STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Wireless Transmission Systems		**1010332131010335792**
Field of study **Control Engineering and Robotics**	Profile of study (general academic, practical) **(brak)**	Year /Semester **2 / 3**
Elective path/specialty **Control Engineering and Robotics**	Subject offered in: **polish**	Course (compulsory, elective) **elective**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **2** Classes: **-** Laboratory: **2** Project/seminars: **-**		No. of credits **5**
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 %) **5 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Student has knowledge from bachelor's degree.
2	**Skills**	Student has skills from bachelor's degree.
3	**Social competencies**	Student has social competencies from bachelor's degree.

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 knowledge on remote systems, distributed systems, real time systems and network technologies. - [K_W06++]
2. Student has extended knowledge on selected topics of robotics. - [K_W11+]

Skills:

1. Student is able to analyze and evaluate technical project documentation, is able to use scientific literature related to a given problem and is able to utilize new methods and technologies. - [K_U10+]
2. Student is able to select and integrate elements of dedicated measurement and control system, including: control unit, actuator, sensor and peripheral and communication units. - [K_U11+]

Social competencies:

1. Student understands and is aware of the importance constant learning ? improving professional, personal and social competencies. Student is able to inspire and organize education for other people. - [K_K01+]
2. Student is aware of the importance of professional methods in technical issues and of thorough knowledge of documentation and environment conditions in which devices and their elements may operate. - [K_K04+]

Assessment methods of study outcomes

Lecture ? exam.

Laboratory ? exercises and report assessments.

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. Wireless transmission aplications in control and robotics.

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	30
3. Exam	2
4. Exam preparation	30
5. Theoretical preparation for laboratory	15
6. Practical preparation for laboratory	20
7. Consultations	3

Student's workload

Source of workload	hours	ECTS
Total workload	130	5
Contact hours	65	2
Practical activities	50	2