POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)
pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

# COURSE DESCRIPTION CARD - SYLLABUS

Course name
## Cellular Network Design

## Course

| Field of study | Year/Semester |
|---|---|
| Electronics and Telecommunications | 2/2 |
| Area of study (specialization) | Profile of study |
| Mobile and Wireless Technologies | general academic |
| Level of study | Course offered in |
| Second-cycle studies | polish |
| Form of study | Requirements |
| full-time | elective |

## Number of hours

| Lecture | Laboratory classes | Other (e.g. online) |
|---|---|---|
| 30 | 15 | |
| Tutorials | Projects/seminars | |
| 15 | | |

## Number of credit points

4

## Lecturers

Responsible for the course/lecturer:

dr hab. inż. Rafał Krenz

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61 6653912

## Prerequisites

Knowledge of cellular systems technology, with emphasis on radio access network. 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 desing and optimisation process of radio access networks for 2G/3G/4G cellular systems. The practical skills, e.g. the application of professional planning software tools and using radiocommunication measurement equipment (spectrum analysers, RF signal generators) are also introduced.

## Course-related learning outcomes

Knowledge

Knows and understands the desing and optimisation process of radio access networks for 2G/3G/4G cellular systems, with emphasis on coverage and capacity planning and the relation between them.

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Understands the inter-system and intra-system EM compatibility issues related to the radio access network planning and optimization.

Skills

Is able to analyze the requirements and to accomplish the radio access network planning process for 2G/3G/4G cellular systems.

Can use professional planning software tools and advanced radiocommunication measurement equipment.

Social competences

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: oral exam consisting of 5-6 questions, based on the list of 25 topics shared during the course duration. Final grade calculated as an average of all partial grades in the range 2-5.

Tutorials/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. UMTS/LTE cellular systems - an overview of Radio Access Networks.

2. Propagation phenomena and radio channel modelling.

3. Theoretical models of radio networks - link-level modeling.

4. Theoretical models of radio networks - system-level modeling.

5. Radio network planning - network dimensioning.

6. Radio network planning - detailed planning od system parameters.

7. Electromagnetic compatibility in cellular systems.

8. Radio network optimisation.

9. Specific issues of LTE radio network planning.

10. Specific issues of GSM radio network planning.

11. Indoor radio network planning.

Laboratory classes:

1. Radio link budget analysis.

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2. Coverage planning for macro-cell based radio access networks.

3. Capacity planning for micro/pico-cell based radio access networks.

4. Indoor radio channel models.

5. Measuring radio signals and devices.

## Teaching methods

Lecture: multimedia presentation

Tutorials/laboratory classes: practical exercises using professional software planning tools and measurement devices, student projects assigned by the teacher,

## Bibliography

Basic

M. J. Nawrocki, M. Dochler, A. H. Aghvami, Understanding UMTS Radio Network, Wiley, 2006

A. Elnashar, M. A. El-saidny, M. Sherif, Design, Deployment and Performance of 4G LTE Networks,

Wiley 2015

L. Song, J. Shen (ed.), Evolved Cellular Network Planning and Optimization for UMTS and LTE,

CRC Press, 2014

Additional

R. Mishra, Advanced Cellular Network Planning and Optimisation, Wiley, 2007

J. Laiho, A. Wacker, T. Novosad, Radio Network Planning and Optimisation for UMTS, Wiley, 2002

M. Tolstrup, Indoor Radio Planning, Wiley, 2008

## 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 and laboratory classes, preparation for exam, project preparation) [1] | 30 | 1,0 |

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[1] delete or add other activities as appropriate