Faculty of Engineering | Electrical and Computer Engineering
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University of Victoria

COURSE OUTLINE

ECE 404 – Microwave Engineering and Fiber Optics

Term –SUMMER 2020 (202005)

Instructor

Dr. Thomas Darcie
Phone: 250 721-8686 (probably not there)
E-mail: tdarcie@uvic.ca (preferred)

Office Hours (Virtual)

Days: Mon./Thur. after class
Any other time – by appointment

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

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

Software Projects (Subject to change)

Project 1	Introduction to Keysight ADS, transmission lines, microwave simulation and measurement
Project 2	CAD microwave couplers and network analysis
Project 3	CAD microwave transmitter or receiver comprising amplifier and antenna

A-Section(s): A01 / CRN 30310   **B**-Sections: TA project support TBD
Days: Mon./Thurs.
Time: 1:00 – 2:20
Course Web Site: https://www.ece.uvic.ca/~tdarcie/ELEC_404/
Login: ece404   Pswd: electro

Required Textbook

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

Optional Textbooks

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

Title:	100 ADS Design Examples
Author:	Ali A. Behagi
Publisher:	Techno Search
Year:	2016

(Ch. 2 available on line:
https://www.keysight.com/upload/cmc_upload/All/Chapter2-100ADS.pdf)

Online Course Delivery:
As this course will be conducted online during this term, students will need to complete assignments/projects online. The students will require access to a computer which is capable of running Keysight (Agilent) ADS software. For detailed system requirements see:
https://edadocs.software.keysight.com/display/engdocads/ADS+2020+Update+2.0+System+Requirements#ADS2020Update2.0SystemRequirements-SystemRequirements-Windows?id=3093434
Detailed installation instructions and access to a license server through CMC Microsystems (no cost to student) will be provided.
Students will also be required to access the course web site (above), CourseSpaces, upload scanned or converted (pdf) assignments and tests, and participate on line via Blackboard Collaborate (or Zoom) (no download required).

References:

Assessment:		Due Dates:
Assignments:	10 %	As posted on web site class calendar
Work Sheets	15 %	Midnight on day of respective lecture
Projects	25 %	TBD
Mid-term	20 %	June 25, 2020 – during scheduled class
Final Exam	30 %	TBD

Important: All deadlines and schedules for this course will reference Pacific Daylight Time.

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://www.uvic.ca/calendar2020-05/undergrad/index.php#/policy/S1AAgoGuV?bc=true&bcCurrent=14%20-%20Grading&bcItemType=policies

Assignment of an 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://www.uvic.ca/calendar2020-05/undergrad/index.php#/policy/SJ2Rxoz_N?bc=true&bcCurrent=13%20-%20Examinations&bcItemType=policies

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.

Course Withdrawal Deadlines:
- May 16, 2020: Withdrawal with 100% reduction of tuition fees
- June 6, 2020: Withdrawal with 50% reduction of tuition fees
- July 1, 2020: Last day for withdrawal (no fees returned)

Accommodation of Religious Observance:
https://www.uvic.ca/calendar2020-05/undergrad/index.php#/policy/r1q0gofdN?bc=true&bcCurrent=10%20-%20Accommodation%20of%20Religious%20Observance&bcItemType=policies

Policy on Inclusivity and Diversity:

Engineering: https://www.uvic.ca/engineering/about/equity/index.php
Academic Calendar: https://www.uvic.ca/calendar2020-05/undergrad/index.php#/policy/HkQ0pzdAN

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

Academic Integrity
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://www.uvic.ca/calendar2020-05/undergrad/index.php#/policy/Sk_0xsM_V?bc=true&bcCurrent=08%20-%20Policy%20on%20Academic%20Integrity&bcItemType=policies

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 an appropriate accommodation. Alternatively, you may want to contact the Centre for Accessible Learning located in the Campus Services Building. https://www.uvic.ca/services/cal/. The University of Victoria is committed to promoting, providing, and protecting a positive, 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

Office of the Ombudsperson:
The Office of the Ombudsperson is an independent and impartial resource to assist with the fair resolution of student issues. A confidential consultation can help you understand your rights and responsibilities. The Ombudsperson can also clarify information, help navigate procedures, assist with problem-solving, facilitate communication, provide feedback on

an appeal, investigate and make recommendations. Phone: 250-721-8357; Email: ombuddy@uvic.ca; Web: https://uvicombudsperson.ca/