COURSE DESCRIPTION CARD - SYLLABUS

Course name
Line-of-Sight Radio Systems

Course

Field of study
Electronics and Telecommunications

Year/Semester
III/VI

Area of study (specialization)
Mobile and wireless technologies

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
15	15	
Tutorials	Projects/seminars	

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
Jarosław Szóstka, Ph.D.

e-mal: jaroslaw.szostka@put.poznan.pl

Responsible for the course/lecturer:

Prerequisites

A student should have a basic knowledge of electronics, circuit theory, transmission lines, antennas, em. wave propagation and electrical metrology. He should also calculate simple AC/DC circuits and should be able to acquire information from suggested literature sources, and should be ready for teamwork.

Course objective

Understanding of operation principle and behaviour of LOS radio links through learning the basic physical principles and mathematical formulae which allow a student to design, deploy and maintenance LOS sradio systems; learning the engineering activities in a company (preparation of technical documentation, bussiness presentations, commercials, exhibitions, patent applications, work in accredited testing laboratories).

Course-related learning outcomes

Knowledge

After completing the course a student has:

1. systematic knowledge of microwave propagation, antennas, design, deploymentnt and maintenance of LOS radio links and understands the importance of the ITU-R recommendations during the design process

2. systematic knowledge of EMC of LOS radio links

3. basic knowledge of technical documentation preparation and knows the technical, social and economic aspects of engineer's work.

Skills

After completing a course a student can:

1. self-study and extract information from literature, databases and other sources, is able to synthesize gathered information, draw conclusions, and justify opinions

2. use the methods and mathematical models for radio link design, can define the design parameters for a LOS radio system including non-technical aspects and is able to use ITU-R recommendations

3. prepare a detailed project, assess its costs (CAPEX and OPEX), and compare his own design with other solutions taking into account technical and economic aspects

4. use technical standards, knows the standardization organizations (ISO, ITU, ETSI).

Social competences

After completing the course a student:

1. understands the need of continuous education and improving professional, social and personal competences,

2. is aware of the responsibility for his proffesional activities and is ready to work in a group

3. is aware of importance of professional behaviour and aethics, can respect various opinions of other people

4. understands the legal constraints coming from international and national telecommunication standards.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

lectures - written and/or oral exam (60-90 minutes, 3-5 questions, 50% threshold - grade 3.0, the list with the exam problems is available as an e-mail)

- laboratory skills - the average grade from lab reports ; the report requirements are presented during introductory classes, the report grade comprises the assesment of the formal agreement with the report template, the assessment of measurement data processing and presentation, and written explanation of problems.

Programme content

1. Definition of a LOS radio link, error correction, modulations, power budget of a link, frequency bands for microwave radio links, channel arrangements, international and national frequency allocations, Friis formula, Fresnel zones, troposphere properties, atmospheric refraction, clearance criteria, fading, rain losses, gas losses, trophospheric scattering and focusing; link design according to the ITU-R recommendations, path profile, calculation of losses and selective and non-selective fading, signature measurements, fading mitigation techniques, diversity reception types and features, noise, co-channel and adjacent channel interference, frequency planning, interference calculation, frequency reuse, link availability and performance calculation, design phases of the link, network architecture, clearance checking, site surveys, channel allocation, choosing a proper equipment, link budget, interference analysis, economical analysis, technical documentation, deployment and maintenance of a radio link, antenna alignment, typical activities of a radio communication engineer.

Laboratory excercises

1. Data transmission iin a microwave link

2. Satellite link

3. Terrestrial link

4. Microwave link modelling

Teaching methods

Lectures: multimedia presentations and board examples

Laboratory: practical excersises in groups (3-4 people) accorging to the written manuals.

Bibliography

Basic

1.Szóstka J., Horyzontowe linie radiowe. Wyd. Politechniki Poznańskiej, Poznań 2011.

Additional

1. Szóstka J., Mikrofale. Układy i systemy. Wyd. Komunikacji i Łączności, Warszawa 2006.

2. Szóstka J. Fale i anteny (wyd. III), Wyd. Komunikacji i Łączności, Warszawa 2006.

3. Manning T., Microwave Radio Transmission Design Guide, Artech House 2005.

4. Freeman, R.L., Radio System Design for Telecommunications, John Wiley & Sons 1997.

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 laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	44	1,5

[1] delete or add other activities as appropriate