IMPORTANT NOTES AND SYLLABUS FOR
AAE 508 Optimization in Aerospace Engineering

1. **Instructor:**
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2. **Learning Objective:**
To introduce students to the theory and numerical calculation of optimal space trajectories and related optimization problems in aerospace engineering. This course provides the essential technical components of space trajectory design and space trajectory optimization. Students develop basic engineering skills in formulating and solving open-ended problems and in writing a project report. Some students have turned their projects into directed studies (AAE 590), conference papers, and journal submissions.

3. **Prerequisites:**
Students should be senior or graduate standing in engineering, science, or mathematics.

4. **Required Text:** Longuski, J.M., Guzman, J. J., and Prussing, J.E., *Optimal Control with Aerospace Applications*, Springer, New York, 2014.

5. **Homework:**
   a. Usually one assignment per week, to be turned in (by On Campus students) at the beginning of class. HW turned in **15 minutes after lecture** begins will not be given credit.
   b. A solution will be posted on Blackboard shortly after HW is due.
   c. Absolutely **NO late homework** will be accepted for any reason. However, your lowest homework score will be discarded in **Grading Scheme 8b** (only).
   d. Rules for homework: must be neat and legible, on 8½ x 11 inch paper (any style), stapled (no paper clips, no dog ears), and must be your own work (copying will result in a grade divided by the number of students involved). Points will be taken off for not following all these rules.

6. **Attendance:** is not required. Please do not attend if you are not interested in hearing the lecture.

7. **Exams and Project:**

a. Three in-class exams are scheduled as follows:

Exam 1 Friday, Sept. 25, 2015
Exam 2 Friday, Oct. 30, 2015
Exam 3 Friday, Dec. 4, 2015

On campus exams will be at 12:30 PM. ProEd students can arrange to take their exams any time during the above scheduled dates.

b. No final exam will be given.

c. All exams will be closed book; however a crib sheet will be allowed.

d. No electronic devices of any kind will be allowed during the exams.

e. A zero will be given for exams missed or a late project. **No exceptions.**

f. See Prof. Longuski if you must take an exam early. No late exams will be given.

8. **Best of Two Grading Schemes:**

a. Everything counts (all 3 exams, all HWs).

b. ***Crisis Option***: Lower of Exam 1 and 2 dropped; lowest HW dropped—but **Exam 3 counts!**

The reason Exam 3 can't be dropped is that the course is cumulative in nature and all students must learn all the course material. (Permitting a student to stop studying for the course after receiving high marks on Exams 1 and 2 is not the goal.) Students will be evaluated by both schemes and awarded the higher grade. Letter grades will not include plus or minus, with the possible exception that some A grades may be raised to an A+ at the discretion of the instructor.

9. **Grades:**

Homework	20%
Project	20%
Exams	60%

10. **Brief Course Description:**

Formulation of optimization problems encountered in aerospace engineering. Minima of functions and functionals, necessary conditions, calculus of variations, control formulation, two-point boundary-value problems. Applications to typical problems in aerospace engineering such as optimal launch, minimum time to climb, maximum range, and optimal space trajectories.

11. **Recommended References:**

Bryson, A. E. and Ho, Y. C., *Applied Optimal Control*, Hemisphere Publishing Corporation, Washington, D. C., 1975. The most popular and most referenced book by aerospace engineers. A must have. A bit difficult for beginners, which is why Longuski, Guzmán, and Prussing wrote their text.

Lawden, D. F., *Optimal Trajectories for Space Navigation*, Butterworths, London, 1963. The classic treatment of optimal space trajectories. Again, a bit difficult for novices mainly due to the nonstandard terminology. Prussing's Chapter 10 in *Optimization of Space Trajectories* puts Lawden's original discoveries into modern terminology.