



# COURSE OUTLINE

2018/2019

COURSE NAME: Microfabrication

COURSE CODE: MCRO2300

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## COURSE DESCRIPTION

This course provides an overview of various micro and nanofabrication technologies. Thin film deposition processes including evaporation, sputtering, oxidation, and chemical vapor deposition are introduced. An overview of basic pattern transfer principles using photolithography and wet/dry etching techniques is included in this course. This course provides many benefits and drawbacks of the different techniques, discussing issues that could affect yield of an overall process flow. Hands-on laboratory sessions provide students experience with microfabrication equipment and processes commonly used in industry.

Course Credits: 3.00

Pre-requisites: CHEM1130, NANO1100

Equivalent Courses: NAN200

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## LEARNING OUTCOMES

OUTCOME	Upon successful completion of this course, you will be able to
1	<p>Explain the history and principles of microfabrication</p> <p>The following concepts, skills, and issues are used to support this Outcome:</p> <ul style="list-style-type: none"><li>• Examine the motivation to make smaller devices</li><li>• Review a brief history of microfabrication</li><li>• Overview the basics of fabrication and process flow</li><li>• Discuss different semiconductor substrates</li><li>• Examine different techniques used to dope substrates</li><li>• Calculate the yield for a particular process flow</li></ul>
2	<p>Explain current methods of photolithography</p> <p>The following concepts, skills, and issues are used to support this Outcome:</p> <ul style="list-style-type: none"><li>• Differentiate between positive and negative photoresists</li><li>• Compare different mask aligners</li><li>• Differentiate between wet etch and lift off techniques</li><li>• Understand some considerations when designing a photomask</li><li>• Overview the steps performed in a typical lithography process</li></ul>

3	<p>Complete a photolithography process</p> <p>The following concepts, skills, and issues are used to support this Outcome:</p> <ul style="list-style-type: none"> <li>• Design a photomask using CAD software</li> <li>• Spin wafers with photoresist</li> <li>• Expose photoresist with a mask aligner</li> <li>• Develop photoresist in a wet deck</li> </ul>
4	<p>Explain the etching process</p> <p>The following concepts, skills, and issues are used to support this Outcome:</p> <ul style="list-style-type: none"> <li>• Explain and apply basic etching terminology</li> <li>• Discuss the pros and cons of wet etching</li> <li>• Distinguish between isotropic and anisotropic etching</li> <li>• Discriminate between the different dry etching mechanisms</li> <li>• Compare RIE and Deep RIE processing</li> </ul>
5	<p>Complete the etching process</p> <p>The following concepts, skills, and issues are used to support this Outcome:</p> <ul style="list-style-type: none"> <li>• Deposit thin films using physical vapour deposition</li> <li>• Pattern thin films using the wet etch technique</li> <li>• Pattern thin films using the lift off technique</li> </ul>
6	<p>Explain the various thin film growth techniques</p> <p>The following concepts, skills, and issues are used to support this Outcome:</p> <ul style="list-style-type: none"> <li>• Describe the uses and growth of silicon dioxide</li> <li>• Examine the technique of physical vapour deposition</li> <li>• Examine the technique of chemical vapour deposition</li> </ul>

## STUDENT EVALUATION

OUTCOME	ACTIVITY DESCRIPTION	MARK DISTRIBUTION
1, 2, 3, 4, 5 and 6	Post Lab Questions	30%
1, 2, 3, 4, 5 and 6	Assignments	30%
1, 2, 4 and 6	Exams	40%
<b>TOTAL</b>		<b>100%</b>

## COURSE COMPLETION REQUIREMENTS

Standard D or no less than 50%.

## DELIVERY METHOD

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This course will be taught using a variety of delivery methods which may include face-to-face, online, or blended teaching platforms. Activities such as collaborative exercises/assignments, seminars, labs, discussion, audio/visual presentations, and case studies may be used to support learning.

## STUDENT RESPONSIBILITY

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Enrolment at NAIT assumes that the student will become a responsible citizen of the Institute. As such, each student will display a positive work ethic, assist in the preservation of Institute property, and assume responsibility for his/her education by researching academic requirements and policies; demonstrating courtesy and respect toward others; and respecting expectations concerning attendance, assignments, deadlines, and appointments.

## EQUITY STATEMENT

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NAIT is committed to providing an environment of equality and respect for all people within the learning community, and to educating faculty, staff, and students in developing inclusive teaching and learning contexts that are welcoming to all.

Changes to This Course Outline: Every effort has been made to ensure that information in this course outline is accurate at the time of publication. The Institute reserves the right to change courses if it becomes necessary so that course content remains relevant. In such cases, the instructor will give the students clear and timely notice of the changes.

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