AE 4342 – Space System Design

HOURS: 2-3-3

CATALOG DESCRIPTION: Spacecraft subsystems and synthesis. Students apply mission and spacecraft design principles in developing a space flight mission concept. Topics may vary.

PREREQUISITES:

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

COURSE OBJECTIVES:

1) Students will develop a proposal for a space flight mission concept within the guidelines provided.
2) Students will work in teams to develop mission architecture, including science instrument selection, spacecraft design, and concept of operations, cost and schedule.
3) Mission concepts will be presented to faculty and external reviewers from the aerospace industry.

LEARNING OUTCOMES:

1. Design principles (requirements, design methods, trade studies, and project lifecycle)
2. Subsystem sizing, Computational design, performance evaluation
3. Application specific environment
4. Technical communications
5. Project management, time management
6. Team skills, leadership

TOPICAL OUTLINE:

1. Course overview and schedule (1 hour)
2. Trends in space flight (1 hour)
3. Space system engineering (1 hour)
4. The space environment (1 hour)
5. Spacecraft design drivers, spacecraft configurations (1 hour)
6. Space mission architecture (3 hours)
   a. System-level trade studies
   b. Multi-attribute decision-making
   c. Mission architecture operational views
7. Spacecraft sizing (mass, power, propellant) (1 hour)
8. Launch vehicle selection, launch performance (1 hour)
9. Payload selection and accommodation (1 hour)
10. Orbit design to meet mission objectives (1 hour)

11. Spacecraft subsystems (8 hours)
    a. Electrical power subsystem
    b. Command & data handling
    c. Telecommunications
    d. Thermal control
    e. Attitude determination & control
    f. Propulsion
    g. Structures & mechanisms
12. System integration & testing (1 hour)
13. Mission operations (1 hour)
14. Project lifecycle cost estimation (1 hour)
15. Risk identification & risk management (1 hour)
16. Industry lectures, special topics (3 hours)
17. Project overview (1 hour)
18. Project design reviews (2 hours)