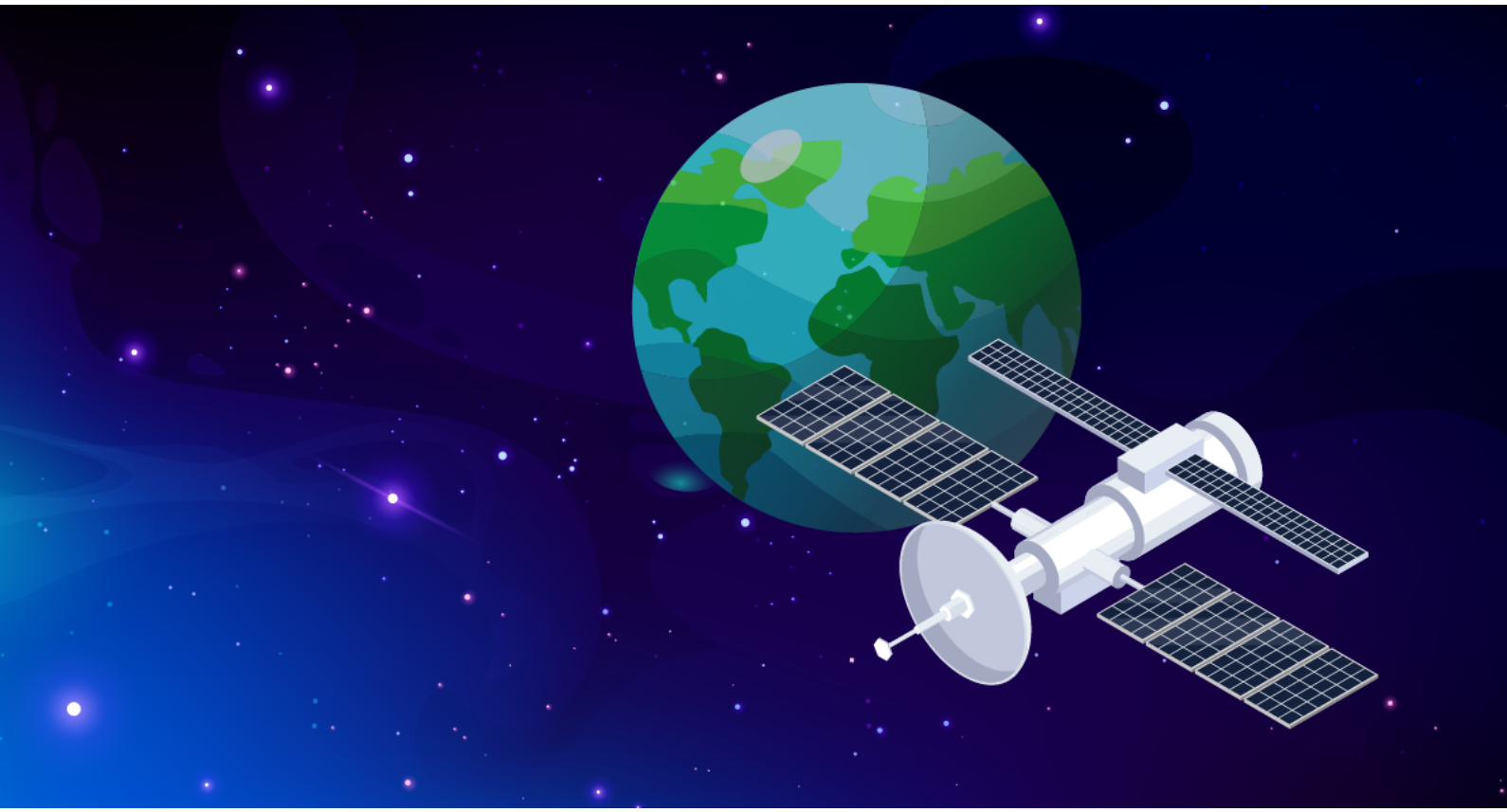
CCBP TECH 4.0



Space Mission Design & Engineering

In this program, we will take you into the fascinating realm of space. You will learn about the applications and the latest trends in space technology. Then, you will learn about designing space missions and satellites. You will get insights on the activities during and after the launch of the satellite.

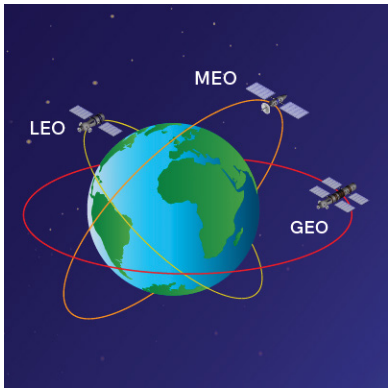
Introduction to Space Technology

This course introduces you to Space Technologies and their applications. You will be able to understand and appreciate how space technologies are being implemented to solve various problems mankind faces. You will learn about the space environment, orbits and the physics behind the spacecrafts. Also, the latest developments in space science and technologies are discussed.

Getting Started with Space

- History
- Space Tech in Our Daily Lives
- Space Environment
- The Indian Space Program
- New Space
  - Nano and Pico Satellites
  - Reusable Launch Vehicles
  - Space Tourism
  - Manufacturing in Space
  - Space Mining

Orbits and Trajectories



In this course, you will learn about orbits and their significance. You will be able to understand the physics behind the motion of spacecrafts in the orbits around the Earth. Also, you will understand why satellites and other spacecrafts stay in the orbits after they are launched without immediately falling back to Earth.

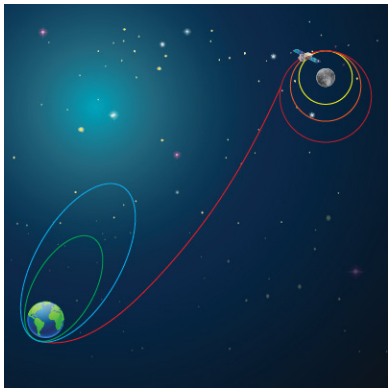
Orbits

- Basic Principles
- Orbital Parameters
- Types of Orbits

Types of Trajectories

- How Satellites remain in orbit?
- Elliptical Trajectory
- Parabolic Trajectory
- Hyperbolic Trajectory

Space Mission Design



In this course, you will learn about various factors that influence the selection of the orbit. You will understand the sequence of operations through which a satellite is placed in a desired orbit and the operations required to maintain the satellite in the desired orbit and desired orientation.

Choosing the orbit for the mission

- Mission Lifetime
- Altitude of the Orbit
- Inclination of the Orbit
- Eccentricity of the Orbit

Time Period

- Orbital Time Period
- Eclipse Time
- Sunlit Time

Earth Coverage & Ground Tracks

- Visibility time
- Payload data rate
- Earth Coverage Area
- Ground tracks

Reaching the desired orbit

- Launch Sequence
- Orbital Maneuvers

Satellite Stabilization

- Orbital Perturbations
- Spin Stabilization
- 3 Axis Stabilization
- Station Keeping

Course Project

Insert a weather satellite in the desired orbit

Plan the mission for inserting a weather observatory satellite in Geostationary Orbit. The satellite will initially be inserted into LEO and then the satellite needs to be transferred to Geostationary Orbit.

Satellite Subsystems - I

This course introduces you to the electrical and electronic subsystems of a satellite. You will learn about the functions of each subsystem and the vital components of each subsystem. In addition to that, you will also understand how these subsystems are interdependent with the help of iB Satellite Design Tool.

Communication Subsystem

- Functions of communication subsystem
- Components of communication subsystem
- Key Parameters & Specifications

Attitude Determination & Control System (ADCS)

- Functions of ADCS
- Components of ADCS
  - Sensors
  - Actuators
- Key Parameters & Specifications

Command & Data Handling Subsystem (C&DH)

- Functions of C&DH
- Components of C&DH
- Key Parameters & Specifications

Electrical Power Subsystem (EPS)

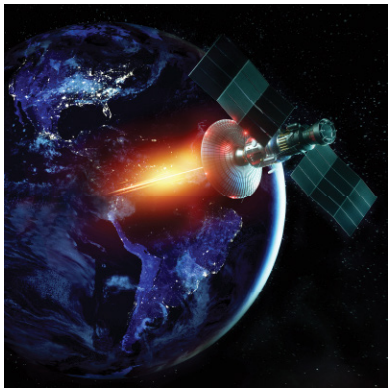
- Functions of EPS
- Components of EPS
- Key Parameters & Specifications

Course Project

Choose appropriate subsystem components

For the given mission parameters and payload specifications, select the appropriate components for Communication, ADCS & EPS subsystems from the CoTS Catalogue using the iB Satellite Design Tool.

Satellite Subsystems - II



This course introduces you to the mechanical subsystems of a satellite. You will learn about the functions of each subsystem and the vital components of each subsystem. In addition to that, you will also understand how these subsystems are interdependent with the help of iB Satellite Design Tool.

Structures & Mechanisms

- Functions of Structure
- Key Parameters & Specifications
- Cubesat Structure
- Mechanisms

Thermal Control Subsystem

- Functions of Thermal Control Subsystem
- Key Parameters & Specifications
- Passive Thermal Control
- Active Thermal Control

Propulsion Subsystem

- Function of Propulsion Systems
- Components of Propulsion System
- Key Parameters & Specifications
- Classification of Propulsion Subsystem

Course Project
Design a Satellite

For a given mission parameters and payload specifications, engineer a nano satellite. Using the iB Satellite Design Tool, you need to select the components from the CoTS Catalogue.

Satellite Integration & Testing

In this course, you will learn the procedure of integration of the subsystems to build the satellite which can execute the mission. You will also learn the different types of tests the satellite must pass to qualify for the launch.

Integration

- Electrical Integration
- Mechanical Integration
- Alignment
- Measurement

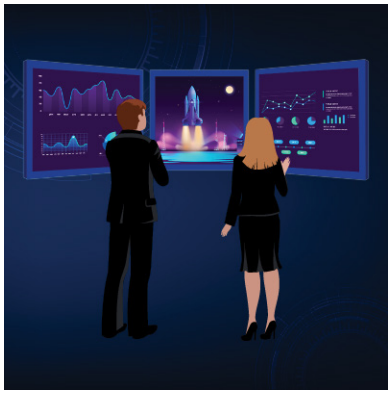
Course Project
Integrate a Satellite

For the satellite you have designed in the previous project, verify the interfaces between the components and prepare an interface compatibility report. Using the report, replace the incompatible components with compatible ones from the catalogue.

Testing

- Functional Testing
- Launch Environment Testing
- Space Environment Testing
- Active Thermal Control

Launching & Monitoring your satellite



Once the satellite is integrated and qualified for launch, it has to be launched to the appropriate orbit to execute the mission. This course introduces you to the various activities during the launch and after the satellite is placed in the desired orbit.

Launching the Satellite

- Selecting a Launch Vehicle
- Launch activities

On-Orbit Operations

- Planning, scheduling and execution of operations
- Monitoring the satellite
- Obtaining the payload data

Course Project

Click a picture of India from Space!

In this mission, you need to take a picture of India from Space. The satellite needs multiple passes to capture the full image of India. You need to maintain the orientation of the satellite appropriately so that picture taken in every pass can be combined to form the complete picture of India. You need to perform the appropriate maneuvers to maintain the satellite orientation and avoid collisions with space debris.

Contact us

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