## ARO 309 – OrBITAL MECHANICS

## Winter 2017

## aerospace engineering Department, california state polytechnic UNIVERSITY, POMONA

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| Office hours: By appointment |

**Prerequisite**

**ARO102, ARO203** and **ME215** - Fundamental knowledge of mechanical systems (dynamics and kinematics of particle and rigid bodies) is required. Also, basic knowledge about ordinary differential equations is needed.

**Objectives**

This course provides a basic knowledge of spacecraft mission design, including orbits and trajectories, orbital environment, orbital maneuvering and rendezvous, and interplanetary transfers. You will obtain an appreciation for the fundamental design issues and constraints associated with the launching and operation of spacecraft and will acquire basic skills in engineering design and problem solving by hand analysis and using computer tools such as FreeFlyer and MATLAB®.

**Textbook**

“*Orbital Mechanics for Engineering Students”,* by Howard Curtis, Butterworth- Heinemann (Elsevier). We will cover Chapter 1 - 8.

**Software: FreeFlyer and MATLAB**

**FreeFlyer** will be used as the main software for trajectory simulation and mission design. You are recommended to use FreeFlyer for the assignments and project (STK is also acceptable). The software is only available in the computer labs in building 17 room 2103 and 2107.

**MATLAB**® will be used for the project and assignments. If you are unfamiliar with MATLAB programming, you should practice the basic knowledge parallel to the class. The Mathworks website provides tutorial and help on MATLAB. The following course is also available online for free: https://www.coursera.org/learn/matlab

**Reading Assignments**

The reading assignments will be discussed during lecture. Approximately, a chapter a week. Reading should be done before class session.

**Homework Assignments**

Homework assignments will be assigned on a regular basis. You are responsible to work on the assignment and finish it prior to the due date which is one week after it has been assigned. One or two problems will be selected randomly from each assignment to be graded. You are encouraged to form “**study groups**” and work with your fellow classmates on the homework. However, **DO NOT COPY** someone else’s paper. Copying serves no purpose and will not help you prepare for the exams. Be sure you understand what you have put down on the paper if you wish to do well on the exams; consider it “practicing” for those events.

**Project**

One technical space mission design project will be assigned for this course. You have to form groups of 4-5 students to work on the project. A technical presentation and report should be prepared for each team to be shared online for peer evaluation of the project. The details of the project and reports will be discussed during the lecture.

**Exams**

One midterm exam (approx. 6th week) and a final exam will be given. The exams will be open to the book and class notes.

**Grading**

The approximate grading recipe will be: Assignments 20%; Project 20%; Midterm exam 30%; and Final Exam 30% of your final grade.

**Disability Services**

Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately to discuss your specific needs. Please also contact the Disability Resource Center (Building 9, Room 103, Phone: 909-869-3333) to coordinate reasonable accommodations. For more information, visit Disability Resource Center website: http://www.cpp.edu/~drc/.

**Academic integrity**

Students are expected to be familiar with the University’s Academic Integrity Policy. Plagiarism, cheating on tests, sabotage, altering an academic record, and using unauthorized study aids are all examples of academic dishonesty. I encourage you to read the Cal Poly Pomona statement on academic integrity (http://www.cpp.edu/~judicialaffairs/index.shtml) and the College of Engineering policy on academic integrity (http://www.cpp.edu/ ~engineering/current/integrity.shtml). You are responsible for complying with these policies whether or not you have read them.