

**Course Title: Satellite Systems**  
**Prerequisite:**

**Number of Credits: 3**  
**Lecturer: Dr. Farhad Fani Saberi**

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**Course Description:**

This course suits students who wish to develop their knowledge in space engineering area. This course provides an overview of satellite system design, satellite subsystem testing, integration, design validation and operation. Different missions of spacecraft (remote sensing, communications, earth observation, space probe and etc.) will introduce. The course will also introduce launcher-&-satellite connection requirements. The principal of orbital mechanics and LEO, MEO, GEO, and HEO orbits specifications will teach.

**Course Goals and Objectives:**

Design, control and application of satellite systems

**Course Topics:**

1. Introducing a variety of satellites and reviewing their application
2. Types of satellite systems based on the type of activity and positioning Orbit (LEO, MEO, GEO)
3. Introduction to ECSS
4. Principles of Designing a Space System and Mission Planning
5. Introduction to the main satellite subsystems and their tasks
6. Steps and phases of satellite design based on ECSS
7. Space , Launcher and Ground Segments in a Space system
8. TLE
9. Brief overview on the principles of satellite Orbit design
10. Engineering control and design of satellite control subsystem
11. Mission planning and opportunities for launching satellites
12. Satellite and launcher compatibility notebook
13. Ground stations and operation control room
14. Before and after launch tests based on standard
15. Launch, control and operation processes of a satellite
16. Provide practical examples of design, construction and launch of national satellites
17. STK Software
18. Reliability
19. FMEA/FMECA , FTA
20. A review of system engineering and its tasks based on ECSS

**The course aims to:**

Students are expected to:

1. Be familiar with different classifications of the satellites.
2. Be Able to analyze mission requirements
3. Understand the concepts of system engineering
4. Be familiar with the satellite design process according to the ECSS space standard

5. Be aware of the satellite launch requirements and constrains
6. Be familiar with satellites different subsystems
7. Understand the basic concepts of orbital mechanics
8. Be familiar with ground segment
9. Be familiar with attitude control methods of satellites

**Reading Resources:**

1. James R. Wertz and Wiley J. Larson (Editors), Space Mission Analysis and Design, 3rd edition, Space Technology Library, Microcosm press and kluwer academic publishers, 1999
2. Kaplan, M. H., Modern Spacecraft Dynamics and Control, Wiley, NY, 1976
3. Paluszek, M., Bhatta, P., Griesemer, P. , Joseph Mueller and Stephanie Thomas, Spacecraft Attitude and Orbit Control, Princeton Satellite Systems, Inc. , 2009.
4. Charles D. Brown, Elements of Spacecraft Design, AIAA education series, 2002.
5. Sidi, M. J., Spacecraft dynamics and control: A Practical Engineering Approach, 1997
6. Curtis, H.D., Orbital Mechanics for Engineering Students 2ed, 2010.
7. Bruce A. Campbell, Samuel Walter, Introduction to Space Sciences and Spacecraft Application, 1996.
8. Fortescue, P., Stark, J., Swinerd, Spacecraft System Engineering, 3ed, 2003.
9. Peter Fortescue, Graham Swinerd, John Stark, Spacecraft Systems Engineering, 4th Edition, August 2011, Wiley Publications

**Evaluation:**

Final Exam: 50%

Midterm Exam: 20%

Project & Presentation: 15%

Homework & Assignments: 15%

Participation & Class Activity: additional point