



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Satellite Systems and Space Communications

### Course

Field of study

Electronics and Telecommunications

Area of study (specialization)

Mobile and Wireless Technologies

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

4/7

Profile of study

general academic

Course offered in

polish

Requirements

elective

### Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

Tutorials

Projects/seminars

### Number of credit points

3

### Lecturers

Responsible for the course/lecturer:

dr hab. inż. Rafał Krenz

Responsible for the course/lecturer:

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### Prerequisites

Basic knowledge of physics, analog and digital communication systems as well as EM wave propagation.

### Course objective

The course presents the theoretical background as well as design and practical implementation of satellite communication systems. Space communication is covered as well.

### Course-related learning outcomes

Knowledge

Knows the principles of the design and operation of satellite communication systems as well as space communication systems.

Understands the limitations of satellite systems due to the propagation effects and orbit type.

Knows the digital signal processing methods applied to satellite communications.



### Skills

Can design a satellite link, based on a link power budget and required link capacity. Is able to select a satellite system for a specific application. Can analyse the correlation between propagation conditions and link quality.

### Social competences

Is aware of the evolution of satellite communication systems, new services and their availability to the user.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: written/oral exam consisting of 5-6 questions, based on the list of 25 topics shared during the course duration. 50% of the total number of points necessary to pass.

Labs: test consisting of 2-3 problems to solve, 50% of the total number of points required to pass.

### Programme content

1. Introduction. Kepler laws. Orbit types.
2. Satellite bus and payload. Satellite subsystems.
3. Satellite links. Power budget analysis. Noise temperature.
4. Link quality. Estimation of the link quality in the uplink and the downlink.
5. Interference and signal distortion. Propagation effects. Radio noise.
6. Transponders. End-to-end link quality.
7. Multiple access in satellite systems and their capacity.
8. Antenna systems. Satellite and ground station antennas.
9. Mobile satellite systems. INMARSAT. Globalstar. Iridium. Orbcomm. StarLink.
10. Deep space communications.

### Teaching methods

Lecture: multimedia presentation

Tutorials: case study, problem solving.

### Bibliography

Basic

L. J. Ippolito, Satellite Communications Systems Engineering, Wiley 2017

D. J. Bem, Radiodyfuzja satelitarna, WKiŁ 1990



Additional

### Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	31	1,5
Student's own work (literature studies, preparation for exam, preparation for labs) <sup>1</sup>	44	1,5

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<sup>1</sup> delete or add other activities as appropriate