UNIVERSITÀ DI PISA

FUNDAMENTALS OF SPACECRAFT TECHNOLOGY

SALVO MARCUCCIO

Anno accademico	2017/18
CdS	AEROSPACE ENGINEERING
Codice	664II
CFU	6

Moduli	Settore/i	Tipo	Ore	Docente/i
FUNDAMENTALS OF SPACECRAFT TECHNOLOGY	ING-IND/05	LEZIONI	60	SALVO MARCUCCIO PIERPAOLO PERGOLA

Learning outcomes

Knowledge
Students who successfully completes the course will have gained a solid knowledge of the working principles and the practical implementation of the technologies involved in modern spacecraft. In particular, starting form a general knowledge of the main features of the space environment, students are expected to be able to perform the preliminary design of the following spacecraft subsystems starting from mission-level requirements:

- power generation, energy storage and power distribution;
- thermal control;
- attitude control;
- telecommunications;
- remote sensing.

In addition, the students will familiarize with the main concets and practices in space project management.

Assessment criteria of knowledge
During the oral exam, the student is required to show full uderstanding of the basic physical principles underlying each of the spacecraft subsystem technologies presented during the course. He/she must be able: - to carry out autonomously the preliminary design of each spacecraft subsystem starting form high level space mission requirements; - to demonstrate proper understanding of the inter-relations among the various subsystems of a modern spacecraft; - to discuss the various aspects of a space missions, from orbit/trajectory considerations, to the choice of subsystem technologies, to the elements of space project management.
Methods:

- Final oral exam

Teaching methods

Delivery: face to face
Learning activities:

- attending lectures
- participation in seminar
- individual study

Attendance: Advised
Teaching methods:

- Lectures
- Seminar

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Syllabus

The course is designed to provide an introduction to the design of modern spacecraft platforms and payloads. Following an introduction on the space environment and operating conditions for various mission categories, the course introduces and discusses the main spacecraft subsystems. The topics presented include power generation, attitude control, thermal aspects of spacecraft design, telecommunications, and the basic types of space instrumentation and space sensors. The discussion covers aspects of satellite communications including topics related to signals and antennas; remote sensing as well as radar and image processing; telemetry and link budget. An introduction to space project management is also provided.

Bibliography

Required reading:

- James R. Wertz, David F. Everett, Jeffery J. Puschell, ed, ***Space Mission Engineering: The New SMAD***, ISBN 978-1881883159, Springer - Microcosm Press, First edition, 2011. Available from www.astrobooks.com (An older edition of SMAD is available at the Library of the Faculty of Engineering: Wiley J. Larson, James R. Wertz, ed., *Space Mission Analysis and Design*, Third edition, Microcosm, Torrance, California; Kluwer, Dordrecht, 1996. Biblioteca della Facoltà di Ingegneria - Collocazione: 629.41 SPA r ING - 629.41 SPA g ING - 629.41 SPA v ING)

Suggested reading:

- Charles D. Brown, *Elements of Spacecraft Design*, AIAA Education Series, 2002, ISBN 1-56347-524-3
- Vincent L. Pisacane, The Space Environment and its Effects on Space Systems, AIAA Education Series, 2008, ISBN 978-1-56347-926-7
- A. M. Cruise, J. A. Bowles, T. J. Patrick, and C.V. Goodall, Principles of Space Instrument Design, Cambridge Aerospace Series 9, Cambridge University Press 1998, ISBN 0-521-45164-7

At "Bibiloteca della Facoltà di Ingegneria":

- Michael D. Griffin, James R. French, Space Vehicle Design, AIAA, Washington, 1991 Collocazione: 629.471 GRI r ING - 629.471 GRI v ING - 629.471 GRI g ING

At "Biblioteca del Dipartimento di Ingegneria Aerospaziale":

- Charles D. Brown, Spacecraft Mission Design, AIAA, Washington, 1992 Collocazione: 712-92-01-00

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