UNIVERSITÀ DI PAVIA

Anno Accademico 2021/2022

SATELLITE AND SPACE SYSTEMS

Anno immatricolazione	2020/2021
Anno offerta	2021/2022
Normativa	DM270
SSD	ING-INF/02 (CAMPI ELETTROMAGNETICI)
Dipartimento	DIPARTIMENTO DI INGEGNERIA INDUSTRIALE E DELL'INFORMAZIONE
Corso di studio	ELECTRONIC ENGINEERING
Curriculum	Photonics
Anno di corso	2°
Periodo didattico	Primo Semestre (27/09/2021 - 21/01/2022)
Crediti	6
Ore	45 ore di attività frontale
Lingua insegnamento	English
Tipo esame	ORALE
Docente	PASIAN MARCO (titolare) - 6 CFU
Prerequisiti	Electromagnetic theory, antennas, communication theory, and passion for space science.
Obiettivi formativi	The course provides the fundamental principles of satellite communications, with particular emphasis on the electromagnetic aspects and on the communication architectures. The student will learn how and why systems are designed and operate, consolidating a sound understanding required to work as a satellite professional. The course covers a broad spectrum of topics, reflecting the complexity of satellite communication systems, giving an optimised balance between long-lasting basics and cutting-edge fast-developing trends.
Programma e contenuti	The course is organized into a number of sections corresponding to the major areas of satellite communication systems.

	Section I: orbits, satellite and probe types, ground station networks launchers, LEO, MEO, HEO, GEO, polar orbits, probes, deep-space missions, impact on satellite communications Section II: link budget G/T, EIRP, noise temperature, dissipative medium, cascaded networks, antenna temperature, C/N, rain effects, link margin Section III: ground segment – ground station building blocks reflector antennas, feeds, LNAs, HPAs, OMTs, polarizers, mode-couplers, diplexers, cryogenic devices, frequency and time distribution, mechanics, HVAC, power supply, external facilities, tracking Section IV: space segment – satellite architectures and communication payloads attitude and orbit control, TT&C, power systems, thermal control, antennas, space environment and qualification, communication schemes and techniques, multi-beam architectures, broadcasting Section V: major operational example, including GNSSs (Global Navigation Satellite Systems).
Metodi didattici	The course is based on standard lectures, complemented by external seminars, when available.
Testi di riferimento	The course topics are partially or totally covered by several textbooks and advanced books. Among the others, the following books are suggested. The slides of the course will be also available Timothy Pratt, Charles Bostian, and Jeremy Allnutt. Satellite Communications. John Wiley & Sons, 2nd edition, U.S.A., 2003. classic textbook, excellent coverage of basic and fundamental topics . Bruce R. Elbert. Introduction to Satellite Communication. Artech House, 3rd edition, U.S.A., 2008. alternative textbook with some room for advanced topics. Gérard Maral, and Michel Bousquet. Satellite Communications Systems – Systems, Techniques and Technology. John Wiley & Sons, 5th edition, 2009. advanced book with a very broad coverage of satellite communication topics.
Modalità verifica apprendimento	Oral examination. The student is invited to prepare a short presentation about a case study (e.g., a specific satellite, probe, or communication system). Alternatively, the student is invited to present in detail his/her favorite topic. In any case, the second part of the exam comprises some questions about the overall course.
Altre informazioni	
Obiettivi Agenda 2030 per lo sviluppo sostenibile	Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation $lbl_legenda_sviluppo_sostenibile