

## ME 406: Experimental Design

<i>Course description:</i>	Designing, conducting, and reporting of experimental investigations involving mechanical equipment.
<i>Number of credits:</i>	3 (1-6) This course is required
<i>Prerequisites by course:</i>	ENGLISH 402 or concurrent enrollment; ME 220; ME 304: ME 306; ME 348; certified major in Mechanical Engineering
<i>Textbooks/other required materials:</i>	A. Wheeler and A. Ganji, <i>Introduction to Engineering Experimentation</i> , Prentice Hall, 2009, 3/e.
<i>Course objectives:</i>	Learn how to design, conduct, and report experimental investigations involving mechanical equipment and systems.
<i>Topics covered:</i>	<ol style="list-style-type: none"><li>1. Experiments involving<ol style="list-style-type: none"><li>a. thermal fluid science</li><li>b. dynamics</li><li>c. materials characterization</li></ol></li><li>2. Professional communication skills<ol style="list-style-type: none"><li>a. memorandum writing</li><li>b. progress report writing</li><li>c. proposal writing</li><li>d. report writing</li><li>e. formal oral reporting</li></ol></li><li>3. Experimental skills<ol style="list-style-type: none"><li>a. design of experiments</li><li>b. uncertainty analysis</li><li>c. computer aided data acquisition</li></ol></li><li>4. Professional conduct<ol style="list-style-type: none"><li>a. ethics</li><li>b. professionalism</li><li>c. intellectual property and patents</li><li>d. ABET and registration</li></ol></li></ol>
<i>Expected learning outcomes:</i>	<p>Outcomes for the Lecture Component:</p> <ol style="list-style-type: none"><li>a. Increased understanding of professionalism and continuation education</li><li>b. Increased understanding of intellectual property and patents</li><li>c. Increased understanding of ethics</li><li>d. Increased understanding of design of experiments</li></ol> <p>Outcomes for the Laboratory Component:</p> <ol style="list-style-type: none"><li>a. Increased understanding of the ideas of experimentation and design of experiments including:<ol style="list-style-type: none"><li>1. Designing experimental projects</li><li>2. Verifying the trends of the raw data</li></ol></li></ol>

3. Reducing and presenting experimental data
4. Estimating uncertainty of the final results
5. Comparing results with other available information
- b. Increased communication skills including:
  1. Writing memoranda to supervisors.
  2. Reporting results in the form of (1) short reports, (2) complete reports, (3) letters, and (4) progress reports
  3. Giving oral reports using PowerPoint and an LCD projector
  4. Communicating on a one-to-one basis with (1) laboratory assistants, (2) engineers, and (3) supervisors
- c. Use of codes and handbooks
- d. Application of the material from coursework to actual problems
- e. Expanded understanding of a subject by reading reference books and textbooks

*Class schedule:* One 50-minute lecture session per week, for one semester.

*Laboratory schedule:* Two 3-hour laboratory sessions per week, for one semester.

*Contribution to meeting the professional component:* Engineering Topics

*Relationship of course to student outcomes:*  
3 strongly supported; 2 supported; 1 minimally supported

Student Outcomes Pre-Fall 2018 (ABET EC2000)											Student Outcomes Fall 2018 forward (ABET EC2019)						
a	b	c	d	e	f	g	h	i	j	k	1	2	3	4	5	6	7
	3		1	2	1	3		3			2		3	1		3	3

*Prepared by:* Andrea Butcherite and C.D. Richards