Course Syllabus

1. General Information:
   Alpha-numeric codification: INEL 6071
   Course Title: Introduction to Micro-electro-mechanical systems
   Number of credits: 3
   Contact Period: 3 hours of lecture per week

2. Course Description:
   English: This course covers the basic principles of micro-electro-mechanical systems (MEMS) design, fabrication and testing. Specifically, it covers the theory behind microfabrication techniques such as pattern transfer, optical lithography, etching and design rules, material deposition techniques, lumped modeling of MEMS structures, static and dynamic behavior of MEMS and MEMS integration into systems.
   Spanish: El curso discute los principios básicos del diseño, fabricación y medición de sistemas micro-electro-mecánicos (MEMS por sus siglas en inglés). Específicamente, cubre la teoría de técnicas de microfabricación tales como transferencia de patrones, litografía óptica, remoción de capas de películas delgadas, y reglas de diseño, técnicas para la deposición de materiales, modelos de estructuras micro-electro-mecánicas, comportamiento estático y dinámico de MEMS y integración de MEMS en sistemas.

3. Pre/Co-requisites and other requirements:
   Permission from the department head

4. Course Objectives:
   • Apply the theory behind microfabrication techniques such as pattern transfer, optical lithography, etching and design rules for the design of MEMS devices
   • Apply lumped modeling to MEMS structures
   • Design MEMS devices using simulation software
   • Evaluate the static and dynamic linear and nonlinear behavior of MEMS

5. Instructional Strategies:
   - conference
   - discussion
   - computation
   - laboratory
   - seminar with formal presentation
   - seminar without formal presentation
   - workshop
   - art workshop
   - practice
   - trip
   - thesis
   - special problems
   - tutoring
   - research
   - other, please specify:

6. Minimum or Required Resources Available:
   ANSYS and/or COMSOL software package

7. Course time frame and thematic outline

<table>
<thead>
<tr>
<th>Outline</th>
<th>Contact Hours</th>
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<tbody>
<tr>
<td>1. Standard semiconductor planar processing technologies</td>
<td>6</td>
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<tr>
<td>2. Specific micromachining technologies</td>
<td>7</td>
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<tr>
<td>3. Signal/Energy Domains and modeling techniques</td>
<td>6</td>
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<tr>
<td>4. Micro electro-mechanical transducers (sensors &amp; actuators)</td>
<td>9</td>
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</tbody>
</table>
5. Micro electro-mechanical-thermal transducers (sensors & actuators) | 7
6. Electro-mechanical and piezoresistive transducers (sensors & actuators) | 7
7. Exams | 3
Total hours: (equivalent to contact period) | 45

8. Grading System
☐ Quantifiable (letters) ☐ Not Quantifiable

9. Evaluation Strategies

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<thead>
<tr>
<th></th>
<th>Quantity</th>
<th>Percent</th>
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<tbody>
<tr>
<td>☒ Exams</td>
<td>3</td>
<td>45</td>
</tr>
<tr>
<td>☒ Final Exam</td>
<td>1</td>
<td>25</td>
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<tr>
<td>☐ Short Quizzes</td>
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<td>☐ Oral Reports</td>
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<td>☐ Monographies</td>
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<td>☐ Portfolio</td>
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<tr>
<td>☒ Projects</td>
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<td>20</td>
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<td>☐ Journals</td>
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<tr>
<td>☒ Other, specify: Homework</td>
<td>4-5</td>
<td>10</td>
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<td>TOTAL:</td>
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<td>100%</td>
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10. Bibliography:

11. According to Law 51
Students will identify themselves with the Institution and the instructor of the course for purposes of assessment (exams) accommodations. For more information please call the Student with Disabilities Office which is part of the Dean of Students office (Chemistry Building, room 019) at (787)265-3862 or (787)832-4040 extensions 3250 or 3258.