ECE 404 – Microwaves and Fiber Optics  
Term – SUMMER 2019 (201905)

Instructor
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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 31547
Days: Mondays & Thursdays
Time: 1:00 - 2:20
Location: ECS 108

Labs
B02  Tue. 14:00-17:00 (wk2)
   TA - babaei.lhm@gmail.com
B04  Fri. 14:00-17:00 (wk2)
   TA - sh.moradi59@gmail.com
B05  Wed. 14:30-17:30 (wk1)
   TA - tai.nguyenthe@gmail.com
B06  Wed. 14:30-17:30 (wk2)
   TA - vahid.shiran1994@gmail.com

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 ECE 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 27, 2019 – regular lecture time and place
Classroom  10 %
Final Exam  40 %  Date: TBD

Note: Failure to complete all laboratory requirements will result in a grade of N being awarded 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.

https://web.uvic.ca/calendar2019-05/undergrad/info/regulations/grading.html

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.

https://web.uvic.ca/calendar2019-05/undergrad/info/regulations/exams.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 Assistant to set up an appointment.

Accommodation of Religious Observance:
https://web.uvic.ca/calendar2019-05/undergrad/info/regulations/religious-observanc.html

Policy on Inclusivity and Diversity:
https://web.uvic.ca/calendar2019-05/general/policies.html

Standards of Professional Behaviour: You are advised to read the Faculty of Engineering document Standards for Professional Behaviour, which contains important information regarding conduct in courses, labs, and in the general use of facilities.
https://www.uvic.ca/engineering/assets/docs/professional-behaviour.pdf

Cheating, plagiarism and other forms of academic fraud are taken very seriously by both the University and the Department. You should consult the entry in the current Undergraduate Calendar for the UVic policy on academic integrity.
https://web.uvic.ca/calendar2019-05/undergrad/info/regulations/academic-integrity.html
Equality: This course aims to provide equal opportunities and access for all students to enjoy the benefits and privileges of the class and its curriculum and to meet the syllabus requirements. Reasonable and appropriate accommodation will be made available to students with documented disabilities (physical, mental, learning) in order to give them the opportunity to successfully meet the essential requirements of the course. The accommodation will not alter academic standards or learning outcomes, although the student may be allowed to demonstrate knowledge and skills in a different way. It is not necessary for you to reveal your disability and/or confidential medical information to the course instructor. If you believe that you may require accommodation, the course instructor can provide you with information about confidential resources on campus that can assist you in arranging for appropriate accommodation. Alternatively, you may want to contact the Centre for Accessible Learning located in the Campus Services Building.

The University of Victoria is committed to promoting, providing, and protecting a positive, and supportive and safe learning and working environment for all its members.

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.

Sexualized Violence Prevention and Response at UVic
UVic takes sexualized violence seriously, and has raised the bar for what is considered acceptable behaviour. We encourage students to learn more about how the university defines sexualized violence and its overall approach by visiting www.uvic.ca/svp. If you or someone you know has been impacted by sexualized violence and needs information, advice, and/or support please contact the sexualized violence resource office in Equity and Human Rights (EQHR). Whether or not you have been directly impacted, if you want to take part in the important prevention work taking place on campus, you can also reach out:

Where: Sexualized violence resource office in EQHR; Sedgewick C119
Phone: 250.721.8021
Email: svpcoordinator@uvic.ca
Web: www.uvic.ca/svp