AE 4361–Space Flight Operations

HOURS: 3-0-3

CATALOG DESCRIPTION:

This course introduces the foundations and analysis of space flight operations for human and robotic space missions.

PREREQUISITES:

AE 3330 Introduction to Aerospace Vehicle Performance
AE 3340 Design and Systems Engineering Methods

TEXTBOOKS:

Required

Cost Effective Space Mission Operations, 2nd Edition, by G. Squibb, D. Boden, and W. Larson, McGraw Hill, 2006.

References

Fundamentals of Astrodynamics, by R. Bate, D. Mueller, and J. White, Dover, 1971.
Space Mission Engineering: The New SMAD, by J. Wertz, D. Everett, and J. Puschell, Microcosm, 2011.

COURSE OBJECTIVES:

1) Introduce mission operations architecture as a means of meeting mission requirements;
2) Present mission operations fundamentals such as command planning, tracking, and telemetry;
3) Present topics in mission management including spacecraft operations, failure mitigation, and cost estimation;
4) Examine historical case studies that provide learning opportunities to study approaches to space flight operations (examples: Space Shuttle program and Voyager spacecraft).

LEARNING OUTCOMES:

At a mastery level, students will be able to:

1. Conduct system level trades between different missions operations architectures;
2. Perform basic operations-related calculations such as satellite pass predictions and communication requirements;
3. Conduct analyses and make recommendations on operational implementations for a given mission;

At a basic understanding level, students will be able to:

4. Perform preliminary assessment of mission operations requirements for a given space mission;
5. Understand the trade space between different elements of the mission operations domain;
6. Obtain a historical perspective on how space missions have employed different approaches to achieve their mission operations objectives;

At an exposure level, students will be aware of:

7. General concepts in space flight operations as they pertain to the overall life cycle of a space mission

LEARNING ACCOMMODATIONS:

If needed, we will make classroom accommodations for students with documented disabilities. These accommodations must be arranged in advance and in accordance with the Office of Disability Services. (http://disabilityservices.gatech.edu).

ACADEMIC INTEGRITY:

Academic dishonesty is not tolerated. This includes cheating, lying about course matters, plagiarism, or helping others commit a violation of the Honor Code. Plagiarism includes reproducing the words or visual/graphical expressions of others without clear attribution and citation. Students are reminded of the

obligations and expectations associated with the Georgia Tech Academic Honor Code, available online at http://osi.gatech.edu/content/honor-code.

TOPICAL OUTLINE:

Topic		Lecture Hours
Introduction, syllabus review		1.5
Elements of mission operations, spacecraft subsystems		1.5
The mission life cycle		1.5
Mission operations activity during space flight		1.5
Mission definition documents hierarchy		1.5
Launch vehicle selection and planning		1.5
Launch event sequence		1.5
Early operations		1.5
Satellite ground tracking problem		3
Sky visibility plots		1.5
Space based navigation		4.5
Team project overview		3
Satellite communications		6
Geostationary missions and communication satellites		1.5
Interplanetary mission operations		1.5
Mission operations testing and training		1.5
Anomaly resolution and fault tolerance		1.5
Human space flight operations		3
Tests/Exams/Reviews		3
	Total	**42**