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Name of the module/subject Telecommunication networks design  Field of study Electronics and Telecommunications  Elective path/specialty  Course (compulsory, elective)  Polish  Second-cycle studies  No. of hours Lecture: 30 Classes: - Laboratory: - Project/seminars: - 5  Status of the course in the study program (Basic, major, other) major  Education areas and fields of science and art  technical sciences Technical sciences Technical sciences Technical sciences  Profile of study (general academic general academic general academic general academic 2 / 3  Subject offered in: Polish  Form of study (full-time,part-time)  Project/seminars: - 5  (university-wide, from another field)  from field  ECTS distribution (number and %)  5 100%  5 100%  Responsible for subject / lecturer:  prof. dr hab. in 2. Maciej Stasiak email: stasiak@et.put.poznan.pl tel. +48 61 665 39 06  Wydział Elektroniki i Telekomunikacji ul. Piotrowo 3A 60-965 Poznań  Ul. Piotrowo 3A 60-965 Poznań	STUDY MODULE DESCRIPTION FORM					
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# Prerequisites in terms of knowledge, skills and social competencies:

1	Knowledge	Knows the basics of traffic engineering, queuing theory, services, devices, management systems, network protocols and telecommunication techniques used in telecommunication and computer networks [K1_W22].
2	Skills	Is able to use known mathematical analysis, algebra and theory of probability concepts to solve basic problems in electronics and telecommunication [K1_U07].
		Is able to solve standard/typical problems related to traffic engineering and parametrization of network elements [K1_U26].
3	Social competencies	Demonstrates responsibility and professionalism in solving technical problems [K1_K02].

## Assumptions and objectives of the course:

Familiarizing the students with the fundamentals of analysis, dimensioning, optimization and design of network systems.

### Study outcomes and reference to the educational results for a field of study

#### Knowledge:

- 1. Has a systematic knowledge, with necessary mathematical background, of traffic theory and traffic engineering; of design, dimensioning and optimization of networks and network systems. [K2\_W11]
- 2. Has a systematic practical knowledge of designing ICT networks. [K2\_W14]

#### Skills:

- 1. . Is able to use already known mathematical models and methods to analyze and design telecommunication devices and systems. [K2\_U18]
- 2. . Is able to analyze, design, construct and exploit advanced telecommunications systems and various networks and devices which are part of them, ensuring that the designed systems and networks will have required technical parameters. [K2\_U16]

# Social competencies:

- $1. \ ls \ aware \ of \ the \ limitations \ of \ his/her \ current \ knowledge \ and \ skills; is \ committed \ to \ lifelong \ learning. \ -\ [K2\_K04]$
- 2. . Demonstrates responsibility for designed telecommunication systems. Is aware of the hazards they pose for individuals and communities if they are improperly designed or produced. [K2\_K06]

#### Assessment methods of study outcomes

### Faculty of Electronics and Telecommunications

#### Final written exam.

### **Course description**

- 1. Basic concepts of traffic engineering.
- 2. The mathematical basis for modelling and optimization of traffic systems.
- 3. Modelling and dimensioning of single-service systems.
- 4. Overflow theory, hierarchical network dimensioning.
- 5. Mathematical foundations of multidimensional systems modelling.
- 6. Modelling and dimensioning of multi-service systems.
- 7. Modelling and dimensioning of state-dependent multi-service systems.
- 8. Basic models of queuing systems, delay analysis, basics of queuing network dimensioning.
- 9. Equivalent bandwidth, packet traffic sources, models of packet flows.
- 10. Bandwidth discretization and dimensioning of the Internet.

### Basic bibliography:

- 1. Stasiak M, Głąbowski M., Hanczewski S., Zwierzykowski P.: Podstawy inżynierii ruchu i wymiarowania sieci teleinformatycznych, Wydawnictwo Politechniki Poznańskiej, Poznań, 2009.
- 2. Stasiak M., Głąbowski M., Zwierzykowski P.: Modelowanie i wymiarowanie ruchomych sieci bezprzewodowych. Wydawnictwo Komunikacji i Łączności, Warszawa 2009.

#### Additional bibliography:

- 1. Czachórski T., Modele kolejkowe w ocenie efektywności sieci I systemów komputerowych, Wydawnictwo PKJS, Gliwice 1999.
- 2. Iversen V.B., ed., Teletraffic Engineering, Handbook, ITU, Study Group 2, Question 16/2 Geneva, January 2005, published on-line.
- 3. Stasiak M., Głąbowski M., Zwierzykowski P.: Modeling and Dimensioning of Mobile Networks: from GSM to LTE, John Wiley and sons Ltd., January 2011.

### Result of average student's workload

Activity	Time (working hours)
1. Lectures	30
2. Preparation for the lectures	40
3. Preparation for the exam	30
4. Exam	2
5. Discussion of the results of the exam	3

#### Student's workload

Source of workload	hours	ECTS
Total workload	125	5
Contact hours	35	1
Practical activities	0	0