**WINTER 2019**

# ECE 7440 – Introduction to Microwave Remote Sensing

COURSE DESCRIPTION:

This course introduces students to the theory, principles, and application of microwave remote sensing, with a focus on active remote sensing of geophysical media.

COURSE OBJECTIVE:

By the end of the course, students will have a fundamental understanding of key concepts in microwave remote sensing. Students will be able to do the following, through the assignments, examination, and design project:

- Critically evaluate radar design parameters for a chosen remote sensing problem
- Implement algorithms and models for microwave remote sensing problems
- Link geophysical parameters to dielectric properties, and hence, electromagnetic wave scattering and radar measurements

PRE-REQUISITES:

- ECE 3590 Electromagnetic Theory (or equivalent)
- A firm grasp of the mathematical concepts and foundations of an undergraduate electrical engineering curriculum.
- An ability to program in a mathematical programming language is required. Programming-specific aspects will generally not be covered in the course.

CONTACT HOURS:

3-hours per week

COURSE CONTENT:

The following topics will be discussed:

1. Introduction to Microwave Remote Sensing
2. Radar and SAR Principles
3. EM Waves in Multilayered Media
4. Dielectric Properties of Natural Materials
5. Scattering from Geophysical Media
6. Polarimetry

Additional advanced research topics as determined by the instructor.

HOMEWORK:

Review of textbooks and contemporary literature are required for the successful completion of this course. Evaluation will include assignments and one project, which will consist of theoretical and applied problems. Please refer to the following table in the Evaluation section.

TEXTBOOK:

- Microwave Radar and Radiometric Remote Sensing, Fawwaz Ulaby and David Long, Artech House, 2014.

REFERENCES:

- Introduction to Microwave Remote Sensing, Iain. H. Woodhouse, CRC Press, 2006.

EVALUATION:

Your final course grade is determined by your performance in assignments, project, and a final examination. The weighting of each of these components is as follows:

| COMPONENT | NO | VALUE % | TOTAL VALUE | DETAILS / ADDITIONAL INFO |
|---|---|---|---|---|
| Assignments | 3 | 10% | 30 | |
| Project | 1 | 30% | 30 | |
| Final Examination | 1 | 40% | 40 | |
| **TOTAL** | | | 100 | |

INSTRUCTOR INFO:

Name:..... Dustin Isleifson, Ph.D., P.Eng.
Office:..... E3-513 EITC
Tel:..... (204) 474-6553
Email:..... Dustin.Isleifson@umanitoba.ca

Office Hours: ..... By appointment

VOLUNTARY WITHDRAW:

**Wednesday, 20 March 2019**

REQUIREMENTS/REGULATIONS

**Student Responsibilities**: It is the responsibility of each student to contact the instructor if he/she is uncertain about his/her standing in the course and his/her potential for receiving a failing grade. Students should also familiarize themselves with Sections 4 and 6 of the Regulations dealing with, among others, incomplete term work, deferred examinations, attendance and withdrawal, etc..

**Lectures:** Attendance at lectures is essential for successful completion of this course. Students must satisfy each evaluation component in the course.

ACADEMIC INTEGRITY

Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations and Requirements of the University of Manitoba, Section 7.1, students are reminded that plagiarism* or any other form of cheating is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university) regardless of media

- examinations
- assignments
- laboratory reports
- term exams

A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty

Please refer any questions regarding Academic Integrity to your course instructor.

***Plagiarism:** to steal and pass off (the ideas or words of another) as one's own; use (another's production) without crediting the source