AEROSPACE ENGINEERING (LM52)

(Brindisi - Università degli Studi)

Insegnamento SPACE MISSION PROJECT AND SYSTEMS (MOD.2) C.I.

GenCod A006606
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Insegnamento SPACE MISSION PROJECT AND SYSTEMS (MOD.2) C.I.

Insegnamento in inglese SPACE MISSION PROJECT AND SYSTEMS

Settore disciplinare ING-IND/05

Corso di studi di riferimento AEROSPACE ENGINEERING
Tipo corso di studi Laurea Magistrale

Crediti 6.0

Ripartizione oraria Ore Attività frontale: 54.0
Per immatricolati nel 2022/2023

Erogato nel 2022/2023

Anno di corso 1

Lingua

Percorso CURRICULUM AEROSPACE SYSTEMS

Sede Brindisi

Periodo

Tipo esame Orale

Valutazione

Orario dell'insegnamento
https://easyroom.unisalento.it/Orario

BREVE DESCRIZIONE DEL CORSO

The course aims to show the complexity, critical aspects and opportunities of space missions and to provide tools for their design.
The idea is to cover space mission projects for human spaceflight and automated or robotic missions.

The course will begin with a brief history of space exploration and an introduction to major space missions.
It will present the characteristics of the space environment, introduce robotic and human spacecraft and their operational aspects. The course will focus on geosynchronous orbit, the radiation belt and Lagrange points.
Launcher technologies will also be a significant focus of the course.
We will also provide tools to calculate, in a simplified way, rendezvous in low Earth orbit and interplanetary trajectories.
There will also be a focus on related on-board systems, and energy management will be a course topic.

PREREQUISITI

Bachelor level courses in physics, vector analysis, and calculus

OBIETTIVI FORMATIVI	The Space Missions Project and Systems (SMP-S) module aims to provide the knowledge necessary to design space missions and systems.
	The course initially focuses on conceptualising space mechanics, manoeuvring, propulsion and control systems used in all spacecraft.
	Space systems are then integrated into the broader concept of the space mission, which is analysed in depth by studying the mission architecture, its elements and their relationships.
	Finally, the student will gain knowledge of the challenges of using the space environment as a scientific and commercial domain. They will also be introduced to the geopolitics of space.
	By the end of the course, the student should be able to
	- Assess/evaluate the goals and objectives of a space mission;
	- Assess/evaluate the mission to achieve the goal; and
	- Evaluate/assess competing designs.
	Students will also learn to communicate effectively with professionals from other disciplines.

METODI DIDATTICI	Lessons, exercises and workshops.

Delivery:
Face to face

Learning activities:
A project will be proposed during the course.
The students, divided into small groups, will be asked to design different elements/systems for a space mission.
The project work is, in fact, a project laboratory: students have to apply the knowledge acquired in the classroom to design the assigned task. Various design support tools such as physical modelling (e.g. FREECAD, FUSION360) and some mathematical modelling (e.g. MODELICA/PYTHON/ EXCEL) will be used for the different types of analysis provided.

Attendance:
Compulsory

Information for non-attending students
Special arrangements may be made for non-attending students on a case-by-case basis. You'll need to discuss this with the tutor before the course starts.

MODALITA' D'ESAME	The learning will be verified by an oral examination of the topics covered during the course: the tests will focus on theoretical arguments, the content of the project work/exercises and the contributions of company testimonials (if applicable).
	Regarding the project work/exercises, the student will be asked to present his copy of the final report, of which he will be asked to discuss a part chosen by the teacher. The report must be handed in at the end of the course.

PROGRAMMA ESTESO	- Types of space missions and their objectives
	- Space environment
	- General concepts of spacecraft architecture (i.e. spacecraft, launchers, space stations, sub-orbital platforms)
	- Applied orbital mechanics, including interplanetary trajectories and space rendezvous
	- Launcher market
	- Selected on-board systems
	- Spacecraft examples: Space Shuttle, Space Station, Tethered Satellite, Hubble Space Telescope.

TESTI DI RIFERIMENTO	Reference material prepared by the teacher and available on the course page on the teaching portal. The material is written in English.
	Some bibliography:
	- Space Mission Analysis and Design (SMAD), 3rd Edition, W.J. Larson and J.R. Wertz, Space Technology Library, Vol. 8
	- Elements of Spacecraft Design, C.D. Brown, AIAA Education Series Mission Geometry; Orbit and Constellation Design and Management,
	- J.R. Wertz et alii, Space Technology Library, Vol. 13 Human Spaceflight; Mission analysis and Design,
	- W.J. Larson, Space Technology Series, McGraw Hill
	- ECSS standards (http://www.ecss.nl/)
	- NASA System Engineering Handbook, NASA/SP-2007-6105, Rev1.