# Mechanical Engineering

**ME 498  Special Topics  credit: 0 TO 4 hours.**

Subject offerings of new and developing areas of knowledge in mechanical engineering intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. 0 to 4 undergraduate hours. 0 to 4 graduate hours. May be repeated in the same or separate terms if topics vary to a maximum of 9 hours.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>70402</td>
<td>Lecture-Discussion</td>
<td>CS3</td>
<td>01:00 PM - 02:20 PM</td>
<td>MW</td>
<td>4101 - Materials Science &amp; Eng Bld</td>
<td>Shao, C</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours  
Mfg Data and Quality Systems  
Restricted to Undergrad - Urbana-Champaign.  
Manufacturing quality management in the big data era; quality improvement philosophies; statistical process control, control charts; process capability, specifications and tolerances, measurement capability, acceptance sampling; time series modeling and analysis; machine learning and applications in quality engineering. Prerequisite: ME 270; and basic statistics, e.g., IE 300/STAT 400/MATH 463.

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<tbody>
<tr>
<td>71647</td>
<td>Lecture-Discussion</td>
<td>CS4</td>
<td>01:00 PM - 02:20 PM</td>
<td>MW</td>
<td>4101 - Materials Science &amp; Eng Bld</td>
<td>Shao, C</td>
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</table>

Credit Hours: 4 hours  
Mfg Data and Quality Systems  
Restricted to Graduate - Urbana-Champaign.  
Manufacturing quality management in the big data era; quality improvement philosophies; statistical process control, control charts; process capability, specifications and tolerances, measurement capability, acceptance sampling; time series modeling and analysis; machine learning and applications in quality engineering. Prerequisite: ME 270; and basic statistics, e.g., IE 300/STAT 400/MATH 463.

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<tbody>
<tr>
<td>70475</td>
<td>Lecture</td>
<td>JB</td>
<td>03:00 PM - 04:50 PM</td>
<td>TR</td>
<td>214 - Ceramics Building</td>
<td>Bentsman, J</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours  
Advanced Computer Control  
Restricted to students with Junior or Senior class standing.  
This course provides foundation for modern computer control through progression from basic discrete time control theory to the more advanced control algorithms, enhanced by the elements of machine learning, which have been highly successful in applications. Exposure to the implementation of these algorithms on modern computing platforms will also be provided. The topics will include: state space and input-output models of discrete time systems; current computer control thinking and platforms; system-theoretic properties of discrete time systems; discrete time control fundamentals; pole placement design, observer design, output feedback, disturbance rejection, servo design; linear discrete time optimal control; robust discrete time (H∞) control for linear and nonlinear systems; discrete time polynomial design; discrete-time nonlinear filtering and control; model-predictive control with constraints; discrete time robust adaptive control (L1 and others); enhancement of discrete time controllers with computationally intensive elements of machine learning/artificial intelligence; introduction to field-programmable gate arrays (FPGAs) and graphical processing units (GPUs) for solving computationally intensive control problems through individual projects. Prerequisite: advanced undergraduate standing. ME360 or equivalent is required. ME460 or ECE 486 is desirable.

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<tbody>
<tr>
<td>71645</td>
<td>Lecture</td>
<td>NGG</td>
<td>09:00 AM - 09:50 AM</td>
<td>MWF</td>
<td>203 - Transportation Building</td>
<td>Glumac, N</td>
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</table>

Credit Hours: 4 hours  
Engineering Spectroscopy
Restricted to Graduate - Urbana-Champaign.
This course aims to provide the theory and practical experience in making measurements of thermodynamic parameters by using
the spectral distribution of light. We will present the theoretical foundations for spectroscopic measurements of temperature,
pressure, and concentration, including structure of matter, nature of light, statistical mechanics, and matter/light interactions. After
these foundational topics, basic applications of emission spectroscopy, absorption spectroscopy, and fluorescence will be covered.
A basic review of practical optics will be conducted, followed by a more detailed coverage of instrumentation for spectroscopic
measurements, with a hands-on component. Scattering theory and non-linear optics will be reviewed, followed by a discussion of
Rayleigh scattering and Raman scattering. Prerequisites: ME 200, Phys 211, 212, Chem 102/103

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<th>Instructor</th>
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<tbody>
<tr>
<td>71644</td>
<td>NGU</td>
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<td>MWF</td>
<td>203 - Transportation Building</td>
<td>Glumac, N</td>
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Credit Hours: 3 hours
Engineering Spectroscopy
Not intended for Undergrad - Urbana-Champaign.
This course aims to provide the theory and practical experience in making measurements of thermodynamic parameters by using
the spectral distribution of light. We will present the theoretical foundations for spectroscopic measurements of temperature,
pressure, and concentration, including structure of matter, nature of light, statistical mechanics, and matter/light interactions. After
these foundational topics, basic applications of emission spectroscopy, absorption spectroscopy, and fluorescence will be covered.
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<tbody>
<tr>
<td>68968</td>
<td>WKG</td>
<td>01:00 PM - 02:20 PM</td>
<td>MW</td>
<td>2015 - Electrical &amp; Computer Eng Bldg</td>
<td>King, W</td>
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</tbody>
</table>

Credit Hours: 4 hours
Additive Manufacturing
Restricted to Gies College of Business or Engineering. Restricted to Graduate - Urbana-Champaign.
Additive manufacturing fundamentals, how and why to design products using additive manufacturing, theory, and practice of
product innovation, modern product realization. This course is restricted to graduate students from the College of Engineering
and the College of Business. Students in Industrial Design can also register with approval override. Please contact the MechSE
Undergraduate Programs Office (mechse-ug-advise@illinois.edu).

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<tr>
<td>68934</td>
<td>WKU</td>
<td>01:00 PM - 02:20 PM</td>
<td>MW</td>
<td>2015 - Electrical &amp; Computer Eng Bldg</td>
<td>King, W</td>
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Credit Hours: 3 hours
Additive Manufacturing
Restricted to Gies College of Business or Engineering. Restricted to students with Senior class standing. Restricted to Undergrad -
Urbana-Champaign.
Additive manufacturing fundamentals, how and why to design products using additive manufacturing, theory, and practice of
product innovation, modern product realization. This course is restricted to senior standing undergraduates in the College of
Engineering and the College of Business. Students in Industrial Design can also register with approval override. Please contact the
MechSE Undergraduate Programs Office (mechse-ug-advise@illinois.edu). Senior undergraduate students in MechSE should have
completed ME 370.