ME 170  **Computer-Aided Design**  credit: 3 hours.
Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; ISO and ANSI standards for coordinate dimensioning and tolerancing; geometric dimensioning and tolerancing. Use of solid-modeling software for creating associative models at the component and assembly levels with automatic blueprint creation, interference checking, and linked bill of materials. Credit is not given for both ME 170 and GE 101 or SE 101.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
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</table>

Restricted to Engineering Mechanics or Mechanical Engineering major(s).
ME students must obtain department approval from staff in 154 MEB to drop this course after the last day to add a class.

### ME 199 Undergraduate Open Seminar

Credit: 1 TO 5 hours. May be repeated.

<table>
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Instructor Approval Required

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<tr>
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</table>

Credit Hours: 3 hours
Instructor Approval Required

Advanced Participation in the Society of Automotive Formula Car and Baja Car. This is not MechSE or Technical Elective for ME Students.

<table>
<thead>
<tr>
<th>CRN</th>
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</table>

Credit Hours: 1 hours
Instructor Approval Required

Multiple interdisciplinary design projects involving project teams. Intended to provide a design project experience over consecutive semesters. Completion of three consecutive semesters may be used to satisfy 3 hours of Technical Elective credit requirement; for students who entered the Mechanical Engineering or Engineering Mechanics program as freshmen. Class meeting times for ECO Marathon and SOLAR Car Teams ONLY. Prerequisite: ME 170 or GE 101 recommended. Students may propose the projects and select the teams.

<table>
<thead>
<tr>
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Credit Hours: 1 hours
Instructor Approval Required

Restricted to students with Senior or Junior class standing. Restricted to Undergrad - Urbana-Champaign.

Students enrolled in this section must concurrently enroll ME 360 (69390) Signal Processing. James Scholar status IS NOT required to register. This ME 199 may not be used in the sequence to replace a MechSE/Technical Elective credit. ME students must obtain department approval from staff in 154 MEB to drop this course after the last day to add a class.

Must enroll concurrently in ME 360 69390.

<table>
<thead>
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Credit Hours: 1 hours
Participation in the Society of Automotive Engineers (SAE) Formula, Baja, and Hybrid vehicle design competitions.

<table>
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Credit Hours: 1 hours
Instructor Approval Required
ME 200  **Thermodynamics**  credit: 3 hours.
Classical thermodynamics through the second law; system and control-volume analyses of thermodynamic processes; irreversibility and availability; relations for ideal gas mixtures. Prerequisite: MATH 241.

<table>
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ME 270  **Design for Manufacturability**  credit: 3 hours.
Introduction to DFM methodologies and tools; material selection (new and traditional materials); designing for primary manufacturing processes (cutting fundamentals, casting, forming, and shaping); designing with plastics (snap-fits, integral hinges, etc.); design for assembly (DFA); geometric dimensioning and tolerancing (GD&T). Same as TAM 270. Prerequisite: ME 170. ME and EM majors only.

<table>
<thead>
<tr>
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<tr>
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<td>Liebenberg, L</td>
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</table>
Restricted to Mechanical Engineering major(s). Restricted to students with Sophomore, Junior, or Senior class standing. MechSE students must obtain department approval from staff in 154 MEB to drop this course after the last day to add a class.

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</table>

Restricted to Mechanical Engineering major(s). Restricted to students with Sophomore, Junior, or Senior class standing. MechSE students must obtain department approval from staff in 154 MEB to drop this course after the last day to add a class.

**ME 297  Introductory Independent Study**  credit: 1 TO 3 hours.

Independent study and/or individual projects related to mechanical engineering. Approved for Letter and S/U grading. May be repeated to a maximum of 6 credit hours for letter grade; no limit for S/U grade mode. Prerequisite: Consent of Instructor.

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Location</th>
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</table>
ME 310 *Fundamentals of Fluid Dynamics*  credit: 4 hours.
Fundamentals of fluid mechanics with coverage of theory and applications of incompressible viscous and inviscid flows, and compressible high speed flows. Credit is not given for both ME 310 and TAM 335. Prerequisite: MATH 285 OR MATH 286 OR MATH 441; credit or concurrent registration in ME 200.

<table>
<thead>
<tr>
<th>CRN</th>
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</table>
Restricted to Mechanical Engineering or Nuclear Engineering or Nuclear, Plasma, Radiogic Engr major(s). Restricted to students with Sophomore, Junior, or Senior class standing.
ME students must obtain department approval from staff in 154 MEB to drop this course after the last day to add a class.

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ME students must obtain department approval from staff in 154 MEB to drop this course after the last day to add a class.

**ME 320  Heat Transfer** credit: 4 hours.
Fundamentals of fluid mechanics with coverage of theory and applications of incompressible viscous and inviscid flows, and compressible high speed flows. Credit is not given for both ME 310 and TAM 335. Prerequisite: MATH 285 OR MATH 286 OR MATH 441; credit or concurrent registration in ME 200.

<table>
<thead>
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Restricted to Mechanical Engineering major(s). Restricted to students with Sophomore, Junior, or Senior class standing. ME students must obtain department approval from staff in 154 MEB to drop this course after the last day to add a class.

<table>
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ME 330  Engineering Materials  credit: 4 hours.
Structures of polymers, metals, and ceramics as the basis for their mechanical behavior. Manipulation of structure through such processes as heat treatment and solidification. Mechanisms of material failure in service (yielding, fracture, fatigue, creep, corrosion, and wear) and simple design techniques to avoid these failures. Strategies for materials selection in design. Credit is not given for both ME 330 and either CEE 300 or MSE 280. Prerequisite: CHEM 102 and TAM 251.

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</table>

Restricted to Industrial Engineering or Mechanical Engineering major(s). Restricted to students with Sophomore, Junior, or Senior class standing. ME students must obtain department approval from staff in 154 MEB to drop this course after the last day to add a class.
ME 340  **Dynamics of Mechanical Systems**  credit: 3.5 hours.
Dynamic modeling of mechanical components and systems; time-domain and frequency-domain analyses of linear time-invariant systems; multi-degree-of-freedom systems; linearization of nonlinear systems. Credit is not given for both ME 340 and either GE 320 or AE 353. Prerequisite: MATH 285 OR MATH 286 OR MATH 441; TAM 212; credit or concurrent registration in ECE 205 and MATH 415.

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Restricted to Mechanical Engineering major(s). Restricted to students with Sophomore, Junior, or Senior class standing. ME students must obtain department approval from staff in 154 MEB to drop this course after the last day to add a class.
ME 360  **Signal Processing**  credit: 3.5 hours.
Basic electromechanical techniques used in modern instrumentation and control systems. Use of transducers and actuators. Signal conditioning, grounding, and shielding. Analog and digital signal processing and feedback control methods with emphasis on frequency domain techniques. Frequency response of continuous and discrete systems. Credit is not given for both ME 360 and ABE 425. Prerequisite: ME 340.

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Restricted to Mechanical Engineering major(s). Restricted to students with Sophomore, Junior, or Senior class standing.
ME 360  Honor's section: Mechanical Engineering for Mastering Modeling, Signal Analysis, Instrumentation, and Control Techniques

This Honor's section (worth an extra credit hour) is for students interested in mastering modeling, signal analysis, instrumentation, and control techniques through solving a challenging industrial problem. Namely, an electrohydraulic-actuator/flexible-beam assembly exhibiting resonance will be introduced, and the sequence of course topics will be integrated into a tool set capable of suppressing this resonance. A high fidelity MATLAB model of an assembly will be used as a virtual lab to carry out the project tasks and help develop problem solution, the likes of which are currently employed in industry. The purpose of the latter is to automatically assign an extra credit hour to anyone enrolling into ME360 Honor's section. James Scholar status is not required to register. ME students must obtain department approval from staff in 154 MEB to drop this course after the last day to add a class.

Must enroll concurrently in ME 199 22278.

**ME 370  Mechanical Design I**  credit: 3 hours.

Kinematics and dynamics of machinery, including introduction to user-centered design and design thinking, analytical and computer-aided design of kinematics, dynamic force analysis, principle of virtual work, cam and gear design, and balancing. Project-based learning of multi-mechanism system design, analysis, fabrication, and evaluation. Prerequisite: ME 270, TAM 212, and TAM 251.

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Restricted to Mechanical Engineering major(s). Restricted to students with Junior or Senior class standing.
MEchSE students must obtain department approval from staff in 154 MEB to drop this course after the last day to add a class. Students enrolled in this Lecture section must choose Lab sections AB1 or AB2.

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Restricted to Mechanical Engineering major(s). Restricted to students with Junior or Senior class standing. MechSE students must obtain department approval from staff in 154 MEB to drop this course after the last day to add a class. Students enrolled in this Lecture section must choose Lab sections BB3 or BB4.

**ME 371 Mechanical Design II**  credit: 3 hours.
Design and analysis of machinery for load-bearing and power transmission. Consideration of material failure modes, including yielding, fracture, and fatigue. Design and selection of machine elements: threaded fasteners, springs, rolling-element bearings, fluid film lubrication, gears and friction drives. Prerequisite: ME 330 OR CEE 300; ME 370.

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MechSE students must obtain department approval from staff in 154 MEB to drop this course after the last day to add a class.

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MechSE students must obtain department approval from staff in 154 MEB to drop this course after the last day to add a class.

**ME 400 Energy Conversion Systems**  credit: 3 OR 4 hours.
Processes and systems for energy conversion, including power and refrigeration cycles, air conditioning, thermoelectrics and fuel cells; ideal-gas mixtures and psychrometrics. 3 undergraduate hours. 4 graduate hours. Prerequisite: ME 200.
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Credit Hours: 3 hours
Restricted to Undergrad - Urbana-Champaign.

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Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.

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Credit Hours: 4 hours

Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCE students. For more details on this course section, please see http://engineering.illinois.edu/online/courses/.

**ME 404 Intermediate Thermodynamics**  credit: 4 hours.
Classical thermodynamics, including the TdS equations and the Maxwell relations; development of thermodynamic property relations, behavior of real gases, thermodynamics of mixtures, phase equilibrium and chemical reactions and equilibrium with an emphasis on combustion reactions; statistical thermodynamics including the effect of molecular and atomic structure, statistical concepts and distributions, calculation of thermodynamic properties of gas-phase atoms and molecules, kinetic theory of gases, and vibrations in crystals and the electron gas in metals; selected applications. 4 undergraduate hours. 4 graduate hours. Credit is not given for both ME 404 and any of PHYS 427, CHEM 442, or CHEM 444. Prerequisite: ME 200.

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**ME 410 Intermediate Gas Dynamics**  credit: 3 OR 4 hours.
Solution of internal compressible-flow problems by one-dimensional techniques, both steady and unsteady; flows with smooth and abrupt area change, with friction, with heat addition, and with mass addition; flows with weak and strong waves, multiple confined streams, and shock waves. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: ME 200; ME 310, TAM 335 or AE 311.

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Restricted to Graduate - Urbana-Champaign.
ME 412  **Numerical Thermo-Fluid Mechs**  credit: 2 TO 4 hours.
Numerical techniques for solving the equations governing conduction and convective heat transfer in steady and unsteady fluid flows: finite-difference and finite-volume techniques, basic algorithms, and applications to real-world fluid-flow and heat-transfer problems. Same as CSE 412. 2 or 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: ME 310 OR TAM 335; ME 320.

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Credit Hours: 3 hours

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<td>Chang, W, Shahane, S</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Not intended for Undergrad - Urbana-Champaign. Section restricted to graduate students.

ME 431  **Mechanical Component Failure**  credit: 3 OR 4 hours.
Relationship of materials and mechanics concepts to the design of structures and components: elasticity, plasticity, thermal loading, creep, fatigue, fracture, and residual-life assessments as they relate to materials selection and design. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: ME 330 and ME 371; Recommended: ME 430.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
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<td>Lecture-Discussion</td>
<td>D3</td>
<td>11:00 AM - 11:50 AM</td>
<td>MWF</td>
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<td>Downing, S, Kim, Y</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours
Restricted to Undergrad - Urbana-Champaign.

<table>
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</tr>
</tbody>
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Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign. Section restricted to graduate students.

<table>
<thead>
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<tr>
<td>40677</td>
<td>Online</td>
<td>ONL</td>
<td>ARRANGED -</td>
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<td>Ahsan, Z Downing, S</td>
</tr>
</tbody>
</table>

Restricted to MS: Civil Engr - Online - UIUC, MCS: Computer Sci Online - UIUC, MS: Mechanical Engineering - UIUC, MS: Aerospace Engr-Online-UIUC, NDEG: Grad Nondegree-CE-UIUC, NDEG: Undergrad Nondeg-CE-UIUC, or MENG: Mech Engineering Onl-UIUC. Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCE students. For more details on this course section, please see http://engineering.illinois.edu/online/courses/. Non-Degree students may enroll on a space-available basis with consent of Program Coordinator, Staci Tankersley (tank@illinois.edu).

ME 440  Kinem & Dynamics of Mech Syst  credit: 3 OR 4 hours.
Kinematics and dynamics of constrained rigid-body mechanical systems; use of modern computer-based analysis software packages. 3 undergraduate hours. 4 graduate hours. Prerequisite: ME 370.

CRN 67735
Type Online
Section ONC
Time ARRANGED -
Days -
Location -
Instructor Ahsan, Z Dankowicz, H

Departmental Approval Required

CRN 67737
Type Online
Section ONL
Time ARRANGED -
Days -
Location -
Instructor Ahsan, Z Dankowicz, H

Credit Hours: 4 hours
Restricted to MS: Civil Engr - Online - UIUC, MCS: Computer Sci Online - UIUC, MS: Industrial Engr Online-UIUC, MS: Mechanical Engineering - UIUC, MS: Env Engr Civil Engr Onl-UIUC, MS: Aerospace Engr-Online-UIUC, NDEG: Grad Nondegree-CE-UIUC, or MENG: Mech Engineering Onl-UIUC.

CRN 67734
Type Online
Section ONU
Time ARRANGED -
Days -
Location -
Instructor Ahsan, Z Dankowicz, H

Credit Hours: 3 hours
Restricted to NDEG: Undergrad Nondeg-CE-UIUC.

ME 445  Introduction to Robotics  credit: 4 hours.
Same as AE 482 and ECE 470. See ECE 470.

<table>
<thead>
<tr>
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<td>3071 - Electrical &amp; Computer Eng Bldg</td>
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<tr>
<td>65302</td>
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<td>09:00 AM - 10:50 AM</td>
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<td>3071 - Electrical &amp; Computer Eng Bldg</td>
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<td>CRN</td>
<td>Type</td>
<td>Section</td>
<td>Time</td>
<td>Days</td>
<td>Location</td>
<td>Instructor</td>
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<td>106B8 - Engineering Hall</td>
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</table>

**ME 446  Robot Dynamics and Control**  credit: 4 hours.
Same as ECE 489 and SE 422. See SE 422.

**ME 452  Num Control of Mfg Processes**  credit: 0 TO 4 hours.
Numerical control systems, manufacturing processes, principles and practices basic to numerical control, and programming methodology for numerical control. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 101 and ME 270.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
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<td>02:00 PM - 03:50 PM</td>
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<tr>
<td>52259</td>
<td>Lecture</td>
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<td>MW</td>
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Credit Hours: 3 hours
AL 3 section is for undergraduate and graduate students who want to take the course for 3 hours.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
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<tr>
<td>52276</td>
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</table>

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
AL4 lecture is for graduate student only who want to take this course for 4 hours.

**ME 455 Micromanufacturing Process & Automation** credit: 3 OR 4 hours.
Scaling laws in miniaturization, Micro-machine tools design and characterization, Micromanufacturing process modeling, simulation and automation, Micro-metrology and Micro-assembly systems. 3 undergraduate hours. 4 graduate hours. Prerequisite: ME 270 or equivalent or consent of instructor.

<table>
<thead>
<tr>
<th>CRN</th>
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<tbody>
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<td>Lecture</td>
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Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.

<table>
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<tr>
<th>CRN</th>
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</tr>
</tbody>
</table>

Credit Hours: 3 hours
Restricted to students with Senior class standing. Restricted to Undergrad - Urbana-Champaign.
ME 460  **Industrial Control Systems**  credit: 4 hours.
Industrial control techniques; case studies of industrial systems; design, selection, and maintenance of industrial control systems, including electromechanical, pneumatic, thermal, and hydraulic systems. 4 undergraduate hours. 4 graduate hours. Credit is not given for both ME 460 and ECE 486. Prerequisite: ME 340 and ME 360.

<table>
<thead>
<tr>
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<td>63288</td>
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<td>130B - Optical Physics &amp; Eng Lab</td>
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<tr>
<td>63289</td>
<td>Laboratory</td>
<td>AB2</td>
<td>03:00 PM - 04:50 PM</td>
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<td>130B - Optical Physics &amp; Eng Lab</td>
<td>Matijevich, T</td>
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<tr>
<td>63291</td>
<td>Laboratory</td>
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<td>63287</td>
<td>Lecture-Discussion</td>
<td>AE1</td>
<td>11:00 AM - 12:20 PM</td>
<td>MW</td>
<td>218 - Mechanical Engineering Bldg</td>
<td>Hovakimyan, N Wu, Z</td>
</tr>
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</table>

ME 465  **Optics: Theory & Applications**  credit: 4 hours.
Introduction to basic concepts in electromagnetic fields and waves as they pertain to measurement science and subsurface imaging. Related applications using wave-based probes, such as acoustic fields and waves with an emphasis on current phenomena and technologies. 4 undergraduate hours. 4 graduate hours. Prerequisite: PHYS 212, MATH 285 OR MATH 286 OR MATH 441. Restricted to students with Senior or Graduate standing, or instructor permission.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
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<tr>
<td>69622</td>
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<td>01:00 PM - 02:50 PM</td>
<td>MW</td>
<td>4101 - Materials Science &amp; Eng Bld</td>
<td>Rajput, H Toussaint, K</td>
</tr>
</tbody>
</table>

Restricted to students with Graduate class standing.
This course is intended to provide a practical understanding to optics/light for engineering and science students who are non-specialists. Students will be introduced to basic concepts in optics as they pertain to current phenomena and technologies. Advanced background in electromagnetics is not required.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
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<tr>
<td>69621</td>
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<td>Lee, W Rajput, H Toussaint, K</td>
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</table>

Restricted to students with Senior class standing.
This course is intended to provide a practical understanding to optics/light for engineering and science students who are non-specialists. Students will be introduced to basic concepts in optics as they pertain to current phenomena and technologies. Advanced background in electromagnetics is not required.

ME 470  **Senior Design Project**  credit: 3 hours.
Solution of a real-world design problem: development, evaluation, and recommendation of alternative solutions subject to realistic constraints that include most of the following considerations: economics, environment, sustainability, manufacturability, ethics, health
and safety, society, and politics. 3 undergraduate hours. No graduate credit. Departmental approval required. Prerequisite: Concurrent enrollment in no more than two required ME courses; completion of all required courses.

This course satisfies the General Education Criteria for a:
Advanced Composition

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
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<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>37401</td>
<td>Lecture</td>
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<td>08:00 AM - 09:50 AM</td>
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<td>100 - Materials Science &amp; Eng Bld</td>
<td>Johnson, B</td>
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</table>

Advanced Composition course.
Departmental Approval Required
Restricted to students in the Mechanical Sci & Engineering department.
Restricted to students with Senior class standing.
Spring ME 470 registration is for students whose UIN ends in an odd number. To petition a change in this spring registration, see staff in 154 MEB. You will receive a TIME CONFLICT AND AN APPROVAL ERROR when registering for this course. To receive the necessary overrides to register, please see staff in the Mechanical Science and Engineering Undergraduate Programs Office in 154 MEB. ME students must obtain department approval from staff in 154 MEB to drop this course after the first day of class.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
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<th>Instructor</th>
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<td>AY1</td>
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<td>TR</td>
<td>153 - Mechanical Engineering Bldg</td>
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</table>

Advanced Composition course.
Departmental Approval Required
You will receive a TIME CONFLICT AND AN APPROVAL ERROR when registering for this course. Please contact the Mechanical Science and Engineering Undergraduate Programs Office in 154 MEB, 217-333-0366, MechSE-Undergrad@illinois.edu to receive the necessary overrides to register for the course.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
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<th>Instructor</th>
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Advanced Composition course.
Departmental Approval Required
You will receive a TIME CONFLICT AND AN APPROVAL ERROR when registering for this course. Please contact the Mechanical Science and Engineering Undergraduate Programs Office in 154 MEB, 217-333-0366, MechSE-Undergrad@illinois.edu to receive the necessary overrides to register for the course.

<table>
<thead>
<tr>
<th>CRN</th>
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Advanced Composition course.
Departmental Approval Required
You will receive a TIME CONFLICT AND AN APPROVAL ERROR when registering for this course. Please contact the Mechanical Science and Engineering Undergraduate Programs Office in 154 MEB, 217-333-0366, MechSE-Undergrad@illinois.edu to receive the necessary overrides to register for the course.

<table>
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<td>Thompson, N</td>
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</table>
### ME 471 Finite Element Analysis  credit: 3 OR 4 hours.

The finite element method and its application to engineering problems: truss and frame structures, heat conduction, and linear elasticity; use of application software; overview of advanced topics such as structural dynamics, fluid flow, and nonlinear structural analysis. Same as AE 420 and CSE 451. 3 or 4 undergraduate hours. 3 or 4 graduate hours. Credit is not given for both ME 471 and CEE 470. Prerequisite: CS 101 and ME 371 or TAM 470. Alternatively, AE 370 for AE students.
<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
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<tr>
<td>59654</td>
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<td>B4</td>
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</table>

Credit Hours: 3 hours

Credit Hours: 4 hours

ME 472 Introduction to Tribology  credit: 3 OR 4 hours.
Friction, wear, and lubrication; engineering surfaces; surface properties and surface topography; Hertzian contacts and contact of rough surfaces; friction of surfaces in contact; wear and surface failures; boundary lubrication; fluid properties; hydrodynamic lubrication; elastohydrodynamic lubrication; bearing selection; introductory micro- and nanotribology. 3 undergraduate hours. 3 or 4 graduate hours.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
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<th>Days</th>
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<tr>
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<td>206 - Transportation Building</td>
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</tr>
</tbody>
</table>

Restricted to Graduate - Urbana-Champaign.

Credit Hours: 3 hours

Restricted to Undergrad - Urbana-Champaign.

ME 481 Whole-Body Musculoskel Biomech  credit: 3 OR 4 hours.
Exploration of the human musculoskeletal system with an emphasis on the whole-body or organism level; modeling and analysis techniques for examining human movement, such as rigid-body modeling techniques, forward and inverse dynamics, and Lagrangian mechanics; examination of current topics, such as orthopedic biomechanics, prosthetics and orthotics, postural control, and locomotion; use of computerized motion-capture equipment and software to examine, simulate, and analyze human movement. Same as BIOE 481. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: TAM 212 and TAM 251.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
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<th>Days</th>
<th>Location</th>
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Restricted to Graduate - Urbana-Champaign.

<table>
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<tr>
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</tbody>
</table>
ME 483  **Mechanobiology**  credit: 4 hours.
Integrative approach to mechanobiology; mechanics of cell adhesion; cytoskeletal structure and mechanics; mechanotransduction; mechanics of cell proliferation, apoptosis, cancer cells, and stem cells; aging; critical issues facing the mechanobiological sciences. 4 undergraduate hours. 4 graduate hours. Prerequisite: CHEM 103 and TAM 251.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
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<td>TR</td>
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<td>Mohagheghian, E Wang, N</td>
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</table>

ME 487  **MEMS-NEMS Theory & Fabrication**  credit: 4 hours.
Physical and chemical theory, design, and hands-on fabrication of micro- and nano-electromechanical systems (MEMS and NEMS); cleanroom fabrication theory, including general cleanroom safety, lithography, additive and subtractive processes, bulk and surface micromachining, deep reactive ion etching (DRIE), lithographic Galvanoformung Abformung (LIGA), packaging, scaling, actuators, and micro-nanofluids; fabrication of two take-home devices, such as piezoresistive sensors and microfluidic logic chips, that demonstrate advanced fabrication processing. 4 undergraduate hours. 4 graduate hours. Prerequisite: PHYS 212.

<table>
<thead>
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<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
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Restricted to Graduate - Urbana-Champaign.

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Restricted to Undergrad - Urbana-Champaign.

ME 496  **Honors Project**  credit: 1 TO 4 hours.
Special project or reading course for James Scholars in engineering. 1 to 4 undergraduate hours. No graduate credit. May be repeated. Prerequisite: Consent of instructor.

<table>
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<tr>
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**ME 497  **Independent Study  credit: 1 TO 3 hours.
Independent study of advanced problems related to mechanical engineering. 1 to 3 undergraduate hours. No graduate credit. May be repeated in separate terms to a maximum of 6 hours, as topics vary. Prerequisite: Consent of Instructor. Students with Junior or Senior standing.

<table>
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**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>
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Credit Hours: 4 hours  
Signal Processing  
Restricted to Engineering. Restricted to Graduate - Urbana-Champaign.  
This course is for graduate students interested in reinforcing their modeling, signal analysis, instrumentation, and control techniques through solving a challenging industrial problem. Namely, an electrohydraulic-actuator/flexible-beam assembly exhibiting resonance will be introduced, and the sequence of course topics will be integrated into a tool set capable of suppressing this resonance. A high fidelity MATLAB model of an assembly will be used as a virtual lab to carry out the project tasks and help develop problem solution, the likes of which are currently employed in industry. This course is taught jointly with ME360 Honor's section, but graduate students will have additional graduate level tasks added to their projects and will be required to go through additional material in the course textbook.

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Location</th>
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Credit Hours: 3 hours  
Bio-Inspired Design  
Restricted to Engineering. Restricted to Undergrad - Urbana-Champaign.  
ME 498 meets with IB496. These courses offer a unique interdisciplinary advanced design experience in the field of bioinspiration. During the course we will cover four focus areas: locomotion, sensing, materials, and complex systems. For each topic, we will discuss the state of the art on engineering side and the solutions in nature that can augment the current engineering systems. By the end of the course you should be able to work in interdisciplinary teams, use analogical design concepts, and produce a prototype based on a biological function to solve an engineering challenge in one of the four focus areas.

<table>
<thead>
<tr>
<th>Course Code</th>
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Credit Hours: 4 hours  
Bio-Inspired Design  
Restricted to students in the Physics, Computational Science & Engr, Civil & Environmental Eng, Bioengineering, Industrial&Enterprise Sys Eng, Computer Science, Engineering Courses, Aerospace Engineering, Engineering Honors, Technology
Entrepreneur Ctr, Mechanical Sci & Engineering, Materials Science & Enginerring, Electrical & Computer Eng, or Nuclear, Plasma, & Rad Engr department.
Restricted to Graduate - Urbana-Champaign.
ME 498 meets with IB496. These courses offer a unique interdisciplinary advanced design experience in the field of bioinspiration. During the course we will cover four focus areas: locomotion, sensing, materials, and complex systems. For each topic, we will discuss the state of the art on engineering side and the solutions in nature that can augment the current engineering systems. By the end of the course you should be able to work in interdisciplinary teams, use analogical design concepts, and produce a prototype based on a biological function to solve an engineering challenge in one of the four focus areas.

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Credit Hours: 4 hours
Comp modeling & optimization
Computational Optimization for Biological and Engineering Systems. This course provides a hands-on introduction to modern computational modeling and simulations techniques applied to the understanding of biophysical and engineering problems. From moving bodies in fluids and bio-hybrid robots, to unconventional ‘birds-nest’ materials and propulsion on sandy dunes, you will learn to model biophysical phenomena and implement software able to capture their essential behavior. Moreover, you will learn to employ evolutionary optimization algorithms in combination with the developed models, to inverse design more performant solutions. This course requires some basic Matlab or Python or C/C++ coding skills.

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Credit Hours: 4 hours
Departmental Approval Required
Corporate Internship - required for Tsinghua 3+2 program. Registration is restricted to students in the Tsinghua 3+2 program. Students are required to obtain a registration override from the MechSE Undergraduate Office, Rm 154 Mechanical Engineering Bldg.

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Credit Hours: 4 hours
Departmental Approval Required
Corporate Internship - required for Tsinghua 3+2 program. Registration is restricted to students in the Tsinghua 3+2 program. Students are required to obtain a registration override from the MechSE Undergraduate Office, Rm 154 Mechanical Engineering Bldg.

ME 501  **Combustion Fundamentals**  credit: 4 hours.
Fundamentals of kinetic theory, transport phenomena, chemical equilibria, and reaction kinetics; flames, their gross properties, structure, and gas dynamics including oscillatory and turbulent burning; solid and liquid propellant combustion; one-dimensional detonation theory including structure and initiation; three-dimensional and other complex detonation waves; supersonic burning. Same as AE 538. Prerequisite: AE 311 or ME 410.
ME 502  **Thermal Systems**  credit: 4 hours.
Steady-state simulation and optimization of thermal systems, dynamic performance, and probabilities in system design. Prerequisite: ME 402.

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<th>CRN</th>
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<th>Section</th>
<th>Time</th>
<th>Days</th>
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</table>

ME 510  **Advanced Gas Dynamics**  credit: 4 hours.
Theoretical gas dynamics; fundamental laws and basic equations for subsonic, transonic, and supersonic steady and unsteady flow processes. Same as AE 510. Prerequisite: ME 410.

<table>
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Credit Hours: 4 hours
Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Industrial Engr Online-UIUC, MS:Mechanical Engineering -UIUC, MS:Env Engr CivilEngr ONL-UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, or MENG:Mech Engineering Onl-UIUC.

ME 520  **Heat Conduction**  credit: 4 hours.
Fundamentals of heat conduction in isotropic and anisotropic materials; methods of solution to steady and transient heat conduction problems in one, two, and three dimensions; internal heat sources; periodic flow of heat; problems involving phase change; approximate analytical techniques; numerical methods; study of current articles on the subject. Prerequisite: ME 420.

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Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Industrial Engr Online-UIUC, MS:Mechanical Engineering -UIUC, MS:Env Engr CivilEngr ONL-UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, or MENG:Mech Engineering Onl-UIUC.
ME 523  Nanoscale Energy Transport  credit: 4 hours.
An advanced treatment of diverse transport phenomena at the nanometer scale involving solids, liquids and gases emphasizing common features in transport by molecules, electrons, phonons, photons, and other quasi-particles of interest, oriented toward applied research in the areas of nanoscale heat transfer and nanoscale energy conversion. Topics include intermolecular forces at surfaces and in the bulk, momentum and species transport in microfluidics, linear response theory, free molecular flow in gases, electron and phonon transport in crystals, Boltzmann equation and its moments, ballistic and diffusive transport, thermoelectric energy conversion, interfacial transport, energy transport in nanostructures and radiative transport in the near-field. Approved for letter and S/U grading.

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Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Industrial Engr Online-UIUC, MS:Mechanical Engineering -UIUC, MS:Env Engr CivilEngr ONL-UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, or MENG:Mech Engineering Onl-UIUC.

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ME 540  Control System Theory & Design  credit: 4 hours.
Same as ECE 515. See ECE 515.

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ME 546  Analysis of Nonlinear Systems  credit: 4 hours.
Same as ECE 528 and SE 520. See ECE 528.

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ME 570  Nonlinear Solid Mech Design  credit: 4 hours.
Optimality conditions; finite element methods; design sensitivity analysis; nonlinear analysis; transient analysis; thermo-mechanical solid mechanics. Same as AE 524. 4 graduate hours. No professional credit. Prerequisite: One of AE 420, CEE 470, ME 471, TAM 470; TAM 445, TAM 551.

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<th>Days</th>
<th>Location</th>
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</table>
ME 590  **Seminar**  credit: 1 hours.
Presentation and discussion of significant developments in mechanical engineering. Approved for S/U grading only. May be repeated.

<table>
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<th>Type</th>
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<th>Days</th>
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</table>

Meets with TAM 500

ME 597  **Independent Study**  credit: 1 TO 4 hours.
Independent study of advanced problems related to mechanical engineering. May be repeated in the same term or in separate terms if topics vary to a maximum of 12 hours. Prerequisite: Consent of instructor.

<table>
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ME 598  **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. May be repeated in the same or separate terms if topics vary.

<table>
<thead>
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<th>CRN</th>
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<tr>
<td>65832</td>
<td>Lecture</td>
<td>ALV</td>
<td>02:00 PM - 04:50 PM</td>
<td>W</td>
<td>-</td>
<td>LaViers Minnick, A</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
High-Level Robotic Control
Restricted to Graduate - Urbana-Champaign.
This interdisciplinary seminar will have three main components: representation, control, and coordination. Course assignments will include interactive, embodied movement sessions, choreography, assigned reading, presentations to fellow students, leading in-class discussions, and intensive writing assignments. Topics covered in representation will include continuous dynamical systems, discrete transition systems, graphs, and movement notation. Topics covered in control will include motion tracking, planning, supervisory control, and formal specification. Topics in coordination will include Laplacian dynamics, consensus, leader-follower networks, and formation control. The course will come full circle when we see the relationship among these three topics: the coordination and performance we can achieve on machines depends on our choices in representation and control strategy. Students should have familiarity with the following: linear algebra, differential equations, digital logic, Laban movement analysis, feedback control, and/or networks. Please contact Tammy Smith (tssmith1@illinois.edu) or Robbie Vermillion (rvermil2@illinois.edu) to be added to the waitlist if the course is closed when you register.

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<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tr>
<td>69470</td>
<td>Lecture</td>
<td>AN1</td>
<td>10:00 AM - 11:20 AM</td>
<td>MW</td>
<td>106B6 - Engineering Hall</td>
<td>Hossain, M Kim, J Nam, S van der Zande, A</td>
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</tbody>
</table>

Credit Hours: 4 hours
Nano-Fab & Characterization
Restricted to Graduate - Urbana-Champaign.

Full Title: Nanoscale Fabrication and Characterization

This course will provide a practical understanding of state-of-the-art, nanoscale fabrication and characterization approaches and the fundamental principles behind these advanced techniques. Lectures will introduce students to topics including top-down and bottom-up paradigms of nano-fabrication, characterization of structures smaller than can be resolved with light, and explore applications at the forefront of nanoresearch. The focus will be on two dimensional materials, which will be used as a case study to understand the broader challenges and opportunities of making and using nanoscale systems. Students will apply course concepts through labs and demonstrations to synthesize monolayer graphene, characterize nanoscale structure and properties, and engineer devices like graphene field effect transistors.

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<tr>
<th>Course Code</th>
<th>Type</th>
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<th>Instructor</th>
<th>Location</th>
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<tr>
<td>69471</td>
<td>Laboratory</td>
<td>11:00 AM - 12:50 PM</td>
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<td>213A - Mechanical Engineering Bldg</td>
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<td>Hossain, M</td>
<td>Kim, J Nam, S van der Zande, A</td>
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Nano-Fab & Characterization

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<tr>
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<td>3081 - Electrical &amp; Computer Eng Bldg</td>
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<td>Wagoner Johnson, A</td>
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Credit Hours: 4 hours

Science Communication for ME

Restricted to students in the Mechanical Sci & Engineering department.

Restricted to Graduate - Urbana-Champaign.

Effective oral and written science communication that reaches both technical and non-technical audiences is increasingly important. Scientists are expected to communicate using a broad range of media. This course provides concentrated instruction and practice in both written and oral communication through a range of communication formats. Topics include persuasion, improv for science communication, story telling, effective graphics, assertion-evidence presentations, and communication to media outlets, as examples. By the end of the semester, students will have curated a research portfolio that includes oral and written products for both technical and non-technical audiences. Prereq: Graduate students must be in at least the second year of the ME program. The course is recommended for students who are approaching or past qualifying exams, and who are ready to write and talk about their research. It is not recommended for students who are in their last semester or first year of graduate studies.

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<th>Instructor</th>
<th>Location</th>
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<tr>
<td>68059</td>
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<td>Socie, D</td>
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Credit Hours: 2 hours

Fun with Mechanics

Restricted to students in the Mechanical Sci & Engineering department.

Restricted to Graduate - Urbana-Champaign.

This course is being offered to give graduate students an opportunity to participate in a creative design project course that is of a competitive nature. In the first semester (2 credit hours) small student teams of 3-5 persons will design a device to meet the specified technical requirements of the competition and provide an engineering analysis that shows that their design is likely to be successful. The device will be fabricated in the second semester (2 credit hours). The Fall 2017 project was to build a walking machine that is powered by a cordless drill that carries a human rider. A competition consisting of racing around the Engineering Quad will be held at the end of the second semester in the spring of 2018. This course has no lectures or exams, grades are based solely on the project.

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<th>Instructor</th>
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<tbody>
<tr>
<td>52404</td>
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<td>TEX</td>
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Credit Hours: 4 hours

Departmental Approval Required

Corporate Internship - required for Tsinghua 3+2 program. Registration is restricted to students in the Tsinghua 3+2 program. Students are required to obtain a registration override from the MechSE Undergraduate Office, Rm 154 Mechanical Engineering Bldg.

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<th>Instructor</th>
<th>Location</th>
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</table>
Departmental Approval Required
Corporate Internship - required for Tsinghua 3+2 program. Registration is restricted to students in the Tsinghua 3+2 program. Students are required to obtain a registration override from the MechSE Undergraduate Office, Rm 154 Mechanical Engineering Bldg.

**ME 599  Thesis Research**  credit: 0 TO 16 hours.
Approved for S/U grading only. May be repeated.

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<th>Location</th>
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