COURSE DESCRIPTION CARD - SYLLABUS

Course name
Introduction to Radio Technologies [S1Teleinf1>WdTR]

Course

Field of study
Teleinformatics

Year/Semester
2/4

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Elementary circuit theory, fundamentals of electric metrology and measurement uncertainty, solving of elementary algebraic equations with logarithms, solving of elementary AC/DC circuits, assessment of measurement uncertainty, ability to acquire information from suggested literature sources.

Course objective

The aim of the course is learning of electromagnetism foundations, transmission line and antenna parameters, the most popular antenna types, modulation, wave propagation, radio channel properties, radio equipment parameters, electromagnetic compatibility, and practicing the basic skills of antenna and feeder measurements.

Course-related learning outcomes

Knowledge:
1. A student can design (according to the assumptions and technical documentation) and deploy typical simple radio communication installations. [K_U10]
2. A student can plan and perform computer simulations and can analytically find the parameters of radio links. [K_U17]

3. A student can perform radio communication measurements (basic parameters of feeders and antennas) and prepare a measurement report.
Social competences
1. A student is aware of the responsibility for his own work and can be an efficient member of a team. [K_K03]
2. A student has basic knowledge necessary for understanding non-technical constraints of engineering activities and knows basic work safety regulations including electromagnetic fields.

Skills:
1. A student has the knowledge about description, modelling and analysis of radio communication systems. [K_W01]
2. A student knows the properties of analog and digital transmission and the properties of the radio channel. [K_W04]
3. A student has mathematically founded and structural knowledge on radio communication techniques and wireless networks and systems. [K_W09]

Social competences:

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
1. Written pass of the lectures.
2. Written laboratory measurement reports.
3. Written or oral laboratory tests.

Programme content

Telecommunication system, analog and digital signal transmission, transmission lines, antennas, radio wave propagation, modulation, radio transmitters and receivers, electromagnetic compatibility,

Course topics

Telecommunication system and chain, signal sampling and coding, PCM, correction codes, radio channel properties, decibel calculus, TEM plane wave, wavelength and frequency, phase velocity, attenuation, waves at the boundary of two media, polarization and power of the plane wave, transmission lines – basic parameters, impedance matching, balanced/unbalanced lines, coaxial line, standing wave, VSWR, RL, Smith chart, measurement of VSWR/RL, antenna in a radio link, basic antenna parameters, reciprocity theorem, basic antennas – short dipole, halfwave dipole, antenna arrays, MIMO, broadband antennas, reflector and aperture antennas, antennas for WLAN, microwave and satellite links, antenna mounting and maintenance, influence of EM waves on a human body, environmental and safety regulations, free space propagation, radio link power
budget, physical phenomena influencing wave propagationmultipath propagation and fading, diversity reception. Earth troposphere, wave propagation in troposphere, propagation of microwaves, block diagrams of a receiver and a transmitter, most important transmitter/receiver parameters, signal modulation – AM, FM, FSK, PSK, QAM, OFDM, signal detection, ITU Radio Regulations, ITU-R recommendations, frequency bands used for radio communications, National Table of Frequency Allocation, radio channel organization for radio systems, simplex, duplex, survey of radio communication systems – satellite TV, cellular telephony, Bluetooth, WLAN, GPS, electromagnetic compatibility of radio communication systems, compatibility regulations.

Teaching methods

1. Conventional lecture.
2. Multimedia presentations.
3. RF hardware laboratory.

Bibliography

Basic:

1. Szóstka J., Fale i anteny (wyd. III), Wyd. Komunikacji i Łączności, Warszawa 2006.
2. Szóstka J., Mikrofale. Układy i systemy, Wyd. Komunikacji i Łączności, Warszawa 2006.
3. Szóstka J., Miernictwo radiokomunikacyjne, Wyd. Politechniki Poznańskiej, Poznań 2021.

Additional:
1. Szóstka J., Horyzontowe linie radiowe, Wyd. Politechniki Poznańskiej, Poznań 2011.
Breakdown of average student's workload
Hours ECTS
Total workload 116 4.0
Classes requiring direct contact with the teacher 60 2.0
Student’s own work (preparation for tests, preparation for laboratory 56 2.0
classes, literature studies)

Breakdown of average student's workload

	Hours	ECTS
Total workload	116	4,00
Classes requiring direct contact with the teacher	60	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	56	2,00