**COURSE GUIDE**

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|---|---|
| Subject name | **Physics II** |
| Course of study | **Quality and Production Management** |
| The form of study | **Full-time** |
| Level of qualification | **First** |
| Year | **I** |
| Semester | **II** |
| The implementing entity | **Department of Physics, Faculty of Production Engineering and Materials Technology** |
| The person responsible for preparing | **dr inż. Marcin Jarosik** |
| Profile | **General academic** |
| ECTS points | **3** |

**TYPE OF TEACHNING – NUMBER OF HOURS PER SEMESTER**

| LACTURE | CLASS | LABORATORY | PROJECT | SEMINAR |
|---|---|---|---|---|
| **15** | | **15** | | |

**COURSE AIMS**

C1. Expanding the knowledge and complementing of physics phenomena and the laws governing these phenomena.
C2. Understanding of the laws of physics in the word of modern technology.
C3. Mastering and complementing the skills of measuring and analyzing physical phenomena and solving technological problems based on the laws of physics.

**ENTRY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES**

1. Basic knowledge of physics laws.
2. Knowledge of the mathematics at the level of secondary school.
3. Ability to draw up written reports of laboratory experiments.
4. Ability to work in a group.

**LEARNING OUTCOMES**

EU1. student has knowledge of the achievements and prospects of modern physics in the field of optics, electricity and magnetism.
EU2. student acquired knowledge of physical phenomena and the laws governing them in the field of optics, electricity and magnetism.
EU3. student has the ability to collect, analyze and elaborate measurement data.
EU4. student is able to interpret the obtained results and present them in a report.

**COURSE CONTENT**

| Type of teaching – LECTURE | Number of hours |
|---|---|
| W1. Diffraction and interference. | 1 |
| W2. Spectroscopy. Light pipe. | 1 |
| W3. Coherence. Generation of coherent light - LASER. | 1 |
| W4. Polarization of light. Birefringence. | 1 |
| W5. Twisting of the plane of polarization and its analytical relevance. | 1 |
| W6. Electrostatics - electric charge, Coulomb's law. | 1 |
| W7. The electric field. The electric potential. | 1 |
| W8. The electric current. | 1 |
| W9. Conductors and insulators. | 1 |
| W10. Magnetic forces associated with the current flow. | 1 |
| W11. Magnetic Field. | 1 |

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| W12. Movement of the conductor in a magnetic field. | 1 |
| W13,W14. Magnetic properties of the materials. | 1 |
| W15. Achievements of Polish physicists in recent years. | 1 |
| **Type of teaching – LABORATORY** | **Number of hours** |
| L1. Introduction to laboratory classes; choosing of the experiments to carry out by each student; calculation of measuring error. | 1 |
| L2-L7. Students carry out 6 experiments selected from dozens which are placed in the following laboratories of the Institute of Physics:<br>- laboratory of mechanics and heat,<br>- laboratory of electricity and magnetism,<br>- laboratory of optics. | 12 |
| L 8 Getting a pass/fail of the laboratory classes; the possibility to make an experiment for student who was absent for justified reasons. | 2 |

**TEACHNING TOOLS**

1. Lecture with the use of audiovisual media.
2. Sets for demonstrations of physics experiments.
3. Sets of laboratory experiments which are placed at Institute of Physics.
4. Instructions (manuals) for laboratory experiments.

**WAYS OF ASSESSMENT (F – FORMATIVE, P – SUMMATIVE)**

F1. Assessment of individual preparation to laboratory classes.
F1. Assessment of final report of individual laboratory experiments.
P1. Averaged assessment of preparation for laboratory classes and for the final reports of each experiment carried out.

**STUDENT WORKLOAD**

| **Form of activity** | | **Average number of hours for realization of the activity** | | |
|---|---|---|---|---|
| | | [h] | ECTS | ECTS |
| Contact hours with the teacher | Lecture | 15 | 0.6 | 1.0 |
| Preparing to classes | | 10 | 0.4 | |
| Contact hours with the teacher | Laboratory | 15 | 0.6 | 1.2 |
| Preparing to Laboratory | | 15 | 0.6 | |
| Getting acquainted with the indicated literature | | 15 | 0.6 | 0.6 |
| Consultation | | 5 | 0.2 | 0.2 |
| **TOTAL NUMBER OF HOURS / ECTS CREDITS FOR THE COURSE** | | **75** | **3** | |

**BASIC AND SUPPLEMENTARY RESOURCE MATERIALS**

**Basic resources**

1. Wybourne B. Physics as a Journey. Wydaw. Uniwersytetu Mikołaja Kopernika, Toruń, 1998.
2. Serway R.A., Jewett J.W.Jr. Physics: For Scientists and Engineers. 6th edition. Brooks/Cole Publishing Co.,2004.
3. Ling S.J., Sanny J., Moebs W. University Physics Vol.1-2. OpenStax, Rice University 2016. http://cnx.org/content/col12031/1.10
4. Lech J. Opracowanie wyników pomiarów w pierwszej pracowni fizycznej. Wyd. Polit. Częstochow., 1997.

**Supplementary resources**

1. Jarosik M., Szczęśniak R., Durajski A., Kalaga J., Leoński W. Influence of External Extrusion on Stability of Hydrogen Molecule and its Chaotic Behavior. Chaos 28, 013126 (2018), https://doi.org/10.1063/1.5008986.

2. Wrona I.A., Jarosik M.W., Szczęśniak R., Szewczyk K.A., Stala M.K., Leoński W. Interaction of the hydrogen molecule with the environment: stability of the system. arXiv:1902.10520 2019, https://arxiv.org/pdf/1902.10520.
3. Sodolski H. Selected Problems in Physics. Wydaw. Politechniki Gdańskiej, Gdańsk, 1996.
4. Zubek M. Experiments in Physics: First Laboratory for Students. Wydaw. Politechniki Gdańskiej, 1996.
5. Dziliński K., Wysłocki J. Solid State Physics in Modern Materials Research: PHYSICS 2010. Wydaw. Wydz. Inżynierii Procesowej, Materiałowej i Fizyki Stosowanej PCz, 2010.

**TEACHERS (NAME, SURNAME, E-MAIL, ADDRESS)**

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**MATRIX OF LEARNING OUTCOMES REALISATION**

| Learning outcome | Reference of given outcome to outcomes defined for whole program (PRK) | Course aims | Course content | Teachning tools | Ways of assessment |
|---|---|---|---|---|---|
| **EU1** | K_W01 | C1 | W1, W6-W8, W10-W12 | 1, 2 | F1, P1 |
| **EU2** | K_W01 | C2 | W2-W5, W9, W13-W15 | 1, 2 | F1, P1 |
| **EU3** | K_U01, K_U02, K_U04, K_U07, K_U08, K_U09, K_U10 | C3 | L1-L8 | 3, 4 | F1, P1 |
| **EU4** | K_U04, K_U05, K_U09 | C3 | L1-L8 | 3, 4 | F2, P1 |

**FORM OF ASSESSMENT - DETAILS**

| | grade 2 | grade 3 | grade 4 | grade 5 |
|---|---|---|---|---|
| **EU1** | Student does not possess knowledge of the achievements and prospects of modern physics in the field of optics, electricity and magnetism. | Student possesses poor knowledge of the achievements and prospects of modern physics in the field of optics, electricity and magnetism. | Student possesses systematic knowledge of the achievements and prospects of modern physics in the field of optics, electricity and magnetism. | student possesses systematic and wide knowledge of the achievements and prospects of modern physics in the field of optics, electricity and magnetism. |
| **EU2** | Student did not acquire knowledge of physical phenomena and the laws governing them in the field of optics, electricity and magnetism. | Student acquired partial knowledge of physical phenomena and the laws governing them in the field of optics, electricity and magnetism. | Student acquired knowledge of physical phenomena and the laws governing them in the field of optics, electricity and magnetism. | Student acquired advanced knowledge of physical phenomena and the laws governing them in the field of optics, electricity and magnetism. |
| **EU3** | Student has not the ability to collect, analyze and elaborate | Student has the limited ability to collect, analyze and elaborate | Student has the fair ability to collect, analyze and elaborate | Student has the advanced ability to collect, analyze and elaborate measurement data. |

| | | | | |
|---|---|---|---|---|
| | measurement dat.a | measurement data. | measurement data. | |
| **EU4** | Student is unable to interpret the obtained results and present them in a report. | Student in some cases is able to solve interpret the obtained results and present them in a report. | Student in most cases is able to interpret the obtained results and present them in a report. | Student in all cases is able to interpret the obtained results and present them in a report. |

**ADDITIONAL USEFUL INFORMATION ABOUT THE COURSE**

1. Information where presentation of classes, instruction, subjects of seminars can be found, etc. - presented to students during first classes, if required by the formula classes are sent electronically to the e-mail addresses of individual dean groups.
2. Information about the place of classes - Information can be found on the website of the Faculty of Management.
3. Information about the timing of classes (day of the week / time) - Information can be found on the website of the Faculty of Management.
4. Information about the consultation (time + place) - Information can be found on the website of the Faculty of Production Engineering and Materials Technology