STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Wireless networks		**1010331551010332254**

Field of study	Profile of study (general academic, practical)	Year /Semester
Information Engineering	**(brak)**	**3 / 5**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**elective**

Cycle of study:	Form of study (full-time,part-time)
First-cycle studies	**full-time**

No. of hours					No. of credits
Lecture: **2**	Classes: **-**	Laboratory: **1**	Project/seminars: **-**		**4**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
(brak)	**(brak)**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**4 100%**

Responsible for subject / lecturer:

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Faculty of Electrical Engineering
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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Student has basic knowledge of physics, especially in such fields as mechanics, thermodynamics, optics, electricity, magnetism, nuclear physics, solid-state physics, including knowledge essential to understand physical phenomena in electronic circuits. Student has organized knowledge with theoretical foundations of basic program constructions, algorithm implementations, paradigms and programming styles, software verification methods, formal languages, compilers, platforms.
2	**Skills**	K_U01: Student is able to acquire information from literature, data bases and other sources; student is able to integrate acquired information, to interpret it, to draw conclusions and to formulate and justify judgments. K_U03: Student is able to create engineer work documentation and to prepare text with the work result discussion.
3	**Social competencies**	K_K02: Student understands and is aware of the importance of nontechnical issues related to computer engineer activity. Student understands the responsibility associated to his engineering decisions. 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 and practice on different aspects of modern wireless transmission systems. Students should obtain practice in making decisions related to wireless network design, installation and configuration.

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 work alone and in a group; student can assess time needed to finish a given work; student can develop and realize schedule necessary to keep up deadlines. - [K_U02]
2. Student is able to create engineer work documentation and to prepare text with the work result discussion. - [K_U03]
3. Student is able to do critical analysis of computer hardware operations, operating system and computer networks. - [K_U11]

Social competencies:
1. 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_K04]
2. 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 ? exercises assesment.

Course description
Lecture
Antennas: types (omnidirectional, sector, ?intelligent?, MIMO systems), features. Electromagnetic waves and their properties. Effects in waves propagation: absorption, diffraction, refraction, reflection, Doppler effect, polarization, interference, scattering. Infrared transmission. Coding, modulation. Multiple access systems: TDMA, SDMA, FDMA, CDMA. Spread spectrum methods: FHSS, DSSS. Wireless communication standards: IEEE 802.11 (WiFi), IEEE 802.15 (Bluetooth, ZigBee), IEEE 802.16 (WiMAX), IEEE 802.20. Mesh networks, routing in mesh networks. Mobile phone systems: GSM, UMTS. Roaming, handover services. Mobile IPv6. Data security in wireless networks. Legal aspects of wireless communication systems.
Course update 2017: wireless communication in IoT, energy utilization in mobile devices.
Teaching methods:
- lecture with multimedia presentation,
- additional topics available in Moodle course.
Laboratory. IEEE 802.11 standards. Active elements configuration in ad-hoc and infrastructural networks. Interference effect, RTS-CTS mode of transmission, CSMA/CA in shared transmission medium. Control and data frames analysis. Bandwidth versus throughput in wireless networks. System configuration: mode, modulation, output power, fragmentation thresholds, DTIM times, control frames times. IEEE 802.11 roaming. Data security methods (WEP, TKIP, CCMP, RADIUS, IEEE 802.11x). IEEE 802.11e. QoS. IEEE 802.15.4 and IrDA ? configuration, throughput testing.
IEEE 802.16: active elements configuration, antenna selection, throughput testing. GSM, GPRS, EDGE, UMTS ? transmission analysis, throughput testing, data security, QoS, roaming.

Basic bibliography:
1. 802.11 Wireless Networks: The Definitive Guide. Creating and Administering Wireless Networks. M. Gast., O'Reilly Media
2. B.A. Miller, C. Bisdikian, Bluetooth,

Additional bibliography:

Result of average student's workload

Activity	**Time (working hours)**
1. Lectures	30
2. Laboratory	15
3. Exam	2
4. Exam preparation	30
5. Theoretical preparation for laboratory	10
6. Practical preparation for laboratory	5
7. Consultations	3
8. Reports preparation	8

Student's workload

Source of workload	**hours**	**ECTS**
Total workload	102	4
Contact hours	50	2
Practical activities	25	1