STUDY MODULE DESCRIPTION FORM

Name of the module/subject **IP telephony**		Code **1010331461010337137**

Field of study **Computer Science**	Profile of study (general academic, practical) **(brak)**	Year /Semester **3 / 6**

Elective path/specialty **Safety of Computer Systems**	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: **1** Classes: **-** Laboratory: **-** Project/seminars: **1**	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:

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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
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.
Laboratory. 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.

Basic bibliography:

1. J. Davidson, J. Peters, Voice over IP.

2. T. Wallingford, Switching to VoIP, O?Reilly Media, Inc. 2005.

Additional bibliography:

1. A. Simmonds, Data Communications and Transmission Principles: An Introduction.

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