COURSE DESCRIPTION CARD - SYLLABUS

Course name

Electromagnetic Field Theory

Course

Field of study

Electrical Engineering

Year/Semester

2/3

Area of study (specialization)

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

polish

Form of study

part-time

Requirements

compulsory

Number of hours

Lecture

20

Laboratory classes

10

Other (e.g. online)

Tutorials

10

Projects/seminars

Number of credit points

5

Lecturers

Responsible for the course/lecturer:

dr inż. Krzysztof Budnik

email: krzysztof.budnik@put.poznan.pl

tel. 61 665 28 38

Wydział Automatyki, Robotyki i Elektrotechniki

ul .Piotrowo 3a, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

The student starting the course should have basic knowledge in mathematics (integral and differential calculus, vector analysis), physics and electrical engineering. He should also be aware of the need to expand his knowledge, understand the need for cooperation within the group.

Course objective

Understanding the physical quantities and laws of the electromagnetic field. Understanding the analytical methods used to calculate the parameters of the electromagnetic field.

Course-related learning outcomes

Knowledge

should be able to formulate the basic laws of electromagnetism, distinguish quantities describing the electromagnetic field, recognize material properties in relation to various types of electromagnetic fields.

Skills

will be able to use Maxwell's laws describing the electromagnetic field, define the quantities describing the electromagnetic field, use material properties when selecting device components.

Social competences

ability to work in a group, readiness to comply with the principles of teamwork, attention to raising own competences .

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:

- assessment of knowledge and skills demonstrated during the written exam of a problem nature.

Auditorium exercises:

- tests and colloquia in written form,

- rewarding with ongoing activity and creativity in solving given tasks.

Laboratory exercises:

- test and rewarding of knowledge necessary to implement the problems posed in a given area of laboratory tasks,

- continuous assessment, during each class,

- rewarding the increase in the ability to use known, principles and methods,

- assessment of knowledge and skills related to the implementation of the exercise task, evaluation of the report of the exercise,

- rewarding cooperation skills within a team that practically performs a specific task in a laboratory,

- rewarding aesthetic diligence of prepared reports and tasks within self-study

Programme content

Lecture:

Long lines theory. Electromagnetic field (physical def.). Lorentz's strength. Electrostatic field. DC flow field. Magnetic field of direct currents. Energy and forces in a charged body system. Energy and forces in a current circuit. Electromagnetic field changing over time. Quasi-stationarity condition. The law of

electromagnetic induction. Maxwell's equations. Electrodynamic potentials. Electromagnetic waves. Harmonic fields in conductor, lossy and perfect dielectric. Energy stream, Poynting vector. Radiation. Hertz's dipole.

Auditorium exercises:

Determination of basic quantities describing the electrostatic field, direct current flow field, DC magnetic field. Determination of capacitance of capacitors. Mutual inductance. The law of electromagnetic induction. Analysis of circuits with distributed parameters.

Laboratory exercises:

Implementation of exercises on the subject of:

- power line model,
- branched magnetic circuits,
- magnetic circuits with an air break,
- circuits with resistive unilateral circuits.

Teaching methods

1. Lecture: classic lecture with examples at the board.

2. Blackboard exercises: solving problem tasks at the blackboard.

3. Laboratory exercises: Experimental verification of the laws of electromagnetism through the implementation of practical exercises in research positions.

Bibliography

Basic

1. Krakowski M.: Elektrotechnika teoretyczna. Tom 1, PWN, Warszawa 1995.

2. Krakowski M.: Elektrotechnika teoretyczna. Tom 2, PWN, Warszawa 1995.

3. Kozłowski J., Machczyński W.: Podstawy elektromagnetyzmu, Wydawnictwo Politechniki Poznańskiej, Poznań 1996.

4. Kozłowski J., Machczyński W.: Zadania z podstaw elektromagnetyzmu, Wydawnictwo Politechniki Poznańskiej, Poznań 1997.

5. Chmielewski A., Poltz J.: Zbiór zadań z teorii pola elektromagnetycznego, Wydawnictwo Politechniki Poznańskiej, Poznań 1992.

6. Frąckowiak J., Nawrowski R., Zielińska M.: Podstawy elektrotechniki. Laboratorium, Wydawnictwo Politechniki Poznańskiej,Poznań 2011.

Additional

1. Guru B. S., Hiziroglu H. R.: Electromagnetic field theory fundamentals, PWS Publishing Company, Boston 1998.

2. Bolkowski S.: Teoria obwodów elektrycznych, WNT, Warszawa 1998.

3. Czarnywojtek P., Kozłowski J., Machczyński W.: Elektromagnetyzm, Wydawnictwo PWSZ Kalisz, Kalisz 2011.

4. Czarnywojtek P., Kozłowski J., Machczyński W.: Zbiór zadań z elektromagnetyzmu, Skrypt Wyd. PWSZ Kalisz, Kalisz 2009.

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,0
Classes requiring direct contact with the teacher	50	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam) [1]	75	3,0

[1] delete or add other activities as appropriate