

**ME 433: Propulsion Systems**  
**Fall or Spring Semester Elective**

<b>Type (check one):</b>	Required: _____ Elective: <u>✓</u> _____
<b>2005-2006 Catalog Data:</b>	Design and operating fundamentals of air-breathing and rocket engines. Propulsion dynamics. Flow and combustion thermodynamics. Engine system and component performance characteristics. Advanced propulsion systems. Prerequisites: ME 313, 316. <i>One semester; three credits</i>
<b>Prerequisites:</b>	ME 313, ME 316
<b>Co-Requisites:</b>	None
<b>Textbook:</b>	Gordon C. Oates, <i>Aerothermodynamics of Gas Turbine and Rocket Propulsion</i> , Third Edition, AIAA, 1997.
<b>Other Required Materials:</b>	None
<b>Other References:</b>	None
<b>Instructor:</b>	Dr. Bernard B. Beard, Associate Professor of Mechanical Engineering
<b>Course Objectives:</b>	<ol style="list-style-type: none"><li>1. Provide instruction in the fundamentals of propulsion system design and operation</li><li>2. Provide a basis for advanced study in propulsion systems engineering</li></ol>
<b>Prerequisites by Topics:</b>	<ol style="list-style-type: none"><li>1. Fluid Mechanics</li><li>2. Thermodynamics II</li></ol>
<b>Topics:</b>	<ol style="list-style-type: none"><li>1. Overview and review of fluid mechanics fundamentals</li><li>2. 1-D compressible fluid flow</li><li>3. 2-D and 3-D compressible fluid flow</li><li>4. Non-ideal and reacting gas flows</li><li>5. Rocket vehicle performance</li><li>6. Rocket propulsion configurations</li><li>7. Rocket performance</li><li>8. Air vehicle performance</li><li>9. Airbreathing propulsion configurations</li><li>10. Ideal cycle analysis</li><li>11. Component performance</li><li>12. Engine off-design performance</li><li>13. Introduction to internal aerodynamics</li></ol>
<b>Class Schedule:</b>	Three 50-minute sessions per week

**Prepared by:** Dr. Bernard B. Beard

**Date:** 15 Nov 2005

**Professional Component:**

Category (check one)	<input type="checkbox"/> Math/Basic Science <input checked="" type="checkbox"/> Engineering <input type="checkbox"/> General Education <input type="checkbox"/> Other
Design (check one)	<input type="checkbox"/> Significant <input checked="" type="checkbox"/> Some <input type="checkbox"/> None
Realistic Constraints (check all that apply)	<input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input type="checkbox"/> Sustainability <input type="checkbox"/> Manufacturability <input type="checkbox"/> Ethical <input type="checkbox"/> Health & Safety <input type="checkbox"/> Social <input type="checkbox"/> Political

**Relationship to Program Outcomes:**

Check all that apply:

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs
- (d) an ability to function on multi-disciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
- (i) a recognition of the need for and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice