ECE 7440 – Microelectronic Fabrication And High Vacuum Technology

COURSE OUTLINE – WINTER 2015

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, expitaxy, metallization, and vacuum system technology.

COURSE OBJECTIVE:
To provide students background in microelectronic fabrication technologies.

PRE-REQUISITES:
ECE 3760 Electronics 3E

CONTACT HOURS:
Follows ECE 4100 lectures, with additional lectures added for which time will be determined.

COURSE CONTENT:
The following topics will be covered:
1. Introduction to Microelectronic Fabrication
   Historical Perspectives; The Fabrication Process and Technologies, Cleanrooms
2. Silicon and GaAs Substrates
   Crystal Structure and Defects; Silicon Wafer Preparation; GaAs Wafer Preparation
3. Oxidation and Doping
   Diffusion of Dopants; Thermal Oxidation of Silicon; Ion Implantation of Dopants
4. Pattern Transfer
   Optical Lithography; Electron Beam and X-Ray Lithography; Wet Etching; Plasma Etching
5. Thin Films
   Vacuum Technology; Physical Vapour Deposition; Sputter Deposition; Chemical Vapour Deposition; Epitaxy
6. Process Integration
   Isolation; Metallization and Reliability; Planarization; Device Technologies
7. High Vacuum Technology
8. Introduction to Silicon Micromachining

HOMEWORK:
Written assignments and a project.

TEXTBOOK:
EVALUATION:

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

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<tr>
<th>COMPONENT</th>
<th>NO</th>
<th>VALUE %</th>
<th>TOTAL VALUE</th>
<th>DETAILS / ADDITIONAL INFO</th>
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<tbody>
<tr>
<td>Homework/Assignments</td>
<td>5</td>
<td>2%</td>
<td>10</td>
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<tr>
<td>Project</td>
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<td>Midterm Exam</td>
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<td>Final Examination</td>
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INSTRUCTOR INFO:

Name: Dr. Cyrus Shafai
Office: E1-534
Tel: 474-6302
Email: Cyrus.Shafai@ad.umanitoba.ca

Office Hours:
TBA

VOLUNTARY WITHDRAW:

**Thursday, Mar. 19, 2015**

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 about his or her potential for receiving a failing grade. Students should also familiarize themselves with Sections 4 and 6 of the Regulations dealing with incomplete term work, deferred examinations, and attendance and withdrawal.
  - **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.

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