

University of Illinois at Urbana-Champaign

Department of Aerospace Engineering

**AE 508**

**Optimal Space Trajectories**

**Spring 2014**

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Course webpage: [prussing.ae.illinois.edu/AE508](http://prussing.ae.illinois.edu/AE508)

### **Course Outline**

AE 504 is recommended but not required

AE 402 is not a prerequisite

One Midterm Exam plus Comprehensive Final Exam

Approximately weekly homework sets due on Fridays. Homework is due at the beginning of the class period. A late penalty of 10 percent per day is enforced. No homework is accepted after graded homework is returned.

### **Course Grade**

Midterm exam counts 40%

Final Exam counts 40%

Homework counts 20%

### **Text**

There will be occasional class handouts, including some printed notes

A few book chapters written by Prussing will be posted on the webpage.

*Take good lecture notes!*

### **Topics**

Orbital maneuvers and rocket dynamics

Optimal Control Theory

Cost functionals for optimal trajectories

Necessary Conditions (NC) for optimal low-thrust (continuous) trajectories

The Primer Vector and aspects of Linear Systems Theory

Necessary conditions for optimal high-thrust (impulsive) trajectories

Optimal trajectories in linearized gravitational fields

Maximum number of impulses and sufficient conditions (SC) for linear problems

Cooperative rendezvous

Second-order NC and SC for optimal control problems