

# Materials 4LF2 Course Outline

## Thin Films

Instructor: Dr. Gu Xu, JHE-357a, [xugu@mcmaster.ca](mailto:xugu@mcmaster.ca)

### - Detailed Course Description (and/or) Calendar Description

2 unit(s)

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 Breakdown (Lectures/Laboratory Content/Due dates)

Lectures: Mondays 10:30AM - 11:20AM. **BSB B138** (from Jan 10<sup>th</sup>, 2022)

Labs: Mondays 8:30-11:20; Wednesdays 14:30-17:20; ([4LF2 schedule.xls](#)); **JHE-128, JHE131**

### - 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 SiO<sub>2</sub> on Silicon
- 4) Reactive Vacuum sputtering of SiO<sub>2</sub>

**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)

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

## **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. **It is your responsibility to understand what constitutes academic dishonesty.**

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. For information on the various types of academic dishonesty please refer to the [Academic Integrity Policy](#), located at <https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/>

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.

## **AUTHENTICITY/PLAGIARISM DETECTION**

**Some courses may** use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc. ) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor or before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to [www.mcmaster.ca/academicintegrity](http://www.mcmaster.ca/academicintegrity).

## **COURSES WITH AN ON-LINE ELEMENT**

**Some courses may** use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, 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 a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

## **ONLINE PROCTORING**

**Some courses may** use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/ software during tests or exams. This software may be required to be installed before the test/exam begins.

## **CONDUCT EXPECTATIONS**

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the [Code of Student Rights & Responsibilities](#) (the “Code”). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students’ access to these platforms.

## **ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES**

Students with disabilities who require academic accommodation must contact [Student Accessibility Services](#) (SAS) at 905-525-9140 ext. 28652 or [sas.mcmaster.ca](http://sas.mcmaster.ca) to make arrangements with a Program Coordinator. 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 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.

## **COPYRIGHT AND RECORDING**

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

### **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.