STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Electromagnetic Field Theory	**1010324331010323393**

Field of study	Profile of study (general academic, practical)	Year /Semester
Electrical Engineering	**general academic**	**2 / 3**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
First-cycle studies	**part-time**

No. of hours	No. of credits
Lecture: **20** Classes: **10** Laboratory: **10** Project/seminars: **-**	**6**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
other	**university-wide**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**100 6%**
Technical sciences	**100 6%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of physics, mathematics and electrical engineering.
2	**Skills**	Differential and integral calculus, vector analysis, fundamentals of electromagnetism, basic electrical circuit theory.
3	**Social competencies**	The students is aware of the need to expand their knowledge and to understand the need for collaboration within the group.

Assumptions and objectives of the course:

Understanding the physical quantities and laws of the electromagnetic field in forms integral. Knowledge of analytical methods for calculating fields.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Should be able to formulate the basic laws of electromagnetism, to distinguish the size of describing the electromagnetic field, identify the material properties for various types of electromagnetic fields. - [K_W01+, K_W06+++]
2. Should be able to identify the status of the long line, its properties, parameters and calculate the level of voltages and currents depending on the signal propagation. - [K_W04++]

Skills:

1. Can use Maxwell - [K_U05++, K_U10+]
2. Can interpret the states of the long line, its properties, parameters, calculate the values of voltages and currents depending on the signal propagation. - [K_U02++, K_U10++]

Social competencies:

1. Ability to work in a team, willingness to comply with the principles of teamwork, attention to improving their own competence. - [K_K02+, K_K03++]

Assessment methods of study outcomes

Lecture:

- assess the knowledge and skills listed on the written exam of a problematic.

Exercises auditorium:

- tests and tests in writing (colloquia: 7, 14 week semester),
- keep rewarding activity and creativity in solving the set tasks.

Laboratory:

- test and favoring knowledge necessary for the accomplishment of problems in the area of laboratory tasks,
- continuous evaluation for each course - rewarding gain skills they met the principles and methods
- assessment of knowledge and skills related to the implementation of the tasks your practice, the assessment report performed exercise
- rewarding ability to work in a team practice performing the task detailed in the laboratory,
- developed aesthetic rewarding diligence reports and tasks within their own learning.

Course description

The theory of long lines. Electromagnetic field (physical definition). Loretnz force. The electrostatic field. Current flow field. The magnetostatic field. Energy and power in the system of charged bodies. Energy and power circuits in the system. The electromagnetic field varying in time. Quasi-stationary condition. The law of electromagnetic induction. Maxwell's equations. Electrodynamic potentials. Electromagnetic waves. Harmonic field in the electrical conductive, lossy and perfect dielectric. Energy flux, Poynting vector. Radiation. Hertz dipole.

Applied methods of education:

The lecture with multimedia presentation, including drawings, photographs, animations, films, supplemented with examples given on the whiteboard, taking into account various aspects of the presented issues, including: economic, ecological, legal, social and practical examples known to students in everyday life, presentation of material in association with other objects.

Exercises - solving sample tasks on the board, initiating discussion about solutions,

Laboratory - instructors detailed review of the reports and discussions about comments, demonstrations, work in teams.

Basic bibliography:

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 bibliography:

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, Wydawnictwo PWSZ Kalisz, Kalisz 2009.

Result of average student's workload

Activity	Time (working hours)
1. participation in class lectures	20
2. participated in exercises auditorium	10
3. participation in laboratory classes	10
4. preparation and development of laboratory reports	22
5. participate in the consultations on the lecture and exercise	14
6. exam preparation	34
7. participation in the exam	4
8. preparation for colloquia	30
9. participate in the consultations on the lab	7

Student’s workload

Source of workload	hours	ECTS
Total workload	151	6
Contact hours	65	2
Practical activities	39	2