

Western University
Department of Mechanical & Materials Engineering

MME 4482A - “Fundamentals of MEMS”

COURSE OUTLINE – 2020-2021

CALENDAR DESCRIPTION: The objective of the course is to cover the fundamental basis of MEMS (Microelectromechanical Systems) including design, analysis, modeling, fabrication, packaging, testing and reliability concerns.

COURSE INFORMATION:
 Instructor: Dr. Jun Yang
 Room: SEB 3089
 Email: jyang@eng.uwo.ca
 Lectures: Wednesday 2:30-4:30 PM (SEB 2200), Thursday 3:30-4:30 PM (SEB 2099)
 Tutorials: TBA

PREREQUISITES: Completion of third year of the Mechanical and Materials Engineering program, Integrated Engineering program or Electrical Engineering program. Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

ACCREDITATION UNITS: Engineering Science = 35%, Engineering Design = 65%

TOPICS:

1. Course Overview, Introduction to MEMS
2. Scale effects at microscales
3. Photolithography
4. Thin film technologies
5. Surface micromachining
6. Bulk micromachining
7. Soft-lithography
8. Packaging and testing
9. MEMS applications

LEARNING OUTCOMES: Upon successful completion of this course, student will

1. learn clean room processes,
2. learn microfabrication technologies,
3. learn testing tools for MEMS devices,
4. be able to design MEMS devices using numerical simulation and/or suitable software, and design associated microfabrication processes,
5. be able to apply MEMS concept to develop new MEMS applications.

GENERAL LEARNING OBJECTIVES:

Knowledge Base	X	Individual Work	X	Ethics and Equity	
Problem Analysis	X	Team Work		Economics and Project Management	
Investigation	X	Communication	X	Life-Long Learning	X
Design	X	Professionalism			
Engineering Tools	X	Impact on Society	X		

CONTACT HOURS:	3 lecture hours, 3 tutorial hours, half course																								
TEXT: (Recommended)	<ol style="list-style-type: none"> 1. Mohamed Gad-el-Hak, The MEMS handbook, Second Edition, London, CRC Press, c2006 2. M. Madou, Fundamentals of Microfabrication and Nanotechnology, Third Edition, New York: CRC Press, 2011. 3. Chang Liu, Foundations of MEMS, Pearson Education, NJ, 2006 																								
REFERENCES:	Research papers, instructor to suggest.																								
COMPUTING:	<p>Basic programming skills will be advantageous. Some problems may be formulated for numerical solution. Available software packages include:</p> <p>ANSYS COMSOL AutoCAD, SolidWorks or any other CAD software</p>																								
UNITS:	S.I.																								
EVALUATION:	<p>The final grade is computed as follows: The course grade will be determined on homework assignments, exams/term test, presentations and project report.</p> <table> <tr> <td>Homework assignments</td> <td>20%</td> </tr> <tr> <td>Assigned week of Sep. 21, 2020</td> <td></td> </tr> <tr> <td>Due: October 1, 2020</td> <td></td> </tr> <tr> <td>Assigned week of Oct. 5, 2020</td> <td></td> </tr> <tr> <td>Due: October 15, 2020</td> <td></td> </tr> <tr> <td>Term test</td> <td>30%</td> </tr> <tr> <td>Week of Nov. 23, 2020</td> <td></td> </tr> <tr> <td>Open book exam</td> <td></td> </tr> <tr> <td>Term Project and Presentation</td> <td>50%</td> </tr> <tr> <td>Presentation: the weeks of Nov. 23 and Nov. 30, 2020</td> <td></td> </tr> <tr> <td>Project report</td> <td></td> </tr> <tr> <td>Due: Dec. 10, 2020</td> <td></td> </tr> </table>	Homework assignments	20%	Assigned week of Sep. 21, 2020		Due: October 1, 2020		Assigned week of Oct. 5, 2020		Due: October 15, 2020		Term test	30%	Week of Nov. 23, 2020		Open book exam		Term Project and Presentation	50%	Presentation: the weeks of Nov. 23 and Nov. 30, 2020		Project report		Due: Dec. 10, 2020	
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ENGLISH:	In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, tests and examinations for the improper use of English. Additionally, poorly written work with the exception of final examinations may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.																								
ATTENDANCE:	Any student who, in the opinion of the instructor, is absent too frequently from class or laboratory periods in any course, will be reported to the Dean (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Dean, the student will be debarred from taking the regular examination in the course.																								
CHEATING:	University policy states that cheating, including plagiarism, is a scholastic offense. The commission of a scholastic offence is attended by academic penalties which might include expulsion from the program. If you are caught cheating, there will be no second warning. (see Scholastic Offence Policy in the Western Academic Calendar).																								
SSD:	<i>Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.</i>																								
NOTE:	The above topics and outline are subject to adjustments and changes as needed. Students who have failed an Engineering course (ie.<50%) must repeat all components of the																								

course. No special permissions will be granted enabling a student to retain laboratory, assignment or test marks from previous years. Previously completed assignments and laboratories cannot be resubmitted for grading by the student in subsequent years.