UNIVERSITY of NICOSIA

Course Syllabus

Course Code	Course Title	ECTS Credits
MENG-424	Spacecraft Platform Subsystems Engineering	6
Prerequisites	**Department**	**Semester**
MENG-252 MENG-324	Engineering	Fall
Type of Course	**Field**	**Language of Instruction**
Elective	Engineering	English
Level of Course	**Lecturer(s)**	**Year of Study**
1st Cycle	Dr Harry Nicos Iordanou	4th
Mode of Delivery	**Work Placement**	**Corequisites**
Face-to-face	N/A	None

Course Objectives:

The main objectives of the course are to:

- Present the key parts of spacecraft, platform and payload
- Introduce the basics of spacecraft payloads for low-, medium- and geostationary- orbit applications.
- Introduce the fundamentals of key spacecraft platform subsystems.
- Familiarize with spacecraft propulsion systems.
- Introduce the key components of spacecraft propulsion systems including electric, chemical and hybrid thrusters, propellant tanks, valves, pressure regulators, pyro valves.
- Familiarize with spacecraft electrical power subsystem.
- Introduce the key components of spacecraft electrical power subsystem including solar arrays, power conditioning and distribution.
- Familiarize with spacecraft attitude determination and control subsystem.
- Introduce the key components of spacecraft attitude determination and control subsystem including sun sensors, star trackers, infra-red earth sensors, gyros, momentum wheels.
- Familiarize with spacecraft mechanisms and structures.
- Introduce the key components of spacecraft mechanisms and structures including antenna, thrusters, solar array deployment mechanisms and motors.
- Familiarize with the basics of spacecraft telecommunication subsystem.
- Introduce the key components of spacecraft telecommunication subsystem including receivers, transmitters, horn, reflectors, beacons.
- Familiarize with spacecraft thermal subsystem.
- Introduce the key components of spacecraft thermal subsystem including heaters, OSR, active and passive thermal control, multi-layer insulation.

Learning Outcomes:

After completion of the course students are expected to be able to:

- Describe the key spacecraft subsystem design considerations for in-orbit operations.
- Illustrate the fundamental characteristics, design considerations and control of spacecraft subsystems including thermal, propulsion, power and attitude.
- Demonstrate ability of selecting suitable spacecraft platform components to meet mission requirements.
- Interpret dynamic spacecraft response and effects in mission trajectory and attitude.
- Recall the design principles and budgets for spacecraft platform equipment, including structures and communications, electrical power (generation, regulation, storage), pointing accuracy, and thruster control.

Course Content:

- Overview of spacecraft payload and platform engineering to meet mission objectives.
- Mission objectives and requirements including performance, coverage, lifetime etc.
- Spacecraft system requirements for orbit configuration and operations, power and mass.
- Spacecraft subsystem requirements for Thermal, Structure, Propulsion, Power, Communications and Attitude Control.
- Modeling of mechanical, electrical, and other dynamic spacecraft systems such as mechanisms for deployable solar arrays and reflectors.

Learning Activities and Teaching Methods:

Lectures, in-class examples, exercises.

Assessment:

Homework, in-class assignments, mid-term exam, final exam.

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Space Mission Engineering - The New SMAD / 4th Edition	Editors: James Wertz, David Everett, Jeffery Puschell	Space Technology Library	2014	978-1-881-883-15-9
Spacecraft Systems Engineering / 4th Edition	Editors: Peter Fortescue, Graham Swinerd, John Stark	Wiley&Sons	2011	978-04-470-750-124

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN / site
European Cooperation for Space Standardization (ECSS)	----------	ESA-ECSS	2023	www.ecss.nl