:	10 %	Due Dates: As posted
Labs	20 %	
Mid-term	20 %	Date: June 25, 2015 – regular lecture time and place
Final Exam	50 %	Date: TBD

Note: Failure to complete all laboratory requirements will result in a grade of N being awarded for the course. Failure to pass the final exam will result in a failing grade for the course.

The final grade obtained from the above marking scheme for the purpose of GPA calculation will be based on the percentage-to-grade point conversion table as listed in the current Undergraduate Calendar.

Assignment of E grade and supplemental examination for this course will be at the discretion of the Course Instructor. The rules for supplemental examinations can be found in the current Undergraduate Calendar.

http://web.uvic.ca/calendar/FACS/UnIn/UARe/Grad.html

Note to Students:

Students who have issues with the conduct of the course should discuss them with the instructor first. If these discussions do not resolve the issue, then students should feel free to contact the Chair of the Department by email or the Chair's Secretary to set up an appointment.

Accommodation of Religious Observance
http://web.uvic.ca/calendar/GI/GUPo.html

Policy on Inclusivity and Diversity
http://web.uvic.ca/calendar/GI/GUPo.html

Standards of Professional Behaviour

You are advised to read the Faculty of Engineering document Standards for Professional Behaviour in current Undergraduate Calendar, which contains important information regarding conduct in courses, labs, and in the general use of facilities.

Cheating, plagiarism and other forms of academic fraud are taken very seriously by both the University and the Department. You should consult entry in current Undergraduate Calendar for the UVic policy on academic integrity.

http://www.uvic.ca/engineering/assets/docs/professional-behaviour.pdf

Course Lecture Notes

Unless otherwise noted, all course materials supplied to students in this course have been prepared by the instructor and are intended for use in this course only. These materials are NOT to be re-circulated digitally, whether by email or by uploading or copying to websites, or to others not enrolled in this course. Violation of this policy may in some cases constitute a breach of academic integrity as defined in the UVic Calendar.