## Aero 483: Space System Design

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<tr>
<th><strong>COURSE #:</strong> AE 483</th>
<th><strong>COURSE TITLE:</strong> SPACE SYSTEM DESIGN</th>
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<td><strong>TERMS OFFERED:</strong> Fall/Winter</td>
<td><strong>PREREQUISITES:</strong> Senior standing</td>
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<td><strong>INSTRUCTOR(S):</strong> Gallimore, Scheeres, Kabamba</td>
<td><strong>SCIENCE/DESIGN CREDITS:</strong> 1/3 (one of AE 481 or AE 483 required)</td>
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### CATALOG DESCRIPTION:
Introduction to the engineering design process for space systems. Includes a lecture phase that covers mission planning, launch vehicle integration, propulsion, power systems, communications, budgeting, and reliability. Subsequently, students experience the latest practices in space-systems engineering by forming into mission-component teams and collectively designing a space mission. Effective team and communication skills are emphasized. Report writing and presentations are required throughout, culminating in the final report and public presentation.

### COURSE TOPICS:
1. Introduction to Course and Mission.
2. Introduction to Space Mission Design process.
3. Teaming and Personality Analysis.
4. Design Trades.
5. Astrodynamics.
6. Telecommunications.
8. Propulsion.
9. Launch Vehicles.
10. Structures.

### COURSE OBJECTIVES
1. Have students work in groups and introduce them to techniques needed to create effective teams. [d]
2. Teach communication skills, both in writing and for presentations. [g]
3. Teach students the appropriate level of modeling and analysis for developing a preliminary spacecraft design.[L, A]
4. Teach students to use/create trade-off diagrams to make engineering decisions. [C,A]
5. Familiarize students with technical issues concerning spacecraft mission design. [C, M, J, A]
6. Acquaint students with the space systems design process, including preliminary design, evaluation and assessment, and more detailed component design. [E,C,K,I,L]
7. Introduce students to non-technical design drivers such as cost, safety, public policy, etc. [J, H]
8. Introduce students to realistic review and design procedures as practiced by NASA, the DOD, and industry. [J,H]

### COURSE OUTCOMES
**On completion of Aero 483, students can:**
1. Work effectively in teams by holding efficient meetings, distributing work effectively, setting realistic goals realistic goals and deadlines, and managing conflicts smoothly. (Assessed by: 1,2,3,4)
2. Write a mission statement, mission objectives, and mission requirements, and identify mission drivers, constraints, and alternative mission architectures. (Assessed by: 1,2,3,4)
3. Perform a simple analysis of a variety of spacecraft systems including propulsion, thermal, power, telecommunications, structures, GNC (guidance, navigation, and control). (Assessed by: 1,2,3,4)
4. Perform cost analysis of aerospace systems at the component/subsystem level. (Assessed by: 1,2,3,4)
5. Calculate the trajectory and impulsive launch energy (i.e., select launch vehicle configuration) needed for interplanetary missions. (Assessed by: 1,2,3,4)
6. Perform a simple reliability analysis of a spacecraft and develop a plan to add redundancy most effectively. (Assessed by: 1,2,3,4)
7. Perform a detailed analysis/design of one or more spacecraft subsystems. (Assessed by: 1,2,3,4)
8. Generate a detailed technical report describing the design of a complex engineering system. (Assessed by: 4)
9. Give a technical presentation on the design of a complex engineering system. (Assessed by: 3)
10. Demonstrate a basic competency in understanding the spacecraft systems engineering design/integration process. (Assessed by: 4)
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<th>ASSESSMENT TOOLS</th>
<th>1. Individual homework.</th>
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<td>2. Hourly exams.</td>
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<td>3. Oral presentations.</td>
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Updated: May 2005