

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Fizyka E5**
 Name in English: **Physics E5**
 Main field of study (if applicable): **Control Engineering and Robotics**
 Specialization (if applicable):
 Level and form of studies: **1st level, full-time**
 Kind of subject: **obligatory / university-wide**
 Subject code: **FZP003067**
 Group of courses: **NO**

| | Lecture | Classes | Laboratory | Project | Seminar |
|--|-------------|----------------------|------------|---------|---------|
| Number of hours of organized classes in University (ZZU): | 30 | 15 | | | |
| Number of hours of total student workload (CNPS): | 120 | 30 | | | |
| Form of crediting: | examination | crediting with grade | | | |
| For group of courses mark (X) final course: | | | | | |
| Number of ECTS points: | 4 | 1 | | | |
| including number of ECTS points for practical (P) classes : | | 1 | | | |
| including number of ECTS points for direct teacher-student contact (BK) classes: | 2.80 | 0.70 | | | |

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. General knowledge and skills in Mathematics and Physics at a secondary school graduation level.

SUBJECT OBJECTIVES

- C1. Acquiring a basic knowledge, taking into account application aspects, of the following sections of the Classical Physics: Classical mechanics Oscillations and wave motion Thermodynamics
- C2. Acquiring basic skills to qualitative and quantitative understanding/interpretation of the selected phenomena/processes related to the sections of Physics specified above.
- C3. Gaining and strengthening social skills including creative thinking and acting, defining clearly priorities leading to the realization of tasks.

SUBJECT EDUCATIONAL EFFECTS*relating to knowledge:*

- PEK_W01 Student has basic knowledge in classical mechanics, oscillations and wave motion, thermodynamics
- PEK_W02 Student knows the relationship of mathematics and physics with selected branches of engineering

relating to skills:

- PEK_U01 Student is able to apply correctly and efficiently the learned principles and laws of physics to analyze qualitatively and quantitatively selected aspects of engineering
- PEK_U02 Student is able to integrate the information, to interpret, to draw conclusions and to formulate and justify opinions

relating to social competences:

- PEK_K01 Student has skills to critical and objective analysis of the acquired information and rational justification of his/her own point of view, using the knowledge of physics

PROGRAMME CONTENT

| Form of classes - lecture | | Number of hours: |
|---------------------------|--|------------------|
| Lec 1 | Organization and rules of the course. The methodology of physics, fundamental interactions | 2 |
| Lec 2 | Kinetics of Particles | 2 |
| Lec 3 | Newton's Laws of Motion | 2 |
| Lec 4 | Applications of the Newton's Laws of Motion | 2 |
| Lec 5 | Work and energy. The mechanical energy conservation law | 2 |
| Lec 6 | Systems of particles | 2 |
| Lec 7 | Dynamics of rigid bodies. | 2 |
| Lec 8 | Linear and angular momentum conservation laws. | 2 |
| Lec 9 | Gravitation | 2 |
| Lec 10 | Fluid mechanics | 2 |
| Lec 11 | Periodic motion | 2 |
| Lec 12 | Wave motion | 2 |
| Lec 13 | Introduction to thermodynamics | 2 |
| Lec 14 | Ideal gas | 2 |
| Lec 15 | Elements of statistical physics | 2 |
| Total hours: | | 30 |

| Form of classes - class | | Number of hours: |
|-------------------------|---|------------------|
| Cl 1 | Organization and rules. Solving exercises related to the dimensional analysis and estimating values of physical quantities | 2 |
| Cl 2 | Application of the Newton's laws. Determination of the time dependence of the kinematic and dynamic quantities in inertial and non-inertial reference frames | 3 |
| Cl 3 | Practice in solving the selected problems using concepts of the mechanical work, the kinetic energy, the potential energy and the conservation law of the mechanical energy | 2 |
| Cl 4 | Quantitative and qualitative analysis of selected problems using the concept of center of mass and the momentum conservation law in the application of the system of material points, elastic and inelastic collisions | 2 |
| Cl 5 | Solving problems referring to the kinematics and dynamics of the circular motion of the rigid body and the conservation law of the angular momentum | 2 |
| Cl 6 | The qualitative and quantitative analysis of the selected topics of the gravitational field concerning: a) determination of the gravitational forces, the field intensity, the gravitational energy and the potential; b) motion in the gravitational field using conservation and Kepler's laws | 1 |
| Cl 7 | Analysis and solving problems related to the dynamic of periodic motion: simple harmonic (various pendulums, particles executing small oscillations around a stable equilibrium position), damped, forced and mechanical resonance. Solving problems related to the thermodynamics of an ideal gas. | 2 |
| Cl 8 | Written test | 1 |
| Total hours: | | 15 |

TEACHING TOOLS USED

- N1. Traditional lectures, multimedia presentations and demonstrations
- N2. Exercise classes – solving exercises and discussions, written tests
- N3. Self-education: preparation for exercises and exam
- N4. Consultations

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

| Evaluation <small>F – forming (during semester) P – concluding (at semester end)</small> | Educational effect number | Way of evaluating educational effect achievement |
|---|-------------------------------|--|
| F1(W) | PEK_W01 PEK_W02 | Examination |
| P(W) | P=F1 | |
| F1(C) | PEK_U01 PEK_U02 PEK_K01 | Oral answers |
| F2(C) | PEK_U01 PEK_U02 PEK_K01 | Discussions |
| F3(C) | PEK_U01 PEK_U02 PEK_K01 | Written tests |
| P(C) | P=0,2F1+0,1F2+0,7F3 | |

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| PRIMARY AND SECONDARY LITERATURE |
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| PRIMARY LITERATURE: |
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| <p>[1] D. Halliday, R. Resnick, J. Walker, Podstawy fizyki, tomy 1.2., Wydawnictwo Naukowe PWN, Warszawa 2003; J. Walker, Podstawy fizyki. Zbiór zadań, PWN, Warszawa 2005 i 2011.</p> <p>[2] W. Salejda, Fizyka a postęp cywilizacyjny (45,35 MB), Metodologia fizyki (1,1MB); opracowania dostępne, w zakładce Jednolite kursy fizyki, na stronie http://www.if.pwr.wroc.pl/index.php?menu=studia&left_menu=jkf</p> |
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| SECONDARY LITERATURE: |
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| <p>[1] R.P. Feynman, R.B. Leighton, M. Sanda, Feynmana wykłady z Fizyki, tom I część 1 i 2, PWN, Warszawa 1971.</p> <p>[2] J. Orear, Fizyka, tom 1. i 2., WNT, Warszawa 2008.</p> <p>[3] K. Sierański, K. Jezierski, B. Kołodka, Wzory i prawa z objaśnieniami, cz. 1. i 2., Oficyna Wydawnicza SCRIPTA, Wrocław 2005; K. Sierański, J. Szatkowski, Wzory i prawa z objaśnieniami, cz. 3., Oficyna Wydawnicza SCRIPTA, Wrocław 2008.</p> <p>[4] Witryna dydaktyczna Instytutu Fizyki PWR w zakładce Jednolite kursy fizyki znajdują się zalecane e-materiał dydaktyczne.</p> |
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| SUBJECT SUPERVISOR |
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| MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT FZP003067 - Physics E5 AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY Control Engineering and Robotics | | | | |
|---|---|--------------------|--|----------------------|
| Subject educational effect | Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable) | Subject objectives | Programme content | Teaching tool number |
| PEK_W01 | K1AiR_W06 | C.1 | Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14 Lec15 | N.1 N.3 N.4 |
| PEK_W02 | K1AiR_W06 | C.1 | Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14 Lec15 | N.1 N.3 N.4 |
| PEK_U01 | K1AiR_U04 | C.2 | CI1 CI2 CI3 CI4 CI5 CI6 CI7 CI8 | N.2 N.3 N.4 |
| PEK_U02 | K1AiR_U04 | C.2 | CI1 CI2 CI3 CI4 CI5 CI6 CI7 CI8 | N.2 N.3 N.4 |
| PEK_K01 | K1AiR_K04 | C.3 | Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14 Lec15 CI1 CI2 CI3 CI4 CI5 CI6 CI7 CI8 | N.2 N.3 N.4 |