EE8097 Introduction to Spacecraft Design

This course introduces spacecraft design and satellite technologies at a fundamental level to undergraduate students.

The course consists of three main modules:

1. Basic orbital dynamics
2. The space environment
3. Different subsystems of a spacecraft

This course will introduce the topic of spacecraft design to undergraduate engineering students helping you to gain a fundamental understanding of the different sub-systems that constitute a spacecraft and the principles governing the design process to achieve mission success.

The Satellite Research Centre at Nanyang Technological University is embarking on a student satellite program where select undergraduate and graduate students will get the opportunity to build a Cubesat called SCOOB-I. SCOOB-I will be built in 2019 and launched in 2020. A Cubesat is a miniaturized self-contained small satellite built in scalable multiples of 10 cm x 10 cm x 10 cm (1 Unit) weighing no more than 1.33 kg per Unit. A cubesat contains all the sub-systems of a larger spacecraft such as attitude control, power, command and data handling, communication, structure and thermal systems. Cubesats are revolutionizing the satellite industry through its miniaturization and lower costs and seeding the growth of a 'NewSpace' Industry globally. Considering these trends and the need for qualified engineers to foster the growth of this sector, especially in Singapore, the student series of satellites will train a cutting edge workforce to support this growing industry.

EE8097 Students will get an opportunity to apply theories and techniques learned in class during tutorials at the Satellite Research Centre on the SCOOB-I satellite.

By the end of this course, you should be able to:

1. Demonstrate knowledge of basic orbital dynamics to solve two-body problem.
2. Calculate orbital elements for different types of orbits.
3. Calculate basic interplanetary trajectories for spacecrafts.
4. Demonstrate the effects of the space environment on spacecrafts.
5. Calculate spacecraft drag.
6. Identify factors affecting mission success.
7. Develop a systems engineering approach toward spacecraft development.
8. Identify and explain the purposes and working principles of components of a spacecraft such as propulsion, attitude dynamics & control, communication, power, command & data handling, thermal and structural subsystems.
9. Explain integration and testing process for spacecraft.
10. Describe project management and scheduling strategies for spacecraft development.

The course is open to all 3rd and 4th year students in good standing having fulfilled foundation mathematics and physics.