

School of Applied Technologies



COURSE SYLLABUS MEMS1002

<b>Course Number/Name:</b>	<b>MEMS1002/Intro to MEMS Theory</b>	<b>Section Number:</b>		<b>CRN:</b>	
<b>Class Day(s):</b>		<b>Class Time:</b>			
<b>Class Location:</b>		<b>Course Credits:</b>	<b>2hrs Lecture</b>		
<b>Prerequisite: Corequisite:</b>	<b>MEMS1092 (Lab) is recommended as a co-requisite but can be taken later</b>				
<b>Instructor:</b>		<b>Email:</b>			
<b>Web Address:</b> [Optional]					
<b>CNM Phone/Voice Mail:</b>		<b>Other:</b>			
<b>Office Hour(s):</b>			<b>Office Location:</b>		

***Texts & Supplies***

**Required text:** None – all materials are web-based pdfs, streaming lectures, animations and video.

**Supplies:** Flash drive to save work is recommended. Notebook to keep notes.

***Course Description***

Focuses on Microelectromechanical systems (MEMS) including micro and nano-enable systems and covers how these tiny devices work, are made, and designed, and where they are used in this emerging high technology field. Devices studied include those used in micro optical displays, sensors and microfluidic pumps used in BioMEMS, pressure sensors and inertial sensors used in transportation and gaming applications. No books required, all is provided online and includes reading, animations, and streaming lecture educational materials.

***Student Learning Outcomes***

Upon successful completion of this course the student should be able to:

1. Describe Historical Perspective of MEMs Development and Key Milestones
2. Describe Current and future application trends + Commercialization concepts
  - 2.1 MOEMS, Accelerometers, DMD, SLM's, Pressure Sensors, Inkjet Print Heads
  - 2.2 BioMEMS – Micro Implants, Chem Lab on a Chip, DNA Chip
  - 2.3 Market Pull Vs Technology Push
3. Define the terminology and jargon used in this broad field through writing, discussion and assessments
4. Describe Basic MEMs Processes – LIGA, Bulk, Surface Micromachining
  - 4.1 Define how patterning using photolithography is done
  - 4.2 Describe wet and dry etch basics including the difference between anisotropic/isotropic etching
  - 4.3 Describe deposition methods including oxidation, CVD, evaporation and sputter
  - 4.4 Demonstrate a comprehension of Clean Room Safety and Protocol
  - 4.5 Be able to give examples of the role of materials in fabrication (sacrificial, structural materials)
5. Demonstrate the ability of using WEB based MEMs research skills in locating information
6. Describe the basics of Microsystems Design concepts applied to surface micromachining
7. Write short summaries of concepts, applications, and technologies reviewed as part of this course.
8. Discuss with classmates ideas in a team learning environment

***Attendance/Tardy/Withdrawal/Drop Policies***

This course may be offered as a traditional lecture (face-to-face), blended course (part online and part face-to-face), or as a strictly an on-line course. You are expected to attend face to face sessions. The online portion of the course expects you to participate in online discussion boards, email threads and to log in several times a week through the CNM distance learning interface.

To avoid interrupting or distracting the class, students are expected to be prompt for each face-to-face class. Class will begin promptly at the time scheduled. Students who arrive to class more than 15 minutes late will be marked tardy. 2 tardies will equal one absence.

**It is the student’s responsibility to drop/withdraw from the course in order to avoid a grade of “F.”** [Important dates](http://www.cnm.edu/depts/enrollment/registration/importantdatesanddeadlines.php), deadlines and the last day to drop this course can be found at <http://www.cnm.edu/depts/enrollment/registration/importantdatesanddeadlines.php>

“Snow Days”

In the event CNM is on a delayed schedule, classes meeting prior to the announced start time will not meet. Classes scheduled to meet for 45 minutes or more after the announced start time or starting at or after the announced start time will meet. In the event CNM closes during the last week of the class, the final grades for students may be calculated on all work assessed up to that point in the course. For students whose final assessment results could influence their grade in the class, an alternative time may be arranged individually.

### **Grading**

The following will be used to determine your grade in this course:

The following scale is used to assign course grades:

	%
<b>Assessments</b>	45
<b>Assignments</b>	45
<b>Participation</b>	10
<b>Total</b>	<b>100</b>

Percentile Range	Grade
<b>91-100</b>	<b>A</b>
<b>81-90</b>	<b>B</b>
<b>71-80</b>	<b>C</b>
<b>61-70</b>	<b>D</b>
<b>Below 61</b>	<b>F</b>

**Note:** A final grade of “D” or “F” is not acceptable for this course if it is required for graduation or as a prerequisite for other courses. A final grade of “D” or “F” requires repeating this course.

### **Late/Make-up/Re-take Policies**

#### **Makeup Assessments**

Assessments are not all weighted the same (some are worth more than others). Online assessments are typically available for one week – so there is no excuse to missing a one. Don’t wait until the last minute. If you have a legitimate excuse, the instructor may extend the time and / or reset the assessment on a case by case basis.

In class assessments will not be allowed to be made up. Under legitimate circumstances, a makeup quiz and/or special assignment can be requested to make up for the lost points.

#### **Late Assignments**

- Assignments are due on the due date.
- Online assignments have a submission cutoff date two days after the due date (48hrs).
- If an assignment is turned in late (but within 48 hours of the due date and time), 10% will be deducted.
- Assignments will not be accepted after the 48 hours unless a legitimate appeal has been made and accepted.

### **Course Codes & Policies**

#### **Student Behavior:**

As a member of this classroom, students are responsible for understanding and adhering to the CNM codes and policies that govern and prescribe acceptable student behavior. The codes and policies of this course are governed by the Academic Policies found on pp. 40-43 of the [CNM 2009-2011 Catalog](#) and the Student Code of Conduct found on pp. 298-310 of the [CNM 2009-2011 Catalog](#) accessed at <http://www.cnm.edu/coursecatalog/index.php>

If a student behaves in a manner that is disruptive to the educational process or violates any other provisions of the Code of Conduct, this behavior will (generally) first be addressed by the instructor. If the behavior continues, or escalates, this behavior will be reported to the Dean of Students for appropriate disciplinary action. If a student demonstrates behavior that is a violation of the Code of Conduct, CNM instructors may require the student to leave the classroom. Should this occur, the incident will be reported to the Dean of Students for further disciplinary action.

### **Academic Dishonesty:**

Academic dishonesty hurts everyone involved. Forms of dishonesty are collaboration if individual work is required (i.e., exams); receiving assistance from others on take-home quizzes and exams if these require individual work; sharing completed assignments unless sanctioned by the instructor. Plagiarizing others work and presenting it as your own – all assignments which include information obtained from other sources must have the information cited and/or referenced. The Dean of Students will be notified of any instances of academic dishonesty.

## ***Student Resources/Advisement/Graduation***

### **Special Needs:**

Special Services is a department that can provide students with documented disabilities the accommodations they might need. It is also a department that can help students who think they might have a disability. Students needing accommodation in an academic setting must contact [Special Services](#) at 224-3259 or at <http://www.cnm.edu/depts/ss/index.php>

The School of Applied Technology (AT) academic advisor is located at Main Campus in Ted Chavez Hall, Room 100, (224-3712). The AT advisor specializes in the programs offered through AT and is available to assist you in planning your schedule, evaluating your program of studies and completing graduation audits/checklists.

AT has a [listing of resources](#) and links for advisement and graduation that can be found at [http://www.cnm.edu/depts/at/about/at\\_resources.php](http://www.cnm.edu/depts/at/about/at_resources.php)

The Achievement Coach (224-3340) is available to all AT students. The Achievement Coach's main job is to help students find the answers to questions concerning classes and issues involving college and life. The Achievement Coach helps with the following: program and course information, campus and community supports, balancing school, family and work, life changes and obstacles, and graduation information.

## ***Tentative Class Schedule***

**Syllabus & Class Schedule:** The syllabus and class schedule are subject to change by the instructor. Changes will be made with as much advance notice as possible.

All materials for this course and class schedule is provided on the Distance Learning site. Course units will be made available throughout the semester – you will always have at least one week to complete an assignment from when it is made available.

**Important dates, deadlines, and the last day to drop this course can be found at <http://www.cnm.edu/depts/enrollment/registration/importantdatesanddeadlines.php> and includes holidays.**

There will be an opportunity to participate in a clean room experience at the University of New Mexico's MTTC Cleanroom. This requires the successful completion of a MTTC Cleanroom Safety and Protocol Learning prep module and:

1. attendance to a MTTC Safety Lecture (required)
2. attendance to the Fab Tour (required)
3. passing of a written safety exam (required) with passing grade of 80% or higher.

Once these requirements are met, the student will be able to participate in the cleanroom experience. The lecture, tour and experience will be held during the week. More than one session may be scheduled to meet the students needs – timing will be negotiated during the face-to-face class meetings.

***Hands-on in class activities (face-to-face) will be held in N214 on the main campus (North Building). Parking is free on Fridays and Saturdays. We will have additional activities off site (tours, MTTC cleanroom experience) – specifics will be provided.***

### ***Electronic Devices in Class***

All cellular telephones, pagers and beepers must be turned off or switched to silent or vibrate mode. During class, all pagers and cell phones are to be placed in your backpack or purse and not on the table or desk. Electronic entertainment devices are to be turned off and head phones removed. You may use your electronic devices to work on class assignments and surf the internet for additional information. It's like a job – you may use electronics for job related activities during work hours – not for personal, entertainment use.

### ***Printing***

PaperCut is an element of the sustainability effort at CNM. Its purpose is to reduce paper usage. Each student has an online account with an allotment of 150 pages of free printer pages per term. If this allotment runs out, additional pages may be purchased by the student. For more information, go to the PaperCut website: <http://cnm.edu/papercut>.

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