# COURSE DESCRIPTION CARD - SYLLABUS

Course name
ICT networks design [S2Teleinf2>PST]

## Course

Field of study
Teleinformatics

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
full-time

Requirements
compulsory

## Number of hours

Lecture
14

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
24

## Number of credit points

3,00

## Coordinators

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## Lecturers

prof. dr hab. inż. Maciej Stasiak
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## Prerequisites

Knowledge: Has systematic knowledge in mathematics useful in formulating and solving problems in the field of ICT. Understands the mechanisms and methods of traffic engineering, used in TCP/IP networks. Knows the principles of object oriented programming. Skills: UIs able to create computational programs in any object-oriented language. Can write a computational problem in algorithmic notation Social competences: Has the ability to work in a team

## Course objective

The aim of the course is to familiarise students with the methpdology of designing and dimensioning of network systems, especially TCP/IP systems. Students learn the basic formulas and methods of traffic engineering necessary to optimize and dimension network resources.

## Course-related learning outcomes

Knowledge:
1. Knows advanced methods of modeling, dimensioning and optimization of network resources in ICT networks, in particular in TCP / IP networks [K2_W01].
2. Knows the methods of optimal selection of network devices parameters, taking into account the

influence of the following factors: access control algorithms, traffic control mechanisms, and the size and type of traffic [K2_W02].
3. Has knowledge of theoretical models of resource allocation, virtualization and traffic distribution in the cloud [K2_W05].
4. Has an extensive vocabulary in English in the field of traffic engineering in ICT networks and data centers .

Skills:
1. Is able to educate himself independently and acquire knowledge necessary to solve problems of optimal allocation and distribution of resources in ICT systems [K2_U01].
2.Is able to extract information from databases storing scientific works and standardization recommendations regarding ICT systems and networks [K2_U01.
3. Is able to designe the amount of resources and their division in ICT networks and systems, taking into account wireless connectivity, traffic flow control mechanisms, traffic shaping mechanisms and virtualization mechanisms [K2_U06].
4. Is able to use advanced computation algorithms, appropriate data structures and programming languages to solve the problems of resources dimensioning and systems optimization in ICT networks [K2_U07].
5. Is able to formulate and justify project assumptions on the basis of the preliminary analysis of operator data [K2_U08].
6. Is able to work in a team, actively participate in planning and implementation of a project related to resources determination of the ICT system [K2_U02].

Social competences:
1. Is aware of changes in technologies and mechanisms of traffic engineering, which consequently leads to the need for continuous training in the area of design and optimization of network systems [K2_K01].
2. Is aware of the responsibility for the work of the team implementing ICT system projects [K2_K06].
3. Is aware of the responsibility for the results of his work, which affects the quality of service and the safety of users of ICT systems [K2_K02].

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired during lecture is verified on the basis of a test. The test includes 25-30 equally scored questions. Each question has 4 answers, one of which is true. Passing threshold: 50% of points (correct answers). Depending on the results, the scoring may change. In the case of a small number of students, the oral exem is preffered. The following grading scale was adopted: very good (A) - 5.0; good plus (B) - 4.5; good (C) - 4.0; sufficient plus (D) - 3.5; satisfactory (E) - 3.0; insufficient (F) - 2.0.
Credit of the project consists in the evaluation of the report (containing documentation of the developed software, calculation results and analysis of the results) concerning the determination of resources for the selected network system with a given traffic management mechanism. The assessment takes into account the student's activity in the classroom.The following grading scale was adopted: very good (A) - 5.0; good plus (B) - 4.5; good (C) - 4.0; sufficient plus (D) - 3.5; satisfactory (E) - 3.0; insufficient (F) - 2.0.

## Programme content

Network resources discretization.
Basic models of network resources.
Full availability models of multi-service systems.
Limited availability models of multi-service systems.
Models of multi-service queueing systems.
Basic traffic shaping mechanisms: stream, elastic and adaptive traffic.
Basic resource allocation algorithms.
Virtualization and resource balancing.
Basic traffic control mechanisms: overflows, reservation, compression, priorities.

## Teaching methods

1. Lecture: multimedia presentation illustrated with examples.

2. Project: multimedia presentation illustrated with examples; solving problems given by the teacher.

## Bibliography

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

Additional:
1. Teaching materials for lectures available to students in the form of pdf files.
2. Stasiak M. Głąbowski M., Zwierzykowski P.: Modeling and Dimensioning of Mobile Networks: from GSM to LTE, John Wiley and sons Ltd., January 2011.
3. Iversen V.B., ed., Teletraffic engineering and network planning, Technical University of Danmark, DTU, 2015, pp. 1-382, http://www.fotonik.dtu.dk. (publikacja dostępna bezpłatnie w sieci).
4. Moscholios I.D., Logothetis M.D., Efficient multirate teletraffic losss models beyond Erlang, John Wiley and sons Ltd., 2019.
5. Czachórski T., Modele kolejkowe w ocenie efektywności sieci I systemów komputerowych, Wydawnictwo PKJS, Gliwice 1999.
6. Bonald T., Feuillet M.: Network Performance Analysis. A John Wiley and Sons, Ltd, Publication, 2011, pp.1- 253.

## Breakdown of average student's workload

| | Hours | ECTS |
|---|---|---|
| Total workload | 78 | 3,00 |
| Classes requiring direct contact with the teacher | 38 | 1,50 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 40 | 1,50 |