University of Manitoba

Department of Electrical & Computer Engineering
Graduate Course Outline

Winter 2025

ECE 7440 – **Microelectronic Fabrication And High Vacuum Technology**

COURSE DESCRIPTION:

This course covers the various technologies used in the fabrication of integrated circuits (ICs) and MEMS. Emphasis is on silicon based processes and devices. Topics include wafer preparation, oxidation, thin film deposition, diffusion and ion implantation, lithography, wet and dry etching, epitaxy, metallization, and vacuum system technology.

COURSE OBJECTIVE:

To provide students background in microelectronic fabrication technologies.

PRE-REQUISITES:

ECE 3760 Electronics 3E or permission by instructor.

CONTACT HOURS:

3-hours per week. Follows ECE 4100 lectures, with additional lectures added for which time will be determined.

COURSE CONTENT:

The following topics will be discussed:

- *Introduction to Microelectronic Fabrication*
- *Silicon and GaAs Substrates*
- *Oxidation and Doping*
- *Pattern Transfer*
- *Thin Films*
- *Process Integration*
- *High Vacuum Technology*
- *Introduction to Silicon Micromachining*

Additional advanced research topics as determined by the instructor.

HOMEWORK:

Written assignments related to the various topics and a report based project with a seminar presentation.

TEXTBOOK:

Fabrication Engineering at the Micro- and Nanoscale, Stephen A. Campbell, Oxford University Press, 4th edition, 2012.

GRADE ANNOUNCEMENTS:

Grades for this course will be announced by May 2025

EVALUATION:

Your final course grade is determined by your performance in the components list below in the Evaluation Table (seminar, assignments, project, mid-term, and a final examination. Students must receive a minimum of 50% on the final examination and must complete and pass all components in the course in order to be eligible to receive a passing grade.

Each component is weighted as follows:

COMPONENT	NO	VALUE %	TOTAL VALUE	DETAILS / ADDITIONAL INFO
Project + Seminar	1	20%	20	
Assignments	5	3%	15	
Term tests	2	15%	30	
Final Examination	1	35%	35	
TOTAL			100	

GRADE SCALE:

LETTER	MARK	LETTER	MARK	LETTER	MARK	LETTER	MARK
A+	95-100	B+	80-84	C+	65-69	D	45-54
A	85-94	B	70-79	C	55-64	F	<45

INSTRUCTOR INFO:

Name: ..... Cyrus Shafai
Office: ..... E1-534 EITC
Tel: ..... (204) 474-6302
Email: ..... Cyrus.Shafai@umanitoba.ca

Office Hours: ..... By appointment

VOLUNTARY WITHDRAW:

....

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