

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject IP telephony		Code 1010331561010337137
Field of study Information Engineering	Profile of study (general academic, practical) (brak)	Year /Semester 3 / 6
Elective path/specialty Security of Information Technology (IT)	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: First-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 15 Classes: - Laboratory: - Project/seminars: 15		No. of credits 3
Status of the course in the study program (Basic, major, other) (brak)		(university-wide, from another field) (brak)
Education areas and fields of science and art technical sciences		ECTS distribution (number and %) 3 100%
Responsible for subject / lecturer: dr inż. Tomasz Bilski email: tomasz.bilski@put.poznan.pl tel. 061 66 53 554 Faculty of Electrical Engineering ul. Piotrowo 3A 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	K_W05: Student has organized knowledge with theoretical foundations of basic program constructions, algorithm implementations, paradigms and programming styles, software verification methods, formal languages, compilers, platforms. K_W07: Student has organized knowledge with theoretical foundations of computer networks.
2	Skills	K_U03: Student is able to create engineer work documentation and to prepare text with the work result discussion. K_U10: Student is able to use software platforms and environments for simple programs encoding, running and testing in imperative, object-oriented and declarative programming languages.
3	Social competencies	K_K04: Student understands the responsibility associated to his own work. Student is able to subordinate to team work rules and to take responsibility for cooperative tasks. K_K07: Student understands the importance of stringent accomplishment of a given project with proper notation standards, proper language. Student understands the importance of keeping deadlines.
Assumptions and objectives of the course: Students should obtain knowledge of many issues related to IP telephony.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Student has organized knowledge with theoretical foundations of computer networks. - [K_W07] 2. Student has organized knowledge with theoretical foundations of Internet technologies. - [K_W11] 3. Student has organized knowledge with theoretical foundations of teleinformatics, protocols and services in telecommunication networks. - [K_W15]		
Skills:		
1. Student is able to create engineer work documentation and to prepare text with the work result discussion. - [K_U03] 2. Student is able to do critical analysis of computer hardware operations, operating system and computer networks. - [K_U11] 3. Student is able to carry out work with web sites and Internet services. - [K_U15]		
Social competencies:		
1. Student understands the importance of stringent accomplishment of a given project with proper notation standards, proper language. Student understands the importance of keeping deadlines. - [K_K07]		

Assessment methods of study outcomes		
Lecture: test.		
Laboratory: tests before exercises, exercises assesment, reports.		
Course description		
<p>Lecture. VoIP systems: IP/PSTN gateways, signalling gateways, management nodes. VoIP protocols and standards overview: signalling protocols, real time protocols, resource reservation protocols. Optimization: data compression, buffering, QoS, VAD. Voice transmission parametres: jitter, delays, packet loss rate. Voice coding and compression standards: wave codecs, source codecs, hybrid codecs. Linear and nonlinear quantization, PCM, ADPCM, CELP, ACELP, MLQ. Voice quality measurement methods: MOS, PSQM, PAMS, PESQ, MNB, E-model. Signalling protocols: H.323 (H.225, H.245), SIP, IAX, MGCP, H.248/Megaco. Real time protocols: RTP, RTCP, AVP. Resource reservation protocols: RSVP. ENUM: E.164 Number Mapping, ENUM domains, NAPTR. Phone number portability: ACQ, QoR, OR, CD. Security in IP telephony: H.235, SRTP, SRTCP.</p> <p>Course update 2017: new models of networks (NFV, SDN).</p> <p>Teaching methods:</p> <ul style="list-style-type: none"> - lecture with multimedia presentation, - additional topics available in Moodle course. <p>Laboratory</p> <p>IP Network parameters (jitter, delay, throughput, loss packet ratio) analysis. Standard signalling protocols (H.323, SIP, SDP) analysis. Real time protocols (RTP, RTCP) analysis. Signalling protocol design and implementation. VoIP systems configuration.</p>		
Basic bibliography:		
<ol style="list-style-type: none"> 1. J. Davidson, J. Peters, Voice over IP. 2. T. Wallingford, Switching to VoIP, O'Reilly Media, Inc. 2005. 		
Additional bibliography:		
<ol style="list-style-type: none"> 1. A. Simmonds, Data Communications and Transmission Principles: An Introduction. 2. T. Bilski, Traffic analysis based on IP packet size, Studia Informatica vol. 32 Number 3A (98), Silesian University of Technology Press, Gliwice 2011, p. 167-176. 3. T. Bilski, New Challenges in Network Security, PRZEGLĄD ELEKTROTECHNICZNY, ISSN 0033-2097, R. 92 NR 12/2016, s. 228-232. 		
Result of average student's workload		
Activity	Time (working hours)	
1. Lectures	15	
2. Projects	15	
3. Preparation for test	13	
4. Consultations	2	
5. Homework related to projects	30	
Student's workload		
Source of workload	hours	ECTS
Total workload	75	3
Contact hours	32	1
Practical activities	45	1