Semester 2

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject **Sport**		Code
Field of study **Electronics and Telecommunications**	Profile of study (general academic, practical) **general academic**	Year /Semester **1 / 2**
Elective path/specialty **Information and Comm. Technologies**	Subject offered in: **English**	Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **full-time**	

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

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

Education areas and fields of science and art	ECTS distribution (number and %**)**

Responsible for subject / lecturer:	Responsible for subject / lecturer:
Wojciech Weiss email: wojciech.weiss@put.poznan.pl tel. 61 6652617 Inter-Faculty Units ul. Jana Pawła II 28, 61-135 Poznań	Krzysztof Rembicki email: krzysztof.rembicki@put.poznan.pl tel. 61 6652517 Inter-Faculty Unit ul. Jana Pawła II 28, 61-135 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge about the rules of volleyball, basketball, table tennis, football, tennis, swimming, skiing, floorball, squash, aerobics and rowing; knowledge of foundations and principles of warm-up and strength exercises as well as techniques and tactics of the game, scoring and rules regarding the walkover victory.
2	**Skills**	Improving technical skills taught in these disciplines, knowledge of basic tactics.
3	**Social competencies**	Ability to suffer a defeat, desire for revenge in a fair sport, respect for sports? equipment, sanities etc. Raising awareness about caring about body care (physical and mental)

Assumptions and objectives of the course:

Educational: To learn techniques and tactics of the game that will be used daily at work, to learn how to organize a game, contest or tournament with proper scoring and refereeing.

Educational: Respect for the rival and colleague, being able to support, motivate and encourage the partner, who is not doing well in the game. Cooperation with and respect for the judge.

Health: To know how to organize spare time, to spend this time effectively, caring for function and fitness, to learn the proper hygienic habits that will have a positive effect on work?s efficiency.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Student knows the technique of performing a particular sport; - [-]

2. Knows the accepted rules of the game and rivalry; - [-]

3. Knows how to explain the rules of the game, sum up the competition, and prepare a simple tournament?s score scale. - [-]

Skills:

1. Student is able to: prepare a mini-tournament in team games and/or table tennis/ tennis, carry out a rowing competition using ergometer, perform an aerobic dance system with a group; - [-]

2. Is able to use their knowledge in practice; - [-]

3. Is able to cooperate with a partner, referee, organizer or participant; - [-]

4. Is able to find and implement the best solutions that will drive the team to a fair-play victory; - [-]

5. Is able to recognize the rival team?s tactics. - [-]

Social competencies:

1. The student should be aware of the need for exercise and physical activity; - [-]

2. Should be responsible for his/hers decisions and actions and for the teammates; - [-]

3. Should be willing to help, both on the field and in everyday life; - [-]

4. Should be sensitive to injustice and harm. Should follow the rules, standards and binding rules. - [-]

Assessment methods of study outcomes

Basketball: 5 wheels test, mini tournaments.

Volleyball: Playing the ball in pairs, the three deflections attack, mini tournaments.

Football: Football test, mini tournaments.

Table tennis and tennis: Single and double tournament.

Weight training: Test of lifting the weights, pulls on the stick and abdominal exercises.

Swimming: Test of swimming in different styles on time.

Skiing, skating, rollerblading: Test the skills of downhill skiing with a specific technique, the ability to change direction.

Aerobic: Preparing and performing a training set with music.

Rowing ergometer : Checking the ability of rowing the distance technically correct on time

Squash: Tournament.

Course description

Basketball: Improving the skills of throwing in the run and jump, learning the throw and passing feints, learning the 5x0 positional attack, learning how to play 2x1, 3x2 and 4x3 advantage.

Volleyball: Perfecting the skills of of playing the ball in pairs and of attack and defense with a single block, learning of a go-around attack and of double and triple block.

Football: Perfecting the pass and go technique and playing in advantage, learning of a zone defense, small games.

Swimming: Learning of: the crawl, backstroke, classical and butterfly styles.

Table tennis and tennis: Perfecting forehand and backhand, taking into account the proper footwork, learning to play half volley.

Skiing: downhill, slalom.

Snowboard: Perfecting the technique ? must have an own snowboard.

Rowing ergometer: Learning the technique, training focused on improving speed and stamina.

Aerobic: Learning new steps and choreography, implementing them into practice.

Weight training: learning about the human musculoskeletal system, particular exercises and preparing training schedules.

Basic bibliography:

1. Rules of Volleyball 2010, Basketball 2011, Floorball 2008, Football 2005, Tennis and Squash.

Additional bibliography:

1. Press titles concerning particular sports.

Result of average student's workload

Activity	Time (working hours)
1. Practical training in sports centers	30

Student's workload

Source of workload	hours	ECTS
Total workload	30	1
Contact hours	30	1
Practical activities	30	1

STUDY MODULE DESCRIPTION FORM

Name of the module/subject **English**		Code

Field of study **Electronics and Telecommunications**	Profile of study (general academic, practical) **general academic**	Year /Semester **1 / 2**

Elective path/specialty **-**	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					No. of credits **3**
Lecture: **-**	Classes: **4**	Laboratory: **-**	Project/seminars: **-**		

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

Education areas and fields of science and art **humanities**	ECTS distribution (number and %**)** **3 100%**

Responsible for subject / lecturer:

Aleksander Kubot
email: aleksander.kubot@put.poznan.pl
tel. 61 665 24 91
Centre of languages and Communication
ul. Piotrowo 3a, 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	According to the national curriculum (http://bip.men.gov.pl/menbip/akty_prawne/rozporzadzenie_20081223_zal_4.pdf), it is assumed that the already acquired language competence compatible with level B1 (CEFR)
2	**Skills**	The ability to use vocabulary and grammatical structures required on the high school graduation exam with regard to productive and receptive skills
3	**Social competencies**	The ability to work individually and in a group; the ability to use various sources of information and reference works.

Assumptions and objectives of the course:

1. Advancing students? language competence towards at least level B2 (CEFR).

2. Development of the ability to use academic and field specific language effectively in both receptive and productive language skills.

3. Improving the ability to understand field specific texts (familiarizing students with basic translation techniques).

4. Improving the ability to function effectively on an international market and on a daily basis.

-

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Radio waves and the operation of the radio - [[K1_W07]]

2. Analog and digital signals - differences, sampling, digitization, digital circuitry - the pros and cons - [[K1_W17]]

3. Operation and structure of alarm systems - [[K1_W08],]

4. Cellular system - the structure and operation, mobile phone - construction, types of cables, - [[K1_W14][K1_W21]]

5. Computers, combinational logic - how it works - [[K1_W09]]

6. and to be able to define and explain associated terms, phenomena and processes - [? [-]]

Skills:

1. give a talk on field specific or popular science topic (in English), and discuss general and field specific issues using an appropriate linguistic and grammatical repertoire - [[K1_U04]]

2. express basic mathematical formulas and to interpret data presented on graphs/diagrams - [[K1_01]]

3. conduct business correspondence in English - [[K1_U06]]

4. describe briefly in writing a short technical process or a particular appliance - [[K1_U03]]

Social competencies:

1.   As a result of the course, the student is able to communicate effectively in a field specific/professional area, express opinions on the development of electronics and telecommunications and to give a successful presentation in English. - [[K1_K04]]

2. The student is able to recognize and understand dilemmas related to work within the scope of electronics and telecommunications, understands cultural differences in a professional and private conversation, and in a different cultural environment.   - [[K1_K05]]

Assessment methods of study outcomes
?   Formative assessment: on-going assessment (presentations, tests, Mid-term test)
?   Summative assessment: credit

Course description
Learning vocabulary which enables describing the operation of simple electronic devices such as the radio. Analysis of more advanced texts on telecommunications, types of waves, their propagation methods, principles of operation of digital technology (such as digital telephony).?Describing the types of telecommunication cables. Exercising language functions to help the student to describe the advantages and disadvantages of complex electronic systems, principles of computer structure and the role of combinational logic. Developing the ability to describe and assess the suitability of various electronic circuits (alarm systems). Discussing the effectiveness of different methods of transmitting signals such as Wi-Fi Business Correspondence (technical description, complaint).
Students carry out a program based on selected chapters from the primary and secondary literature and based on the sources of information from the Internet. They also take lexical and grammatical exercises.

Basic bibliography:

1.   E. Glendinning & John McEwan, Oxford English for Electronics

2. CM and D. Johnson, General Engineering, Prentice Hall

3.   R. Maksymowicz, Język angielski dla elektroników i informatyków

4. Anna Dubis & Justyna Figranek, English through Electrical and Energy Engineering

5. M. Weber& Ł. Brzosko, English for Engineers

6. Keith Harding & Liz Taylor International Express intermediate New Edition

Additional bibliography:

1. Liz Taylor International Express pre-intermediate New Edition

2. Liz Taylor International Express intermediate

3. E. Glendinning, Oxford English for Information Technology

4. Bodo Hanf, Angielski w technice, LektorKlett

Result of average student's workload	
Activity	**Time (working hours)**
1. Participation in classes	60
2. Participation in MOODLE classes	10
3. Preparation for tests/midterm test	20

Student's workload		
Source of workload	**hours**	**ECTS**
Total workload	90	3
Contact hours	60	2
Practical activities	90	3

STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Metrology**		Code

Field of study **Electronics and Telecommunications**	Profile of study (general academic, practical) **general academic**	Year /Semester **1 / 2**

Elective path/specialty **-**	Subject offered in: **English**	Course (compulsory, elective) **obligatory**

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

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

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

Education areas and fields of science and art **technical sciences** **Technical sciences**	ECTS distribution (number and %) **2 100%** **2 100%**

Responsible for subject / lecturer:

dr inż. Maciej Wawrzyniak
email: mwawrz@et.put.poznan.pl
tel. 665 3835
Electronics and Telecommunications
Polanka 3

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	1. Has a systematic knowledge of mathematical analysis, algebra and theory of probability. (K1_W01)
		2. Has a basic, systematic knowledge of physics. (K1_W02)
		3. Has a detailed, systematic knowledge of the fundamentals of circuit theory, together with necessary mathematical background; this knowledge allows him/her to understand, analyze and evaluate the operation of electrical circuits. (K1_W05)
2	**Skills**	1. Is able to extract information from Polish or English language literature, databases and other sources. Is able to synthesize gathered information, draw conclusions, and justify opinions. (K1_U01)
		2. Is capable of studying autonomously. (K1_U05)
		3. Demonstrates the ability to solve basic problems in physics. (K1_08)
		4. Demonstrates the ability to solve typical tasks and problems related to analysis of electrical circuits. (K1_09)
		5. Can implement the occupational health and safety principles. (K1_U27)
3	**Social competencies**	1. Is aware of the limitations of his/her current knowledge and skills; is committed to further self-study. (K1_K01)
		2. Is able to participate in collaborative projects. (K1_K02)

Assumptions and objectives of the course:

-To present of the basic definitions and concepts of metrology, measurement methods and measurement equipment. To introduce students to the analysis and presentation of data and the determination of errors and measurement uncertainty. Practical carrying out laboratory experiments involving the preparation and execution of measurements.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Has a systematic knowledge, together with necessary mathematical background, of the fundamentals of metrology, which is necessary to measure the signal properties and the parameters of electronic and telecommunication systems components. Has knowledge of measurement methods, measurement equipment. - [K1_W18]

2. Has knowledge of devices and systems exploitation. - [K1_W20]

Skills:

1. Is able to extract information from English language literature, databases and other sources. Is able to synthesize gathered information, draw conclusions, and justify opinions. - [K1_U01]

2. Is able to prepare a well-documented study, in English or in Polish, on problems related to electronics and telecommunication. - [K1_U03]

3. Is capable of studying autonomously. - [K1_U05]

4. Is able to measure typical parameters of signals, systems and devices, in particular those used in telecommunication. Is able to choose appropriate methods to measure given electrical quantities and parameters of signals and devices. Is able to plan and perform measurements and analyze the results. - [K1_U17]

Social competencies:

1. Demonstrates responsibility and professionalism in solving technical problems. - [K1_K02]

2. Demonstrates responsibility for designed electronic and telecommunication systems. Is aware of the hazards they pose for individuals and communities if they are improperly designed or produced. - [K1_K03]

3. Is aware of the main challenges facing electronics and telecommunication in the 21st century. - [K1_K04]

Assessment methods of study outcomes

-Tests in the laboratory.

-Reports from laboratory experiments.

Course description

- Basic definitions and terms of metrology.

- Methods, principles and procedures of measurements. Digital measurements of frequency and period.

- Sources of errors. Identification of systematic errors.

- Statistics in metrology. Point and range estimation.

- Uncertainty and error in direct and indirect measurements. Calculation of the total standard uncertainty.

- Measurements with analog and digital oscilloscopes.

- Analogue and digital measurements of voltage, current and resistance.

- Metrological attributes of modern measuring instruments.

- Selected characteristics of analog and digital measurements.

- Conditioning circuitry and signal conditioners.

- Digital to analog converters.

- Analog to digital converters: the dual ramp ADC; flash , successive approximation and sub-ranging types. ADC errors.

Basic bibliography:

1. Czichos H., Tetsuya S., and Leslie E. S., eds, Springer handbook of metrology and testing, Springer, 2011.

2. Rabinovich S. G., Measurement errors and uncertainty: theory and practice. Springer, 2005.

3. Bucher J. L., ed., The metrology handbook, ASQ Quality Press, 2012.

4. Keithley Instruments, Inc, Low Level Measurements Handbook: Precision DC Current, Voltage, and Resistance Measurements, Keithley, 1998

Additional bibliography:

1. Fraden J., Handbook of modern sensors. Springer, 2010.

2. Fornasini P., The uncertainty in physical measurements, Springer, 2008.

3. Layer E., Tomczyk K, eds., Measurements, modelling and simulation of dynamic systems, Springer, 2010.

4. Scott A. W.,Frobenius R., RF Measurements for Cellular Phones and Wireless Data Systems, Wiley, 2013.

Result of average student's workload

Activity	Time (working hours)
1. Participation in laboratories.	30
2. Preparation of the reports	30

Student's workload

Source of workload	hours	ECTS
Total workload	60	2
Contact hours	30	1
Practical activities	60	2

Faculty of Electronics and Telecommunications

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject **Physics**		Code
Field of study **Electronics and Telecommunications**	Profile of study (general academic, practical) **general academic**	Year /Semester **1 / 2**
Elective path/specialty **Information and Comm. Technologies**	Subject offered in: **English**	Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **full-time**	

No. of hours				No. of credits
Lecture: **2** Classes: **2** Laboratory: **1** Project/seminars: **-**				**5**

Status of the course in the study program (Basic, major, other) **basic**	(university-wide, from another field) **university-wide**
Education areas and fields of science and art **technical sciences**	ECTS distribution (number and %**)** **5 100%**

Responsible for subject / lecturer:

dr hab. Dobrosława Kasprowicz
email: dobroslawa.kasprowicz@put.poznan.pl
tel. 616653247
Wydział Fizyki Technicznej
Nieszawska 13, 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	fundamental knowledge of physics and mathematics (program basis for high schools, standard level)
2	**Skills**	skills in solving elementary problems in physics based on the knowledge possessed, ability to extract information from the recommended sources
3	**Social competencies**	understanding of the necessity of extending one?s competences, readiness to cooperate within a team

Assumptions and objectives of the course:

1. Transfer of fundamental knowledge in physics, within the range defined by the program relevant for the field of study

2. Development of skills in solving elementary problems and performing simple experiments, as well as the analysis of results obtained, based on the knowledge possessed

3. Development of skills in self-study and team work

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. W01-. student can define basic physical concepts, within the range covered by program relevant for the field of study, and indicate simple examples of their application in the surrounding world - [K1_W02]

2. W02-student can formulate and explain fundamental physical laws, within the range covered by program relevant for the field of study, define general restrictions and the range of their applicability, give examples of their application in phenomena in the surrounding world - [K1_W02]

3. W03-student can explain the aim and meaning of simplified models in description of physical phenomena - [K1_W02]

Skills:

1. U01-student can apply basic physical laws and simple models in solving simple problems within the range covered by program relevant for the field of study   - [K1_U08]

2. U02-. student can plan and perform standard measurements concerned with basic physical phenomena, identify and judge the importance of basic factors disturbing the measurement   - [K1_U08]

3. U03-student can perform a qualitative and quantitative analysis of the results of simple physical experiments   - [K1_U08]

4. U04-student can formulate simple conclusions on the basis of measurements performed   - [K1_U08]

5. U05-. student can use, with understanding, the recommended sources of knowledge (basic references list), as well as gain knowledge from other sources - [K1_U01 K1_U02 K_U05]

Social competencies:

1. K01-student can get actively involved in solving problems stated, develop and extend his (her) competences unaided - [K1_K01]

2. K02-student can cooperate within a team, fulfill the duties resulting from division of team work, show responsibility for his (her) own work and joint responsibility for the results of team work - [K1_K02]

3. K03-comply with fundamental ethical principles - [K1_K02 K1_K03]

Assessment methods of study outcomes

W01,W02,W03: written/oral exam

3.0: 50.1%-60.0%   3.5: 60.1%-70.0%   4.0: 70.1%-80.0%   4.5: 80.1%-90.0%   5.0: from 90.1%

U01: solving problems in physics at auditory classes, written/oral exam, written test

U02: solving problems in physics at auditory classes

U03: written test

3.0: 50.1%-60.0%   3.5: 60.1%-70.0%   4.0: 70.1%-80.0%   4.5: 80.1%-90.0%   5.0: from 90.1%

K01: activity at auditory classes

U01: laboratory classes report, oral and written answers, written/oral exam

U02, U03, U04: laboratory classes report, oral and written answers

K01: activity at laboratory classes

K02: realization of laboratory exercise

Course description

1. Gravitation
   - gravitational field and force, orbits and energy of satellites, effect of gravity on space-time, curvature of space.
2. Oscillations:
   - mechanical oscillations (simple harmonic motion (SHM), kinematics and energy of SHM, forced oscillations, damping, resonance),
   - electromagnetic oscillations (LC oscillations, damped oscillations in an RLC circuit, resonance).
3. Mechanical waves:
   - transverse and longitudinal waves, the speed of a traveling wave, energy and power of a traveling wave, the principle of superposition for waves, interference of waves, standing waves, sound waves, ultrasounds, infrasounds, Doppler effect.
4. Electromagnetism:
   - electric field (the electric field due to a point charge and an electric dipole, Coulomb's Law, the Gauss' Law: cylindrical, plannar and spherical symmetry, electric potential, capacitance),
   - magnetic field (magnetic field due to a current, electrodynamic force, Biot–Savart Law, Ampere's Law, Gauss' Law for magnetic, Faraday's Law of induction, Lenz's Law),
   - charge particle in electric and magnetic field; cyclotrons and synchrotrons,
   - electric current (Ohm's Law, resistance and resistivity),
   - conductivity/ the electrical properties of solids, energy levels in solids (metals, insulators, semiconductors, n-type and p-type semiconductors, the p-n junction),
   - superconductors,
   - magnetic materials (diamagnetism, paramagnetism, ferromagnetism).
5. Electromagnetic waves:
   - Maxwell's equations,
   - the electromagnetic spectrum,
   - the travelling electromagnetic waves (channels of communication).
6. Optics:
   - reflection and refraction of light, total internal reflection of light, critical angle,
   - white light, dispersion, diffraction, interference and polarization of light, diffraction gratings, Brewster's Law,
   - travelling of electromagnetic waves (VIS and IR range) – classical and photonic optical fibres,
   - lasers – work and applications.
7. Special theory of relativity (relativity, the speed of light postulate, mass and energy, time dilatation, length contraction, the twin paradox, Doppler effect of light, the NAVSTAR Navigation System, GPS Global Positioning System).
8. Selected problems of modern physics:
   - quantum nature of light (photons, the photoelectric effect),
   - matter waves (de Broglie waves),
   - Schrödinger's equation, Heisenberg's uncertainty principle,
   - barrier tunneling effect – STM the scanning tunneling microscope,
   - low-dimensional structures (nanocrystallites, quantum dots, quantum corrals, graphene).

Basic bibliography:

1. D.Halliday, R.Resnick, J.Walker, Fundamentals of Physics, John Wiley&Sons, Inc., New York 1997.

2. Paul A. Tipler, Physics for scientists and engineers, W. H. Freeman and Company, New York, 1999.

Result of average student's workload	
Activity	**Time (working hours)**
1. participation in lectures	30
2. participation in auditory classes	30
3. participation in laboratory classes	15
4. preparation for auditory classes	20
5. preparation for laboratory classes	10
6. preparation of laboratory classes reports	10
7. participation in consultation concerning education process, in particular laboratory classes	3
8. preparation for exam	20
9. participation in exam	2

Student's workload		
Source of workload	**hours**	**ECTS**
Total workload	140	6
Contact hours	80	
Practical activities	75	

STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Programming in C**		Code

Field of study **Electronics and Telecommunications**	Profile of study (general academic, practical) **general academic**	Year /Semester **1 / 2**

Elective path/specialty **Information and Comm. Technologies**	Subject offered in: **English**	Course (compulsory, elective) **Obligatory**

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

No. of hours Lecture: **30** Classes: **-** Laboratory: **30** Project/seminars: **-**	No. of credits **7**

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

Education areas and fields of science and art **technical sciences** **Technical sciences**	ECTS distribution (number and %**)** **7 100%** **7 100%**

Responsible for subject / lecturer:

dr hab. inż. Mariusz Głąbowski, prof. nadzw. email: mariusz.glabowski@put.poznan.pl tel. +48 61 665 3904 Wydział Elektroniki i Telekomunikacji ul. Piotrowo 3A 60-965 Poznań	dr inż. Adam Kaliszan e-mail : adam.kaliszan@gmail.com tel. +48 61 6653909 Wydział Elekroniki i Telekomunikacji ul. Piotrowo 3A, 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of mathematics K1_W01
2	**Skills**	Is able to retrieve and interpret information from books and Internet K1_U01
3	**Social competencies**	Student understands a necessity to acquire a new knowledge and skills stemming from a chosen field of studies. K1_K01

Assumptions and objectives of the course:

The aim of the subject is to deliver to a student a basic knowledge of algorithms, data structure, computational complexity, and princicples of C programming.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Knows the principles of construction of computer programs ; has knowledge from the area of computing science; knows the syntax of C - [K1_W09]

2. Has a knowledge of implementation in C algorithms (sorting, greedy algorithms, searching, graph algorithms) and data structures (tables, binary trees, graphs) - [[K1_W09]]

Skills:

1. Is able to write software for basic computational algorithms, using C programming languages   - [K1_U13]

2. Uses high level programming languages: C - [K1_U13]

3. Is able to write and run programs to solve selected problems in telecommunication - [K1_U13]

Social competencies:

1. Is aware of the limitations of his/her current knowledge and skills; is committed to further self-study. - [K1_K01]

2. Demonstrates responsibility and professionalism in solving technical problems. Is able to participate in collaborative projects. - [K1_K02]

Assessment methods of study outcomes

Forming assessment:

Lectures: Written exam; exam is passed when student receives at least 50% points. Exam can be taken after the completion of laboratories.

Laboratories:

- evaluation and assessment of knowledge increment that need to be effective in solving problems covering all tasks within a given subject area;

- continuous assessment during daily classroom practice - rewarding knowledge increment in skills in management of using rules and methods learnt in class.

Course description

- computers architecture

- complexity

- greedy algorithms

- recursion

- basic data structures

- structure of C programs

- operators and expressions

- control statements, recursion vs. Iteration

- functions

- functions with multiple parameters

- function call stack

- arrays

- sorting and searching algorithms

- pointers and dynamic memory allocation

- C characters and strings

- C data structures

Basic bibliography:

1. D.E. Knuth, The art of computer programming, Addison-Wesley Publishing Company, Reading, MA, 1968, 1973.

2. T.H. Cormen, C.E. Leiserson, R.L. Rivest, C. Stein, Introduction to Algrithms, The MIT Press; third edition edition (July 31, 2009)

3. Paul Deitel, Harvey Deitel, C How to Program, Prentice Hall; 7th edition (March 4, 2013)

Additional bibliography:

Result of average student's workload

Activity	Time (working hours)
1. Lectures	30
2. Laboratories	30
3. Preparation for lectures, literature studies	30
4. Preparation for laboratories	50
5. Exam	3
6. Discussion of exam otucomes	2
7. Sef-training in C programming	30

Student's workload

Source of workload	hours	ECTS
Total workload	175	7
Contact hours	65	2
Practical activities	90	4

<table>
<tr><td colspan="4" align="center">**STUDY MODULE DESCRIPTION FORM**</td></tr>
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Name of the module/subject **Electrical circuits**		Code	
Field of study **Electronics and Telecommunications**	Profile of study (general academic, practical) **general academic**	Year /Semester **1 / 2**	
Elective path/specialty **Information and Comm. Technologies**	Subject offered in: **English**	Course (compulsory, elective) **obligatory**	
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **full-time**		

No. of hours				No. of credits
Lecture: **2** Classes: **2** Laboratory: **-** Project/seminars: **-**				**5**

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

Education areas and fields of science and art **technical sciences** **Technical sciences**	ECTS distribution (number and %**)** **5 100%**

Responsible for subject / lecturer:

Dr inż. Agnieszka Wardzińska
Agnieszka.wardzinska@put.poznan.pl
Faculty of Electronics and Telecommunications
ul. Piotrowo 3A 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Has a systematic knowledge of mathematical analysis, algebra. Has a basic, structured knowledge of physics.
2	**Skills**	Can apply the vector analysis in three basic systems of coordinates.
3	**Social competencies**	Knows the limits of his own knowledge and abilities, understands the need for ongoing education

Assumptions and objectives of the course:

Understanding of electromagnetic phenomena in circuit components and networks as objects transfering energy and signals. Ability to describe these phenomena and to analyze the circuit in order to get knowledge and for the practical needs of the research and design of electronic and telecommunications systems.

<table><tr><td align="center">**Study outcomes and reference to the educational results for a field of study**</td></tr></table>

Knowledge:

1. Knows basic laws in circuit theory: voltage and current Kirchoff - [K_W05]

2. Knows the characteristics and basic branch equations of linear elements and typical non-linear elements. - [K_W05]

3. Knows the basic circuit analysis methods including elements of numerical methods. In particular is familiar with method of complex numbers and the method of Laplace transform. - [K_W05]

4. Knows the two-port description of circuit using a matrices Z, Y, H, A, and S. Understands the concepts: transfer function, amplitude and phase characteristics. Elemental understanding the concept of the stability of the circuit. - [K_W05]

Skills:

1. Can take the information from the literature and databases, and other sources; able to integrate the information, make their interpretation, draw conclusions and justify opinions - [K_U01]

2. Can solve common tasks and problems associated with the analysis of electrical circuits. - [K_U09]

3. Calculates the elements of the two-port matrices and transfer function of the system. Knows how to analyze the dynamics of a simple piecewise-linear circuit. - [K_U09]

Social competencies:

1. Able to self-learning (textbooks, computer programs) - [K_K01]

2. Behaves actively in class, asks questions, knowingly uses the contact with the teacher (eg consultation). - [K_K03]

Assessment methods of study outcomes
1 Written examinations and test questions
2 Problem solving tests (written tests) at classes
3 Housework

Course description
1. Basic laws in circuit theory: voltage and current Kirchoff's laws, Tellegen's theorem. Real circuit and its mathematical model, Thevenin and Norton theorem.
2. Linear and non-linear passive components and active elements of analog circuits. The basic principles, theorems and methods in the analysis of resistive circuits.
3. Circuits with harmonic currents in steady state - Method of complex numbers, phasor diagrams. Coupled and resonant circuits.
4. Transients, analysis in time and frequency domain (Laplace transform). Two-ports and their description using the matrices: Z, Y, H, A, etc., and S.
5. The concept of transfer function, amplitude and phase characteristics.
6. Basic concepts of circuits stability.

Basic bibliography:

1. *Introductory Circuit Analysis*, Robert L. Boylestad, Prentice Hall PTR, 2000, 2003, 2007, 2010;

2. *AC and DC Network Theory*, A. J. Pointon, H. M. Howarth, Springer Netherlands, 1991;

3. *Electrical Circuit Theory and Technology*, Bird, John, Elsevier Newnes, 2003;

Additional bibliography:

1. *Circuits Systems with Matlab and PSpice*, Won Y. Yang, Seung C. Lee, Wiley, Asia, 2007.

2. *Linear and Nonlinear Circuits*, L.O. Chua, C.A. Desoer, E.S. Kuh , McGraw-Hill Inc., 1987.

3. *Analog and digital filters: design and realization*, H. Y.,-F. Lam , Prentice_Hall, Inc., Englewood Cliffs, New Jersey, 1979.

4. *Classical Circuit Theory*, Omar Wing, Springer US, 2009

Result of average student's workload	
Activity	**Time (working hours)**
1. Classes that require personal contact with an academic teacher	60
2. Preparations for the training (problem solving), development problems and preparation for written tests	40
3. Reading of literature (textbooks, catalogs)	10
4. Preparations for the examination	20
5. Consultations	10

Student's workload		
Source of workload	**hours**	**ECTS**
Total workload	140	5
Contact hours	70	4
Practical activities	70	2

STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Signal Theory**		Code

Field of study **Electronics and Telecommunications**	Profile of study (general academic, practical) **general academic**	Year /Semester **1 / 2**

Elective path/specialty **Information and Comm. Technologies**	Subject offered in: **English**	Course (compulsory, elective) **obligatory**

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

No. of hours	No. of credits **5**
Lecture: **2** Classes: **2** Laboratory: **-** Project/seminars: **-**	

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

Education areas and fields of science and art	ECTS distribution (number and %**)**
study effects leading to the acquisition of engineering qualifications	**5 100%**
technical sciences	**5 100%**
Technical sciences	**5 100%**

Responsible for subject / lecturer:

dr inż. Maciej Bartkowiak
email: mbartkow@multimedia.edu.pl
tel. 6653850
Wydział Elektroniki i Telekomunikacji
ul. Piotrowo 3A 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Has a systematic knowledge of mathematical analysis, algebra, and trigonometry. Has a basic, structured knowledge of physics.[K1_W01][K1_W02]
2	**Skills**	Can apply calculus for functions of one and two independent variables. Can analyse the variation of a function and draw function plots. Can operate on complex numbers. Can calculate limits of a function and check the convergence of a series.[K1_U07]
3	**Social competencies**	Knows the limits of his own knowledge and abilities, understands the need for ongoing education

Assumptions and objectives of the course:

Understanding of Fourier analysis of periodic and non-periodic deterministic signals, introduction to signal processing by linear systems, and sampling of continuous signals. Ability to solve basic signal theory problems in order to get the knowledge and for the practical needs of research and design of signal processing solutions in telecommunications.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Has a structured and theoretically underpinned knowledge on one-dimensional signal theory which is necessary for understanding the representations of signals in time domain and frequency domain. - [K1_W06]

2. Knows and understands basic notions related to linear circuit description in time and frequency. Understands, how properties of systems affect the spectra of signals being processed by them. - [K1_W10]

Skills:

1. Can solve typical problems related to signal analysis in time and frequency domains. - [K1_U10]

Social competencies:

1. Is open for the possibilities of sustained learning and understands the neccessity of increasing the level of expertise - [K1_K01]

Assessment methods of study outcomes

1. Individual solving of problems at the blackboard during the class

2. Checking of homework

3. Two written tests during the semester

4. Written + oral final exam

Course description

Signals and models (deterministic and stochastic, discrete and continuous, analog and quantized). Properties of periodic and non-periodic waveforms. Real and complex-valued harmonic (sinusoidal) signals. The notions of DC and AC components. Power and energy of a signal, the RMS value, calculating the shape coefficient and peak coefficient). Distributions as signals.

Analysis of periodic signals by the use of Fourier series. Orthogonality, norm, orthogonal signals and series. Trigonometric Fourier series and its properties. Complex exponential Fourier series, and its properties. Harmonic spectrum, magnitude and phase spectra. The shift property. Properties related to signal symmetries. The Gibbs phenomenon. The Parseval theorem.

The integral Fourier transform (definition of forward and inverse transform, basic properties and interpretation, amplitude and phase spectrum). The linearity of Fourier transform. The symmetries of transforms of a real signal. The properties of Fourier transform: time shift, frequency shift, scaling, differentiation, integration, symmetry.

The transforms of infinite energy signals. The Parseval theorems for energy and power. The spectral power density and energy density.

Signal processing by linear systems. The LSI system (static and dynamic) and its transfer function. The impulse response of an LSI system, the response for arbitrary signal, the convolution formula and the properties of convolution. The convolution theorem for Fourier transform. The transfer function in frequency domain. Types of frequency characteristics of LSI systems. Ideal filters and their properties.

Correlation functions and their properties (auto and cross-correlation for finite energy and finite power signals. The Wiener-Kinchin theorem. The correlation of the input and output of a linear system.

Introduction to discrete signals and systems. Sampling, and spectrum of a sampled signal. Signal reconstruction from its samples. The Shannon sampling theorem. The DFT transform, discrete signal processing by discrete LSI systems. Discrete convolution.

Basic bibliography:

1. A. Oppenheim, A. Wilsky, I. Young, Signals and Systems, Prentice Hall

2. R.A. Gabel, R.A. Roberts, Signals and Linear Systems, Wiley 1986

3. B.P. Lathi, Linear Systems and Signals, Oxford University Press, 2004

4. E. Kamen, Introduction to Signals and Systems, MacMillan, 1987

Additional bibliography:

Result of average student's workload

Activity	Time (working hours)
1. Lecturers and auitory exercises	60
2. Preparation for classes	40
3. Consultations	2
4. Preparation to the exam	20
5. Exam	3

Student's workload

Source of workload	hours	ECTS
Total workload	125	5
Contact hours	68	2
Practical activities	70	2

STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Business in ICT**		Code	
Field of study **Electronics and Telecommunications**	Profile of study (general academic, practical) **general academic**	Year /Semester **1 / 2**	
Elective path/specialty **-**	Subject offered in: **English**	Course (compulsory, elective) **elective**	
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **full-time**		

No. of hours					No. of credits **2**
Lecture: **30**	Classes: **-**	Laboratory: **-**	Project/seminars: **-**		

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

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

Responsible for subject / lecturer:

Ph.D., D.Sc. Marek Szczepański
email: marek.szczepanski@put.poznan.pl
tel. +48 665 3393
Faculty of Engineering Management
ul. Strzelecka 11 60-965 Poznań

Ph. D. Ewa Badzińska
email: ewa.badzinska@put.poznan.pl
tel. +48 61 665 3390
Faculty of Engineering Management
ul. Strzelecka 11 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Student has the basic understanding of entrepreneurship.
2	**Skills**	Student should describe the basic organizational structures of companies. Student is able to evaluate the information the media.
3	**Social competencies**	Students are active and willing to undertake entrepreneurial activities The student has the ability to work in team and participate in the preparation of projects

Assumptions and objectives of the course:

To familiarize students with the basic concepts of management theory.

Understand the operation of the market mechanism.

To familiarize students with the basic tools of business analysis.

Developing the ability and competences of understanding basic aspects of company's competitiveness.

The acquisition of skills by the students themselves to decide, from the point of view of the consumer and the manufacturer.

Transfer of knowledge in the allocation of resources and wealth in the process of globalization

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Has knowledge of conducting economic activity - [T1A _ W08]
2. Has information about the competitive environment of a company and about the opportunities of getting competitive advantage of enterprise using material and non-material resources.

Skills:

1. Able to extract information from Polish or English language literature, databases and other sources. Is able to synthesize gathered information, draw conclusions, and justify opinions.   - [T1A_U01]
2. Able to self-study - [T1A_U05]
3. Student can correctly use the basic terms of management and entrepreneurship.

Social competencies:

1. Is aware of the limitations of his/her current knowledge and skills; is committed to further self-study. - [K1A_K01]
2. Demonstrates responsibility for designed electronic and telecommunication systems. Is aware of the hazards they pose for individuals and communities if they are improperly designed or produced.   - [K1A_K03]
3. Is aware of the main challenges facing electronics and telecommunication in the 21st century. Is aware of the impact electronics and ICT systems and networks will have on the development of the information society. - [K1A_K04]
4. Correctly interprets and solves the dilemmas related to working in electronics and telecommunication. - [K1A_K05]
5. Is able to think and act in an entrepreneurial manner - [T1A_K06]

Assessment methods of study outcomes

The written examination (test)

Course description

1. Concept, types, facilitators and inhibitors of business
2. Generation and utilization of resources, concept of market, exploring and segmenting the market, demand and supply factors, understanding customer adoption process
3. Concept, function and culture of management, management of innovations and technology
4. Creating a new company – marketing- and business plan, risk management
5. Communication skills and competence of entrepreneur
6. Business ethics
7. Technological innovations – case study of the Apple Company
8. Academic entrepreneurship - case studies in the ICT industry
9. The influence of non-material recourses on building company's competitiveness.
10. Trends which changes the world and consumers (case studies)

Basic bibliography:

1. Drucker Peter F. (1985), Innovation and entrepreneurship: practice and principles, Harper & Row.
2. Scarborough, Norman M. (2011). Essentials of Entrepreneurship and Small Business Management, 6 ed., Prentice Hall.
3. Mellor B.R., Coiulton G., Chick A., Mellor N., Fisher A. (2011), Przedsiębiorczość [Entrepreneurship] , PWE, Warszawa.
4. Porter, M.E. (2008), The Five Competitive Forces That Shape Strategy, "Harvard Business Review", January 2008, pp. 79–93.

Additional bibliography:

1. Porter, M.E. & Kramer, M.R. (2011), Creating Shared Value," Harvard Business Review", Jan/Feb 2011, Vol. 89 Issue 1/2, pp 62–77.
2. Porter, M.E. & Kramer, M.R. (2006) Strategy and Society: The Link Between Competitive Advantage and Corporate Social Responsibility, "Harvard Business Review", December 2006, pp. 78–92.
3. Lundstrom A., Stevenson L.A. (2005), Entrepreneurship Policy: Theory and Practice, Springer. ISBN 038724140X.
4. Deakins D., Freel, M. (2009), Entrepreneurship and Small Firms, 5th Edition. McGraw Hill.
5. Swedberg R. (2000), Entrepreneurship: The Social Science View, Oxford University Press. ISBN 019829462X.
6. Minniti, M., Moren, L. (2010), Entrepreneurial types and economic growth, "Journal of Business Venturing", 25 (3), pp. 305-314.
7. Shane S. A. (2003), A General Theory of Entrepreneurship: the Individual-Opportunity Nexus, Edward Elgar Publishing. ISBN 1843769964.
8. Misala J. (2011), Międzynarodowa konkurencyjność gospodarek narodowych, PWE, Warszawa.
9. Glinka B., Gudkova S. (2011), Przedsiębiorczość, Wolters Kluwer Polska, Warszawa.
10. Hołub-Iwan J., Perenc J. (2011), Innowacje w rozwijaniu konkurencyjności firm. Znaczenie, wsparcie, przykłady zastosowań, C. H. Beck, Warszawa.

Result of average student's workload

Activity	Time (working hours)
1. Participation in classes	30
2. Studies of the literature	15
3. Preparation for the test	15

Student's workload

Source of workload	hours	ECTS
Total workload	60	2
Contact hours	30	1
Practical activities	30	1

Poznan University of Technology

Faculty of Electronics and Telecommunications

STUDY MODULE DESCRIPTION FORM			
Name of the module/subject **Principles of Enterpreneurship**		Code	
Field of study **Electronics and Telecommunications**		Profile of study (general academic, practical) **general academic**	Year /Semester **1 / 2**
Elective path/specialty **Information and Comm. Technologies**		Subject offered in: **English**	Course (compulsory, elective) **elective**
Cycle of study: **First-cycle studies**		Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **-** Classes: **30** Laboratory: **-** Project/seminars: **-**			No. of credits **2**
Status of the course in the study program (Basic, major, other) **other**		(university-wide, from another field) **university-wide**	
Education areas and fields of science and art **social and management sciences**			ECTS distribution (number and %**)** **2 100%**

Responsible for subject / lecturer:

Ph.D., D.Sc. Marek Szczepański
email: marek.szczepanski@put.poznan.pl
tel. +48 665 3393
Faculty of Engineering Management
ul. Strzelecka 11 60-965 Poznań

Ph. D. Ewa Badzińska
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Faculty of Engineering Management
ul. Strzelecka 11 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Student has the basic understanding of entrepreneurship.
2	**Skills**	Student should describe the basic organizational structures of companies. Student is able to evaluate the information the media.
3	**Social competencies**	Students are active and willing to undertake entrepreneurial activities The student has the ability to work in team and participate in the preparation of projects

Assumptions and objectives of the course:

To familiarize students with the basic concepts of entrepreneurship.

To familiarize students with the basic tools of business analysis.

Developing the ability and competences of understanding basic aspects of company's competitiveness.

The acquisition of skills by the students themselves to decide, from the point of view of the consumer and the manufacturer.

Study outcomes and reference to the educational results for a field of study

Knowledge:

3. Has knowledge of conducting economic activity - [T1A _ W08]

4. Has information about the competitive environment of a company and about the opportunities of getting competitive advantage of enterprise using material and non-material resources.

Skills:

4. Able to extract information from Polish or English language literature, databases and other sources. Is able to synthesize gathered information, draw conclusions, and justify opinions.   - [T1A_U01]

5. Able to self-study - [T1A_U05]

6. Student can correctly use the basic terms of management and entrepreneurship.

Social competencies:

6. Is aware of the limitations of his/her current knowledge and skills; is committed to further self-study. - [K1A_K01]

7. Demonstrates responsibility   for designed electronic and telecommunication systems. Is aware of the hazards they pose for individuals and communities if they are improperly designed or produced.   - [K1A_K03]

8. Is aware of the main challenges facing electronics and telecommunication in the 21st century. Is aware of the impact electronics and ICT systems and networks will have on the development of the information society.   - [K1A_K04]

9. Correctly interprets and solves the dilemmas related to working in electronics and telecommunication.   - [K1A_K05]

Is able to think and act in an entrepreneurial manner - [T1A_K06]

Assessment methods of study outcomes

The written test

Course description

1. Theoretical aspects of entrepreneurship
2. Theoretical aspects of company's competitiveness
3. The role of entrepreneurship in getting a competitive position
4. Economics of entrepreneurship and innovations
5. How to build a new company – marketing- and business plan, risk management
6. Communiation skills and competence of entrepreneur
7. Business ethics
8. Technological innovations – case study of the Apple Company
9. Academic entrepreneurship – aim, essence, features, support institutions
10. Commercialization of innovative ideas and research results – Start-up in the ICT industry (case studies)
11. New trends in enterprise communication with customers - customization, gamification, fan pages, corporate blogging, virtual world (case studies)

Basic bibliography:

5. Drucker Peter F. (1985), Innovation and entrepreneurship: practice and principles, Harper & Row.
6. Scarborough, Norman M. (2011). Essentials of Entrepreneurship and Small Business Management, 6 ed., Prentice Hall.
7. Mellor B.R., Coiulton G., Chick A., Mellor N., Fisher A. (2011), Przedsiębiorcześć [Entrepreneurship] , PWE, Warszawa.
8. Porter, M.E. & Kramer, M.R. (2006) Strategy and Society: The Link Between Competitive Advantage and Corporate Social Responsibility, "Harvard Business Review", December 2006, pp. 78–92.

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11. Porter, M.E. & Kramer, M.R. (2011), Creating Shared Value," Harvard Business Review", Jan/Feb 2011, Vol. 89 Issue 1/2, pp 62–77.
12. Lundstrom A., Stevenson L.A. (2005), Entrepreneurship Policy: Theory and Practice, Springer. ISBN 038724140X.
13. Deakins D., Freel, M. (2009), Entrepreneurship and Small Firms, 5th Edition. McGraw Hill.
14. Swedberg R. (2000), Entrepreneurship: The Social Science View, Oxford University Press. ISBN 019829462X.
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16. Shane S. A. (2003), A General Theory of Entrepreneurship: the Individual-Opportunity Nexus, Edward Elgar Publishing. ISBN 1843769964.
17. Misala J. (2011), Międzynarodowa konkurencyjność gospodarek narodowych, PWE, Warszawa.
18. Glinka B., Gudkova S. (2011), Przedsiębiorczość, Wolters Kluwer Polska, Warszawa.
19. Hołub-Iwan J., Perenc J. (2011), Innowacje w rozwijaniu konkurencyjności firm. Znaczenie, wsparcie, przykłady zastosowań, C. H. Beck, Warszawa.

Result of average student's workload

Activity	Time (working hours)
1. Participation in classes	30
2. Studies of the literature	15
3. Preparation for the test	15

Student's workload

Source of workload	hours	ECTS
Total workload	60	2
Contact hours	30	1
Practical activities	30	1