



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Spread spectrum systems [S2EiT1E-TIT>SzPW]

Course

Field of study

Electronics and Telecommunications

Year/Semester

1/2

Area of study (specialization)

Information and Communication Technologies

Profile of study

general academic

Level of study

second-cycle

Course offered in

English

Form of study

full-time

Requirements

elective

Number of hours

Lecture

30

Laboratory classes

30

Other

0

Tutorials

0

Projects/seminars

0

Number of credit points

5,00

Coordinators

dr hab. inż. Rafał Krenz
rafal.krenz@put.poznan.pl

Lecturers

Prerequisites

Knowledge of wireless communication systems technology. Knowledge of EM wave propagation and antenna systems. Understanding computer simulation of communication systems.

Course objective

The course aims at providing informations related to the design, operation and implementation of wireless systems using spread spectrum transmission technique. Both commercial and military applications are covered, with emphasis on cellular 2G/3G CDMA systems.

Course-related learning outcomes

Knowledge:

Knows and understands the theoretical foundations of spread spectrum transmission technique.

Knows the basic building blocks and signal processing methods of the spread spectrum communication system.

Skills:

Is able to design and develop the spread spectrum communication system for commercial and military

applications.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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.

Laboratory classes: continuous evaluation of tasks assigned by the teacher, evaluation of final project; final grade calculated as an average of all partial grades in the range 2-5 (D-A)

Programme content

Lectures:

1. Introduction to spread spectrum systems.
2. Pseudonoise sequences - properties and generation.
3. Direct sequence spread spectrum technique.
4. Frequency hopping spread spectrum technique.
5. UWB and MC-CDMA systems.
6. RAKE receiver - time diversity reception.
7. Joint detection techniques.
8. Capacity of CDMA systems.
9. Synchronization in spread spectrum systems.
10. CdmaOne (IS-95) standard - design of uplink and downlink.
11. UMTS standard - design of uplink and downlink.

Laboratory classes:

1. Pseudonoise sequence generation and properties.
2. DS.-CDMA system performance in AWGN channel - single user case.
2. DS.-CDMA system performance in AWGN channel - multi user case.
2. DS.-CDMA system performance in multipath channel - single user case.
2. DS.-CDMA system performance in multipath channel - multi user case.

Course topics

Lectures:

1. Introduction to spread spectrum systems.
2. Pseudonoise sequences - properties and generation.
3. Direct sequence spread spectrum technique.
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Laboratory classes:

1. Pseudonoise sequence generation and properties.
2. DS.-CDMA system performance in AWGN channel - single user case.
2. DS.-CDMA system performance in AWGN channel - multi user case.
2. DS.-CDMA system performance in multipath channel - single user case.
2. DS.-CDMA system performance in multipath channel - multi user case.

Teaching methods

Lecture: multimedia presentation

Laboratory classes: practical exercises using Matlab simulation environment, student projects assigned by the teacher

Bibliography

Basic

J. G. Proakis, Digital Communications, McGraw-Hill, Inc., New York 1995

J. S. Lee, L. E. Miller, CDMA Systems Engineering Handbook, Artech House Publishers, Boston-London 1998

Additional

R. C. Dixon, Spread Spectrum Systems with Commercial Applications, John Wiley & Sons, Inc., New York 1994

R. Prasad, CDMA for Wireless Personal Communications, Artech House Publishers, Boston-London 1996

Breakdown of average student's workload

| | Hours | ECTS |
|---|-------|------|
| Total workload | 125 | 5,00 |
| Classes requiring direct contact with the teacher | 70 | 3,00 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 55 | 2,00 |