COURSE DESCRIPTION CARD - SYLLABUS

Course name
Foundations of wireless communications

Course

Field of study
Electronics & Telecommunications
Area of study (specialization)

Level of study
Second-cycle studies
Form of study
full-time

Year/Semester
1/1
Profile of study
general academic
Course offered in
English
Requirements
elective

Number of hours

Lecture
30
Laboratory classes
0
Other (e.g. online)
0
Tutorials
30
Projects/seminars
0

Number of credit points

4

Lecturers

Responsible for the course/lecturer:
Prof. dr hab. inż. Krzysztof Wesołowski

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Responsible for the course/lecturer:

Prerequisites

A student has a systematic knowledge of mathematical analysis, algebra and theory of probability, he/she has a systematic knowledge, together with necessary mathematical background, of 1D signal theory; this knowledge allows him/her to understand the representation of signals and signal analysis in

time domain and frequency domain, he/she knows and understands basic concepts and methods of description of linear and non-linear electronic systems, control systems and telecommunications systems

Course objective

Getting knowledge of the basics in radio propagation of digital signals in various environments, typical phenomena and distortions; knowledge of the basics in cellular systems and their design

Course-related learning outcomes

Knowledge

A student has basic knowledge and mathematical foundations in the area of radio communications. A student has basic knowledge concerning propagation of digital signals over radio communication channels. A student has a sufficient knowledge and mathematical foundations in the area of EM field, EM wave propagation and antennas

Skills

A student is able to solve basic problems in the area of electromagnetic fields, radio propagation, antenna design. A student is able to compare radio communication systems and stantards, and to select appropriate radio transmission technique or wireless standard in the given propagation and users mobility conditions

Social competences

A student is aware of the necessity of professional approach to technical problems and responsibility for his/her proposed technical solutions. A student feels responsibility related to the designed electronic and telecommunication systems and is aware of the potential threats for other persons or society of improper use of these systems and designs. A student is able to formulate opinions concerning challenges of contemporary radio communications. A student is aware of the impact of rario systems and networks on the information society

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written exam checking the knowledge presented during lectures and trained during tutorials (problem sessions). An exam questionnaire is applied in which four problems to solve are presented. Students write their answers to the stated questions/problems in a supplied questionnaire. Solution of each problem is evaluated in the scale from 0 to 3 points. Exam is approved as passed if a student obtained at least 7 points (out of 12 points). If the number of obtained points is between 5 and 6.5 a student participates in an additional exam round in which he/she solves two additional questions using a similar, supplementary questionnaire. The satisfactory grade is received if the number of obtained points is 7, 7.5 or 8. The grades rise each full obtained point. the "very good" grade is assigned when the number of points is 11.5 o 12. Evaluation resolution is 0.5 point.

Evaluation of learning outcomes of exercises is carried by means of a test that is to be taken at the end of a semester. A few questions span the whole material covered during exercises showing knowledge,

reasoning ability and proficiency in enginering calculations. The grade is given in the range from 2 to 5. Students that obtained 2 are asked to retake the test at the time consulted with the tutor.

Programme content

Lectures:

Recalling basic knowlwdge in signal theory, orthogonality principle, and probability and random processes. Elements of digital communication systems: overview of digital modulations, multiple access methods (FDMA, TDMA, CDMA, OFDMA), basic information on block and convolutional codes; cellular system concept, radio propagation, fading channels, frequency selective fading, mobile radio communication channel modeling, propagation modeling, classification of radio systems, short overview of the GSM system and its derivatives (GPRS and EDGE), overview of UMTS (CDMA system), directions in future mobile communications.

Excercises:

Exercising on sampling and quantization, repetition codes, illustrating basic features of digital modulations, phenomena and properties of radio communication channels, calculations of propagation losses for different propagation models, multipath propagation, calculations of link power budget

Teaching methods

Interactive lecture; besides presentation of the course content the students are asked about possible solutions to active them. After a half of each lecture a short brake (3 minutes) is done in which the lecturer changes the topic. Due to specific topic of the lectures the students are often asked about wireless systems operating in their home countries.

Exercises are based on a set of taks solved by students with support from the teacher. Before solving of each task the teacher explains main problems and refers to appropriate material presented during lectures.

Bibliography

Basic

1. K. Wesołowski, Mobile communication systems, John Wiley & Sons, Chichester, 2003,

2. Th. Rappaport, Wireless Communications. Principles & Practice, Prentice Hall 2002

3. K. Wesołowski, Introduction to digital communication systems, John Wiley & Sons, Chichester 2009

Additional

1. A. Molisch, Wireless Communications, Wiley - IEEE, New York, 2010

2. A. Goldsmith, Cambridge University Press, Cambridge, 2005

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	70	3,0
Student's own work (literature studies, preparation for tutorials, preparation for tests/exam) [1]	30	1,0

[1] delete or add other activities as appropriate