# Aerospace Engineering

**AE 598  Special Topics  credit: 1 TO 4 hours.**

Subject offerings of new and developing areas of knowledge in aerospace engineering intended to augment existing formal courses. Topics and prerequisites vary for each section. See Class Schedule or departmental course information for both. May be repeated in the same or separate terms if topics vary to a maximum of 12 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>43789</td>
<td>Lecture-Discussion</td>
<td>AAA</td>
<td>04:00 PM - 05:20 PM</td>
<td>TR</td>
<td>1111 - Siebel Center for Comp Sci</td>
<td>Selig, M</td>
</tr>
<tr>
<td>62621</td>
<td>Lecture</td>
<td>ANS</td>
<td>10:00 AM - 11:20 AM</td>
<td>MW</td>
<td>106B3 - Engineering Hall</td>
<td>Gao, X</td>
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<tr>
<td>64177</td>
<td>Lecture-Discussion</td>
<td>C</td>
<td>10:00 AM - 11:50 AM</td>
<td>MW</td>
<td>203 - Transportation Building</td>
<td>James, K</td>
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<td>Tortorelli, D</td>
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<tr>
<td>51409</td>
<td>Lecture-Discussion</td>
<td>MCF</td>
<td>09:00 AM - 10:20 AM</td>
<td>MW</td>
<td>319M - Talbot Laboratory</td>
<td>Le Chenadec, V</td>
</tr>
<tr>
<td>62423</td>
<td>Lecture-Discussion</td>
<td>MGD</td>
<td>09:00 AM - 10:50 AM</td>
<td>TR</td>
<td>403B2 - Engineering Hall</td>
<td>Panesi, M</td>
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</tbody>
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**Credit Hours:** 4 hours

**Advanced Applied Aerodynamics**

Prerequisite: AE 416 or consent of instructor Propeller and wind turbine aerodynamic performance and design, wind tunnels, elements of configuration aerodynamics, low-speed airfoil design, and more.

**Credit Hours:** 4 hours

**Adv Global Nav Sat Systems**

Satellite Navigation, and in particular, the Global Positioning System (GPS) is a critical component in avionics, and has been widely used in both ground and aerial vehicles. The discipline is in a period of flux. The U.S. GPS and the Russian GLONASS are being joined by the European Galileo and the Chinese BeiDou systems. Furthermore, the prospect of a commercial UAV industry in the near future will create significant new engineering opportunities in designing and building avionics systems involving GPS. In this course, students will learn advanced satellite navigation technologies with applications in UAV flight and control systems.

**Credit Hours:** 4 hours

**Nonlinear Solid Mech Design**

This course will be taught with ME 570, Nonlinear Solid Mech Design. Optimality conditions; finite methods; design sensitivity analysis; transient analysis; thermo-mechanical solid mechanics. Prerequisite: One of AE 420, CEE 470, ME 471, TAM 470, TAM 445, TAM 551.

**Credit Hours:** 4 hours

**Multiphase CFD**

4 hours. Topic: Multiphase Computational Fluid Dynamics. Course will concentrate on governing equations and numerical solution of multiphase equations in both Eulerian and Lagrangian reference frames. This includes a review of theoretical and empirical point-force expressions for an individual particle surface force. In addition, resolved-surface techniques, such as immersed-boundary methods and level-set methods will be employed. Prerequisite: Introductory Multiphase course such as CEE 559 Sediment Transport or ME 504 Multiphase Systems and Processes.

**Credit Hours:** 4 hours

**Gas Dynamics**
The course provides the basic knowledge of the kinetic theory of gases, chemical thermodynamics and statistical mechanics. These analytical tools will then be applied to the study of equilibrium gas properties over wide temperature ranges, the kinetics of physical and chemical reactions, and the interaction of matter with radiation. The course material is useful in studies of combustion chemistry, high temperature and rarefied gas dynamics, low temperature plasmas, hypersonics, gas diagnostics with lasers, etc.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Mode</th>
<th>Instructor</th>
<th>Credit Hours</th>
<th>Description</th>
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</thead>
</table>
| 62469       | Online | MGO        | 4            | Gas Dynamics  
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, or MCS: Computer Sci Online-UIUC. Restricted to online graduate non-degree, online MCS, online MSME, online MSCEE, and online MSAE students. Center for Innovation in Teaching & Learning (CITL) restrictions and assessments apply, see http://online.illinois.edu. 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). OCE Tuition $1034.00 per Bill Hour, and OCE Fees $50.00 per Bill Hour. |
| 64334       | Laboratory-Discussion | MRM       | 4            | Mechanics of Robotic Manipulation  
Human hands do many useful things. We would like robot hands to do these same things, and more. The goal of this course is to understand how. To achieve this goal, we will study the mechanics of contact between robot hands and the objects they manipulate. We will learn how to model the kinematics and dynamics of articulated rigid bodies that roll across, slide along, and impact each other. We will learn how to test these models by comparison with experimental data. We will apply what we have learned to solve a variety of manipulation problems (manufacturing, construction, rehabilitation, in-home assistance, planetary sample return, satellite maintenance, etc.). Prerequisites: Either be a graduate student or have taken ECE470 (a course on robot kinematics). |