COURSE DESCRIPTION CARD - SYLLABUS

Course name
Signalling and management systems in telecommunications [S1MiKC2>SSiZwT]

Course

Field of study
Microelectronics and Digital Communication

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

A student beginning this course should have basic knowledge of data communication networks and equipment, as well as an understanding of fundamental telecommunications concepts. They should be able to obtain information from designated sources and recognize the importance of continuously expanding their competencies. Additionally, in terms of social competencies, the student should demonstrate qualities such as honesty, responsibility, perseverance, intellectual curiosity, creativity, personal culture, and respect for others.

Course objective

The aim of the course is to provide students with fundamental knowledge of signaling in data communication networks, call handling, and network management. It also aims to develop their ability to solve basic problems related to call handling and network operations, as well as to enhance their skills in acquiring knowledge about implemented solutions in data communication networks.

Course-related learning outcomes

Knowledge:
1. Understands the functions of signaling in telecommunication networks, including the principles of

signaling systems and their importance for the proper operation of ICT networks.
2. Possesses structured knowledge of signaling protocols, including their structure, functions, and operation.
3. Has a systematic understanding of data communication network management.

Skills:
1. Is able to obtain information from Polish and English literature, databases, and other sources; can integrate acquired knowledge, draw conclusions, and formulate opinions; is also capable of analyzing standardization recommendations.
2. Is able to configure communication devices and protocols in data communication networks.
3. Is able to analyze signaling messages and monitor the operation of a data communication network to ensure its proper functioning.

Social competences:
1. Is aware of the responsibility for their own work.
2. Is able to collaborate effectively in a team.
3. Is capable of planning their own learning process.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired during lectures is assessed through an oral and/or written exam.
The oral exam requires students to provide correct answers to questions posed by the instructors. The written exam consists of a final test comprising 45-60 multiple-choice questions. Each question has four answer options, with only one correct answer. Students receive 1 point for a correct answer and 0 points for an incorrect or unanswered question. A minimum score of 50% is required to pass. For students whose scores are close to the passing threshold, an additional oral question may be given.
Knowledge and skills acquired during laboratory sessions are assessed based on class participation, evaluation of progress in laboratory exercises, quality of laboratory reports, preparedness for laboratory sessions, and performance on the final test. The final test includes both open-ended and multiple-choice questions (with one correct answer out of four options). A minimum of 50% of the total points is required to pass.

Programme content

1. Signaling methods and call handling in fixed and mobile telecommunication networks across different generations, as well as the management of these networks.
2. Structure, functions, and operation of selected signaling and network management protocols.

Course topics

Lectures:
1. Types of telecommunication networks.
2. User, control, and management planes in network models.
3. Services in telecommunication networks.
4. Types of connections in networks.
5. Operation of connections in networks.
6. Functions and types of telecommunication signaling.
7. Examples of call implementation in different networks.
8. Call handling in subscriber access: numbering, addressing, and types of subscriber signaling.
9. Signaling in integrated service networks, with a focus on DSS1 and SS7 signaling.
10. Signaling in VoIP services.
11. Signaling in 5G and optical networks.
12. Standardization in network management: OSI model-based management and network management protocols.
13. Service management: SLAs and methods for monitoring SLA-defined parameters.
14. IT infrastructure management based on ITIL.
15. Tools and applications for network management.
Laboratory Sessions:
1. Analysis of call routing and construction of signaling messages for various service implementations in

fixed and mobile networks.
2. Call handling using DSS1, SS7, and SIP signaling.
3. Call handling using signaling in mobile networks of different generations.
4. Construction of the MIB database and implementation of the SNMP protocol.

Teaching methods

Lectures:
1. Traditional lecture using a blackboard.
2. Lecture with a multimedia presentation (slides are provided to students in advance).
3. Interactive lecture involving student discussions.
4. Case study analysis.
Laboratory Sessions:
Laboratory classes follow an exercise-based approach. Depending on the topic, the instructor assigns students specific service scenarios for analysis. Using call handling message files, students examine the types, structure, and functions of signaling messages in different service contexts. Additionally, students analyze the MIB database and SNMP protocol based on predefined instructions.

Bibliography

Basic:
1. W. Kabaciński, M. Żal: Sieci Telekomunikacyjne, WKŁ, 2008
2. G. Danilewicz, W. Kabaciński: System sygnalizacji nr 7, WKŁ, 2005
3. A. Clemm, Network Management Fundamentals, Cisco Press, 2006
4. W. Stallings, Protokoły SNMP i RMON. Vademecum profesjonalisty, Helion, Gliwice, 2003
5. M. Bromirski, Telefonia VoIP
6. Stefan Rommer i in., 5G Core Networks. Powering Digitalization, Academic Press, ISBN 978-0-08-103009-7, 2020.

Additional:
1. L. Dryburgh, J. Hewett: Signaling System No. 7, Networking Technology Series, Cisco Press, 2004
2. T. Russel: Signaling System #7, McGraw-Hill Education, 2014

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00