Washington State University
MAJOR CURRICULAR CHANGE FORM - - COURSE
(Submit original signed form and ten copies to the Registrar's Office, zip 1035.)

<table>
<thead>
<tr>
<th>Future Effective Date: 09/15/2013</th>
<th>☐ New course ☐ Temporary course ☐ Drop service course</th>
</tr>
</thead>
<tbody>
<tr>
<td>(effective date cannot be retroactive)</td>
<td>☐ There is a course fee associated with this course (see instructions)</td>
</tr>
</tbody>
</table>

☐ Variable credit ____________

☐ Increase credit (former credit ____________)

☐ Number (former number ____________)

☐ Crosslisting (between WSU departments) (Must have both departmental signatures)

☐ Conjoint listing (400/500)

☐ Request to meet Writing in the Major [M] requirement (Must have All-University Writing Committee Approval)

☐ Request to meet GER in ____________ (Must have GenEd Committee Approval) ☐ Fulfills GER lab (L) requirement

☐ Professional course (Pharmacy & Vet Med only) ☐ Graduate credit (professional programs only)

☐ Other (please list request) ____________________________

<table>
<thead>
<tr>
<th>MECH</th>
<th>529</th>
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</thead>
<tbody>
<tr>
<td>course prefix</td>
<td>course no.</td>
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</table>

EXPERIMENTAL METHODS FOR MECHANICAL ENGINEERING RESEARCH

title

<table>
<thead>
<tr>
<th>3</th>
<th>3</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>credit</td>
<td>lecture hrs</td>
<td>lab hrs</td>
<td>studio hrs</td>
</tr>
<tr>
<td>per week</td>
<td>per week</td>
<td>per week</td>
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</tbody>
</table>

GRADUATE STANDING

prerequisite

Description (20 words or less) Examination of research methods for mechanical engineers, including experimental design, techniques, analysis, and presentation

Instructor: Stephen Solovitz Phone number: (360) 546-9253 Email: stevesol@vancouver.wsu.edu

Contact: Stephen Solovitz Phone number: (360) 546-9253 Email: stevesol@vancouver.wsu.edu

Campus Zip Code: 98686

- Please attach rationale for your request, a current and complete syllabus, and explain how this impacts other units in Pullman and other branches (if applicable).
- Secure all required signatures and provide 10 copies to the Registrar's Office.

Chair/Date 10/15/12

Dean/Date 10/31/12

General Education Com/Date

Chair (if crosslisted/interdisciplinary) *

Dean (if crosslisted/interdisciplinary) *

Graduate Studies Com/Date

All-University Writing Com/Date

Academic Affairs Com/Date

Senate/Date

*If the proposed change impacts or involves collaboration with other units, use the additional signature lines provided for each impacted unit and college.
The MSME program at WSU Vancouver is currently designed with a broad scope. Each graduate student is required to complete the same number of graduate credits, but there are only two courses taken by every student: Math 540 (Applied Mathematics) and Mech 598 (Seminar). This allows flexibility for students with interests in disparate fields, such as heat transfer, controls, or failure analysis. However, many of these same students share more common goals, particularly in regard to research. Thus, we propose to create a new graduate level course in research methods, which would be applicable to all current MSME students.

The new course, Mech 529, considers a research project from beginning to end. The topics include: literature review, design of experiments, data analysis, uncertainty, and research presentation. These issues are critical to all MSME students, as they each must consider these in the completion of their theses. The latter third of the course focuses on common experimental techniques, including methods from different departmental disciplines. While only a subset of these techniques will be directly relevant to each student, the general concepts will provide broader context to their own studies. Finally, the students will complete an individual project over the last portion of the course. They will propose, design, and conduct a simple experiment, and then they will present their results to the class at the end of the semester. It is probable that students would choose projects directly related to their own thesis research, providing a boost to their initial studies.
Experimental Methods for Mechanical Engineering Research

Instructor:  Stephen Solovitz, Assistant Professor, ENCS  
             VSCI 301P  
             stevesol@vancouver.wsu.edu  
             360-546-9253

Lecture Hours:  Tuesdays/Thursdays from 12 p.m. – 1:15 p.m.  
Location:      VSCI 18  
Office Hours:  Tuesdays/Thursdays from 2:00 p.m. – 3:00 p.m.  
               and by appointment


Prerequisites:  Graduate standing

Homework:  Problem sets will be assigned over the course of the quarter,  
            approximately one every two weeks. You are encouraged to work along  
            with your colleagues, but each of you must provide your own individual  
            solution set. Plagiarism will result in a zero for that set.

Project:  You will complete an individual project as part of this course. This will  
           involve the design, performance, and analysis of a laboratory  
           experiment. You will write a final report detailing your results, and you  
           will present your findings to the class.

Exams:  There will be a midterm and a comprehensive final exam. Each will be  
        open book and notes.

Grading:  
        Homework  20%  
        Project  25%  
        Midterm  20%  
        Final exam  35%

Website:  Class updates and homework will be provided via the on-line  
          Angel website (lms.wsu.edu).

Academic Integrity:  Academic integrity is the cornerstone of the university and will be  
                     strongly enforced in this course. Any student caught cheating on any  
                     assignment will be strongly reprimanded for the course and will be  
                     referred to the Office of Student Conduct.

Disabilities:  Accommodations may be available if you need them in order to fully  
               participate in this class because of a disability. Accommodations may  
               take some time to implement so it is critical that you contact Disability  
               Services as soon as possible. All accommodations must be approved  
               through Disability Services, located in the Student Resource Center on  
               the Lower Level of Student Services Center (360) 546-9138.

Experimental Methods for ME Research  3 credits
WSU has made an emergency notification system available for faculty, students and staff. Detailed information is located at the following links:

- **WSU Vancouver Campus Safety Plan:**
  
  http://www.vancouver.wsu.edu/safety-plan
  
  - Comprehensive listing of university policies, procedures, statistics, and information relating to campus safety, emergency management, and the health and welfare of the campus community.

- **WSU Vancouver Public Safety website:**
  
  http://www.vancouver.wsu.edu/police

- **WSU Vancouver ALERTS website:**
  
  http://www.vancouver.wsu.edu/alerts/
  
  - Information about emergencies and other issues affecting WSU Vancouver.

- **ZZUSIS portal:**
  
  http://zzusis.wsu.edu
  
  - Register/update your emergency contact information for the Crisis Communication System (CCS). Enter your network ID and password and you will be taken to the zzusis portal page. Look for the Vancouver Emergency Info box on the left side of the page and click on “update your emergency contact information” where you can enter your cell, landline, and email contact information.
Course Outcomes:

1. Design and conduct a well-formulated experiment, and consider its impact within the context of other research.
2. Use data analysis methods, including statistics, curve fitting, and uncertainty analysis.
3. Understand the function of typical measurement devices.
4. Deliver well-organized, informative oral presentations.

Outcome Evaluation:

<table>
<thead>
<tr>
<th>WSU Learning Outcome</th>
<th>At the end of this course, students should be able to:</th>
<th>Course topics that address these learning outcomes</th>
<th>This outcome will be evaluated primarily by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENCS-GO-1</td>
<td>Use data analysis methods and understand typical measurement devices.</td>
<td>Data acquisition (weeks 4-5), Uncertainty analysis (week 6), Data analysis and statistics (weeks 7-8), Common experimental devices (weeks 10-14)</td>
<td>Homework problems, Exams</td>
</tr>
<tr>
<td>ENCS-GO-2</td>
<td>Design and conduct a well-formulated experiment, and consider its impact within the context of other research.</td>
<td>Literature review (week 2), Design of experiments (week 3), Class project (weeks 10-15)</td>
<td>Project report</td>
</tr>
<tr>
<td>ENCS-GO-3</td>
<td>Deliver well-organized, informative oral presentations.</td>
<td>Report writing and presentations (week 9), Research project presentation (week 15)</td>
<td>Project presentations</td>
</tr>
</tbody>
</table>
## Course Calendar

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Homework/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/20</td>
<td>Introduction (Ch. 1), Basic concepts (Ch. 2)</td>
<td></td>
</tr>
<tr>
<td>8/27</td>
<td>Literature review (class notes)</td>
<td>HW1 due</td>
</tr>
<tr>
<td>9/3</td>
<td>Design of experiments (Ch. 16)</td>
<td></td>
</tr>
<tr>
<td>9/10</td>
<td>Data acquisition (Ch. 14)</td>
<td>HW2 due</td>
</tr>
<tr>
<td>9/17</td>
<td>Dynamic measurements (Ch. 2)</td>
<td></td>
</tr>
<tr>
<td>9/24</td>
<td>Uncertainty analysis (Ch. 3)</td>
<td>HW3 due</td>
</tr>
<tr>
<td>10/1</td>
<td>Statistics and probability (Ch. 3)</td>
<td></td>
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<tr>
<td>10/8</td>
<td>Data analysis and curve fitting (Ch. 3)</td>
<td>HW4 due</td>
</tr>
<tr>
<td>10/15</td>
<td>Report writing and presentations (Ch. 15)</td>
<td>Midterm in class</td>
</tr>
<tr>
<td>10/22</td>
<td>Electric measurements, Transducers (Ch. 4)</td>
<td>HW5 due; Project assigned</td>
</tr>
<tr>
<td>10/29</td>
<td>Pressure measurements (Ch. 6)</td>
<td></td>
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<tr>
<td>11/5</td>
<td>Flow measurements (Ch. 7)</td>
<td>HW6 due</td>
</tr>
<tr>
<td>11/12</td>
<td>Temperature measurements (Ch. 8)</td>
<td></td>
</tr>
<tr>
<td>11/19</td>
<td>Thanksgiving – no class!</td>
<td></td>
</tr>
<tr>
<td>11/26</td>
<td>Force/torque/strain measurements (Ch. 10)</td>
<td>HW7 due</td>
</tr>
<tr>
<td>12/3</td>
<td>Final presentations, review</td>
<td>Project presentations</td>
</tr>
<tr>
<td>12/10</td>
<td>Final exam</td>
<td>FINAL EXAM</td>
</tr>
</tbody>
</table>

(Comprehensive)