

**DEPARTMENT OF MATERIALS SCIENCE AND TECHNOLOGY**  
**COURSE SYLLABUS**

| Course Details                        |  |          |                 |                     |
|---------------------------------------|--|----------|-----------------|---------------------|
| <b>Code</b>                           | <b>Academic Year</b>   |          |                 | <b>Semester</b>     |
| PHY112                                | 1  |          |                 | 1                   |
| <b>Title</b>                          | <b>T</b>   | <b>A</b> | <b>L</b>        | <b>ECTS</b>         |
| Physics II                            | 2  | 1        | 2               | 6                   |
| <b>Language</b>                       | German   |          |                 |                     |
| <b>Level</b>                          | <b>Undergraduate</b>   | X        | <b>Graduate</b> | <b>Postgraduate</b> |
| <b>Department / Program</b>           | Materials Science and Technology   |          |                 |                     |
| <b>Forms of Teaching and Learning</b> | Face to face   |          |                 |                     |
| <b>Course Type</b>                    | <b>Compulsory</b>  | X        | <b>Elective</b> |                     |
| <b>Objectives</b>                     | The students have gained knowledge and understanding of the most important phenomena of electrodynamics and optics and can explain and interpret them. They can transfer the knowledge to related phenomena and bring it into connection with everyday and current phenomena. The students are also familiar with the methods of experimental physics and relevant mathematical tools and can use them to solve scientific questions.  |          |                 |                     |
| <b>Content</b>                        | Electrostatics (field, flux, potential, Gaussian theorem, capacity), currents (resistance, Ohm's law, Kirchhoff's rules), magnetostatics (Lorentz force, Amperes law), electrostatics and magnetostatics in the medium (dielectricity, diamond agitation, paramagnetism), induction and alternating currents (Faraday's law of induction, resonant circuits, complex resistors), electromagnetic fields and Maxwell's equations (Hertzian dipole, electromagnetic waves), electrical conduction processes (liquids, gases, solids), geometric optics, optical instruments (refraction law, lens equation), wave optics (interference, diffraction ), Dispersion, polarization, coherence |          |                 |                     |
| <b>Prerequisites</b>                  |  |          |                 |                     |
| <b>Coordinator</b>                    | None   |          |                 |                     |
| <b>Lecturer(s)</b>                    | Asist Prof.Dr. Neşe Aral   |          |                 |                     |
| <b>Assistant(s)</b>                   | None   |          |                 |                     |
| <b>Work Placement</b>                 | No   |          |                 |                     |
| Recommended or Required Reading       |  |          |                 |                     |
| <b>Books / Lecture Notes</b>          | Demtröder, Wolfgang: Experimentalphysik 2: Elektrodynamik und Optik, Springer  |          |                 |                     |
| <b>Other Sources</b>                  | <ul style="list-style-type: none"> <li>• Demtröder, Wolfgang: Experimentalphysik 2: Elektrodynamik und Optik, Springer</li> <li>• Meschede, Dieter: Gerthsen Physik, Springer</li> <li>• Staudt, Günter: Experimentalphysik, Teil 2, Wiley-VCH</li> </ul>  |          |                 |                     |
| Additional Course Material            |  |          |                 |                     |
| <b>Documents</b>                      |  |          |                 |                     |
| <b>Assignments</b>                    |  |          |                 |                     |
| <b>Exams</b>                          |  |          |                 |                     |

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| Course Composition                 |  |  |                   |
|------------------------------------|--|--|-------------------|
| Mathematics und Basic Sciences     |  |  | 80%               |
| Engineering                        |  |  | 10%               |
| Engineering Design                 |  |  | %                 |
| Social Sciences                    |  |  | %                 |
| Educational Sciences               |  |  | %                 |
| Natural Sciences                   |  |  | 10%               |
| Health Sciences                    |  |  | %                 |
| Expert Knowledge                   |  |  | %                 |
| Assessment                         |  |  |                   |
| Activity                           | Count  |  | Percentage (%)    |
| Midterm Exam                       | 1  |  | 20                |
| Quiz                               | 2  |  | 10                |
| Assignments                        | 2  |  | 10                |
| Attendance                         |  |  |                   |
| Recitations                        | 0  |  | 20                |
| Projects                           |  |  |                   |
| Final Exam                         | 1  |  | 40                |
|                                    |  | <b>Total</b>                                 | <b>100</b>        |
| ECTS Points and Work Load          |  |  |                   |
| Activity                           | Count  | Duration                                     | Work Load (Hours) |
| Lectures                           | 14   | 3  | 42                |
| Self-Study                         | 14   | 5  | 70                |
| Assignments                        | 2  | 10   | 20                |
| Presentation / Seminar Preparation |  |  |                   |
| Midterm Exam                       | 1  | 3  | 3                 |
| Recitations                        |  |  |                   |
| Laboratory                         | 10   | 3  | 30                |
| Projects                           |  |  |                   |
| Final Exam                         | 1  | 3  | 3                 |
|                                    |  | <b>Total Work Load</b>                       | <b>168</b>        |
|                                    |  | <b>ECTS Points (Total Work Load / Hours)</b> | <b>6</b>          |
| Learning Outcomes                  |  |  |                   |
| 1                                  | Having a theoretical understanding of electric and magnetic fields and being able to solve practical problems. |  |                   |
| 2                                  | Being able to model and solve problems in engineering and advanced physics applications.                       |  |                   |

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|    |   |
|----|---|
| 3  | Being able to find relations of electric and magnetic field concepts with other science disciplines and with the environment. |
| 4  |   |
| 5  |   |
| 6  |   |
| 7  |   |
| 8  |   |
| 9  |   |
| 10 |   |
| 11 |   |
| 12 |   |

**Weekly Content**

|    |   |
|----|---|
| 1  | Electrical charge, electrostatics                             |
| 2  | Coulomb's Law, Electrical Field                               |
| 3  | Gauss Law   |
| 4  | Voltage, Electric potential                                   |
| 5  | Capacitors, Dielectrics                                       |
| 6  | Electrical current, resistors, Ohm's Law, Electromotive force |
| 7  | Direct current ciurcuits, Kirchhoff's Law                     |
| 8  | Magnetic field, Magnetic Forces                               |
| 9  | Sources of magnetic field                                     |
| 10 | Electromagnetic induction, Faraday's Law                      |
| 11 | Inductivity   |
| 12 | Alternating current circuits (RLC)                            |
| 13 | Electromagnetic waves   |
| 14 |   |
| 15 |   |

**Contribution of Learning Outcomes to Program Objectives (1-5)**

|   | P1 | P2 | P3 | P4 | P5 | P6 | P7 |
|---|----|----|----|----|----|----|----|
| 1 | 5  | 5  |    | 4  |    | 5  |    |
| 2 | 5  | 5  |    | 4  |    | 5  |    |
| 3 | 5  | 5  |    | 4  |    | 5  |    |
| 4 | 5  | 5  |    | 4  |    | 5  |    |
| 5 |    |    |    |    |    |    |    |
| 6 |    |    |    |    |    |    |    |



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|                             |   |  |  |  |  |  |  |
|-----------------------------|---|--|--|--|--|--|--|
| 7                           |   |  |  |  |  |  |  |
| 8                           |   |  |  |  |  |  |  |
| 9                           |   |  |  |  |  |  |  |
| 10                          |   |  |  |  |  |  |  |
| 11                          |   |  |  |  |  |  |  |
| 12                          |   |  |  |  |  |  |  |
| <b>Contribution Level</b>   | 1: Low 2: Low-intermediate 3: Intermediate 4: High 5: Very High |  |  |  |  |  |  |
| <b>Compiled by:</b>         |   |  |  |  |  |  |  |
| <b>Date of Compilation:</b> |   |  |  |  |  |  |  |