Materials 4LF2 Course Outline

Thin Films

Instructor: Dr. Gu Xu, JHE-357a, xugu@mcmaster.ca

TAs: Milenka Andelic, andelicm@mcmaster.ca (Labs 2,3)
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Course Description
A sequence of experiments to investigate and study a wide range of thin film
growth methods and applications including vacuum deposition, electrodeposition,
spin coating, sol gel, and sacrificial oxidation.
One lecture, one lab (three hours)
Prerequisite(s): Registration in the final Level of a Materials Engineering program
Antirequisite(s): MATLS 4A02, 4L02, 4L04

Schedule
Lectures: Wednesdays 3:30pm-4:20pm, JHE-210 (from Jan 8th, 2020)
Labs: Thursdays 10:30-1:20; Fridays 9:30-12:20; (Matls 4LF2 schedule.xls); JHE-128

Course Structure
A set of four laboratory experiments has been developed to enable an understanding of thin film
deposition methods and thin film properties. A wide range of thin film techniques is covered including
vacuum deposition methods, electroplating, solution coating and sacrificial oxidation.

In addition a set of lectures will focus on vacuum deposition science and technology, and gas molecule
behaviour. Students will be asked to do a report and presentation on a thin film deposition technique
and its industrial uses.

Lab Topics:
1) Electrodeposition of Metal
2) Meyer Rod Application of Polymer Films
3) Oxidation Growth of SiO2 on Silicon
4) Reactive Vacuum sputtering of SiO2

Evaluation:
Lab report  60%.
Class presentation and Report:  30%.
Assignments 10%.

NOTE THAT ATTENDANCE AT ALL LABS AND COMPLETION OF THE LAB REPORT IS COMPUSORY
Presentation and Report

- Groups of two
- 15 minute presentation
- 2 page report
- Must describe a thin film material, process and application

Office Hours (TBA)

Learning Objectives/Outcomes (CEAB Attributes)

<table>
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<tr>
<th>Attribute</th>
<th>Learning Outcomes</th>
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<tr>
<td>1. Knowledge Base for Engineering</td>
<td>Vacuum engineering</td>
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<td>2. Problem Analysis</td>
<td>Thin film morphology analysis and</td>
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<td>3. Investigation</td>
<td>Determination of thin film characteristics including thickness, electrical properties, optical properties, peel strength</td>
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<td>5. Engineering Tools</td>
<td>This film deposition techniques and analysis techniques</td>
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<td>6. Individual and Team Work</td>
<td>Both lab group and individual assignments</td>
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<td>7. Communication Skills</td>
<td>Presentation of lab results in written reports Powerpoint presentations or research topics</td>
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<tr>
<td>9. Impact of Engineering on Society and Environment</td>
<td>Production issues in thin film selection and deposition techniques</td>
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Regulations, policies, procedures and guidelines

The Faculty of Engineering is concerned with ensuring an environment that is free of all adverse discrimination. If there is a problem that cannot be resolved by discussion among the persons involved, individual are reminded that they should contact the Department Chair, the Sexual Harassment Office or the Human Rights Consultant, as soon as possible. The Senate Resolution on Course Outlines states that:

“students should be reminded that they should read and comply with the "Statement on Academic Ethics and the Senate Resolution on Academic Dishonesty" as found in the Senate Policy Statements distributed at registration and available in the Senate Office”.

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McMaster University is committed to fostering, creating and maintaining a barrier-free environment for all individuals providing equal rights and opportunities, including:

- Promoting a respectful attitude for persons with disabilities
- Promoting awareness of the needs and abilities of persons with disabilities
- Informing the University community about the services available to persons with disabilities and seeking to ensure that such services are delivered in ways that promote equity
- Providing support services, subject to certain limitations.

Students requiring service or accommodation contact Student Accessibility Services (SAS) at http://sas.mcmaster.ca/ as soon as possible.

For more information, please visit http://mcmaster.ca/policy/Students-AcademicStudies/

Academic Integrity:
You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university. It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at: www.mcmaster.ca/academicintegrity.

The following illustrates only three forms of academic dishonesty:
- Plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
- Improper collaboration in group work.
- Copying or using unauthorized aids in tests and examinations.

A2L Course Site:
In this course we will be using A2L. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

Academic Accommodation:
Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Student Accessibility Services can be
contacted by phone 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca. For further information, consult McMaster University’s Academic Accommodation of Students with Disabilities policy.

Requests for Relief for Missed Academic Term Work:
McMaster Student Absence Form (MSAF) In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar “Requests for Relief for Missed Academic Term Work”.

Academic Accommodation for Religious, Indigenous or Spiritual Observances (RISO):
Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students requiring a RISO accommodation should submit their request to their Faculty Office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar’s Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

Extreme Circumstances:
The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.