| **Faculty of Electrical Engineering** | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Field of study** | Electrical and Electronic Engineering | | | | | | | **Degree level and programme type** | bachelor’s degree | |
| **Specialization / diploma path** | **-** | | | | | | | **Study profile** |  | |
| **Course name** | Electromagnetism – Engineering Physics | | | | | | | **Course code** | IS-FEE-10046W | |
| **Course type** | elective | |
| **Forms and number of hours of tuition** | **L** | **C** | **LC** | **P** | **SW** | **FW** | **S** | **Semester** | winter | |
| 15 | 0 | 0 | 0 | 15 | 0 | 0 | **No. of ECTS credits** | 2 | |
| **Entry requirements** |  | | | | | | | | | |
| **Course objectives** | To acquaint students with chosen electromagnetic phenomena. To show students mathematical formulation of the electromagnetic field theory, inc. vector calculus. | | | | | | | | | |
| **Course content** | Lecture:  Assumptions of electromagnetic field (EM) theory, Electrostatics (Coulomb’s law, electrostatic field). Magnetostatics (Ampère’s law, magnetostatic field). Currents and conductors: current distributions, continuity of current, static electroconductive field, power losses. Electromagnetic potentials. Interface conditions. Maxwell’s macroscopic equations, the energy theorem. Electrodynamics (equation of continuity for electric chargé, displacement current, electromotive force, Faraday’s law of induction). Electromagnetic field: equations, power and the Poynting vector, conditions of continuity, interactions between the EM waves and materials. Electric polarisation and displacement, electric multipole moments, magnetisation, energy.  Specialization workshop:  Solving selected issues related to electrostatic, magnetostatics and current flow problems. The examples are solved using some computer applications and numerical methods. Analysis of some examples. Interpretation of results (analysis of field phenomena). | | | | | | | | | |
| **Teaching methods** | understands and knows the mathematical formulation of the EM field theory | | | | | | | | | |
| **Assessment method** | lecture – final written test (at least 50% of points are necessary to pass);  workshop – written reports and tests | | | | | | | | | |
| **Symbol of learning outcome** | **Learning outcomes** | | | | | | | | **Reference to the learning outcomes for the field of study** | |
| **LO1** | understands and knows the mathematical formulation of the EM field theory | | | | | | | |  | |
| **LO2** | is able to explain some field phenomena | | | | | | | |  | |
| **LO3** | understands the principles of EM field, including some practical aspects (e.g. positive and spurious effects) | | | | | | | |  | |
| **LO4** | explain some principles of EM field | | | | | | | |  | |
| **Symbol of learning outcome** | **Methods of assessing the learning outcomes** | | | | | | | | **Type of tuition during which the outcome is assessed** | |
| **LO1** | test, evaluation of students’ reports and written tests | | | | | | | | L, SW | |
| **LO2** | test, evaluation of students’ reports and written tests | | | | | | | | L, SW | |
| **LO3** | test, evaluation of students’ reports and written tests | | | | | | | | L, SW | |
| **LO4** | test, evaluation of students’ reports and written tests | | | | | | | | L, SW | |
| **Student workload (in hours)** | | | | | | | | | **No. of hours** | |
| **Calculation** | lecture attendance | | | | | | | | 15 | |
| preparation for workshops | | | | | | | | 10 | |
| participation in workshops | | | | | | | | 15 | |
| work on reports from workshop classes and/or work on home assignments | | | | | | | | 7 | |
| participation in student-teacher sessions related to lectures and workshops | | | | | | | | 3 | |
| preparation for and attendance at the final test from lectures | | | | | | | | 10 | |
| **TOTAL:** | | | | | | | | 60 | |
| **Quantative indicators** | | | | | | | | | **Hours** | **No. of ECTS credits** |
| **Student workload – activities that require direct teacher participation** | | | | | | | | | 30 | 1.0 |
| **Student workload – practical activities** | | | | | | | | | 32 | 1.5 |
| **Basic references** | 1. Lehner G.: Electromagnetic field theory for engineers and physicists. Springer, New York 2010. 2. Brandao Faria J. A.: Electromagnetic foundations of electrical engineering. J. Wiley & Sons, Chichester 2008. 3. Griffiths D.: Introduction to Electrodynamics. Cambridge University Press, Cambridge 2017. 4. Guru B.S., Hiziroglu H.: Electromagnetic field theory fundamentals. Cambridge, 2009. 5. Orfanidis S. J.: Electromagnetic waves and antennas. Rudgers University, online version. | | | | | | | | | |
| **Supplementary references** | 1. Morgenthaler F. R.: The power and beauty of electromagnetic fields. J. Wiley & Sons, Hoboken 2011. 2. Stratton J. A.: Electromagnetic theory. J. Wiley & Sons, New York 2007. 3. Bhag G. S., Hiziroglu H. R.: Electromagnetic field theory fundamentals. 4. Morgenthaler F.R.: The power and beauty of electromagnetic fields. J. Wiley & Sons, 2011. | | | | | | | | | |
| **Organisational unit conducting the course** | Department of Electrotechnics, Power Electronics and Power Engineering | | | | | | | | **Date of issuing the programme** | |
| **Author of the programme** | Boguslaw Butrylo, D.Sc., Ph.D., Assoc. Prof. | | | | | | | | 2023-02-05 | |