

# Fundamentals of Physics III - Electricity and magnetism - opis przedmiotu

Informacje ogólne	
Nazwa przedmiotu	Fundamentals of Physics III - Electricity and magnetism
Kod przedmiotu	13.2-WF-FizP-FPIII-EM-S16
Wydział	Wydział Nauk Ścisłych i Przyrodniczych
Kierunek	Fizyka
Profil	ogólnoakademicki
Rodzaj studiów	pierwszego stopnia z tyt. licencjata
Semestr rozpoczęcia	semestr zimowy 2019/2020

Informacje o przedmiocie	
Semestr	3
Liczba punktów ECTS do zdobycia	7
Typ przedmiotu	obowiązkowy
Język nauczania	angielski
Sylabus opracował	• prof. dr hab. Wiesław Leoński

Formy zajęć					
Forma zajęć	Liczba godzin w semestrze (stacjonarne)	Liczba godzin w tygodniu (stacjonarne)	Liczba godzin w semestrze (niestacjonarne)	Liczba godzin w tygodniu (niestacjonarne)	Forma zaliczenia
Wykład	30	2	-	-	Egzamin
Ćwiczenia	45	3	-	-	Zaliczenie na ocenę

## Cel przedmiotu

To present the basic concepts of the classical theory of electromagnetism and the expansion of knowledge possessed by the student in the field. Transfer a knowledge in physics enabling for understanding at basic level the phenomena and processes in the classical electric and magnetic systems.

## Wymagania wstępne

Skills in calculus and knowledge of the laws of physics at the high school level, and gained during completed courses.

## Zakres tematyczny

- Basic historical background related to discoveries in the field of electromagnetism

- Basic concepts of electricity, discrete nature of the charge, the principle of charge conservation. The concept of an electric field and electric potential - relationships between them. Electric field lines. Potential energy in electric field. Point charge and electric dipoles - their behavior in the electric field. Coulomb's law, electric flux, Gauss's law, gradient of the field.

- Conductors in electric field, charge distributions in conductors, capacitors, capacity. Connecting of capacitors.

- Dielectrics in an electric field, Faraday's experiment, the polarization of dielectrics, electric susceptibility, polarization, electric displacement, isotropic and anisotropic dielectrics.

- Electricity, the concept of stationarity and homogeneity of current, current and its density, resistance and resistivity, temperature dependence of resistance, Ohm law, superconductivity, the microscopic description of electric current, Kirchhoff law, electromotive force, energy and its conversion in electric circuits, combining of resistors, compensation circuit, measuring current and voltage, electrical RC circuit.

- Basic concepts related to magnetic field, definition of the vector of magnetic field induction, Lorentz force, magnetic dipole and its behavior in the magnetic field.

- Ampere's law, Biot-Savart law, forces acting on a current-carrying conductor in a magnetic field, ampere unit - its definition.

- Faraday's induction law, Lenz's law, inductance, LR circuit, energy of magnetic field.

- Gauss' law for magnetism, magnetic materials (para-, dia- and ferromagnetic) Curie law, magnetic field vector, magnetization, magnetic permeability.

- Displacement current, symmetry of equations of electromagnetism, the concept of divergence and curl and their relationship to macroscopic physical quantities, integral Maxwell equations and their differential counterparts.

## Metody kształcenia

Classical lectures supported by physical demonstrations, classes.

## Efekty uczenia się i metody weryfikacji osiągnięcia efektów uczenia się

Opis efektu	Symbolce efektów	Metody weryfikacji	Forma zajęć
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Opis efektu	Symbol e efektów	Metody weryfikacji	Forma zajęć
The student has a general knowledge of classical and modern physics, physical measurement methods, which allows for understanding of fundamental physical phenomena of the surrounding world and knows the cause-effect relationships	• <a href="#">K1A_W01</a>	• egzamin - ustny, opisowy, testowy i inne	• Wykład
The student has a general knowledge of classical and modern physics, physical measurement methods, which allows for understanding of fundamental physical phenomena of the surrounding world and knows the cause-effect relationships	• <a href="#">K1A_W01</a>	• sprawdzian	• Ćwiczenia
The student understands and can explain physical phenomena and processes using the language of mathematics, can independently reproduce theorems and laws of physics, and selected calculations. Student can create a theoretical model of the phenomenon and find its relationships with the results of measurements	• <a href="#">K1A_W03</a>	• sprawdzian	• Ćwiczenia
The student understands and can explain physical phenomena and processes using the language of mathematics, can independently reproduce theorems and laws of physics, and selected calculations. Student can create a theoretical model of the phenomenon and find its relationships with the results of measurements	• <a href="#">K1A_W03</a>	• egzamin - ustny, opisowy, testowy i inne	• Wykład
The student can analyze and solve physical problems on the basis of his acquired knowledge and information from the available literature sources, online resources (both in Polish and foreign language)	• <a href="#">K1A_U01</a>	• sprawdzian	• Ćwiczenia
The student is able to analyze the theoretical and experimental results and formulate appropriate conclusions on their basis	• <a href="#">K1A_U02</a>	• sprawdzian	• Ćwiczenia
The student is able to describe chosen physical problem and provide possible solutions	• <a href="#">K1A_U05</a>	• sprawdzian	• Ćwiczenia
The student is able to acquire by oneself his knowledge and develop his skills using a variety of sources (in Polish and foreign language) and modern technology	• <a href="#">K1A_U07</a>	• egzamin - ustny, opisowy, testowy i inne	• Wykład
The student recognizes social role of the physics graduate. He especially understands the need for formulating and providing the information and opinions on the achievements of physics to the public. In consequence, he endeavors to provide such information and opinions in a widely understood way	• <a href="#">K1A_K05</a>	• egzamin - ustny, opisowy, testowy i inne	• Wykład

## Warunki zaliczenia

**Lecture** - obtaining a positive assessment of the final exam (written). In addition, there is the opportunity to prepare and present a study on the given topic or practical task.

**Classes** - Positive pass all tests.

Before taking the exam a student must gain positive grade during the class.

**Total score:** a weighted average rating of the exam (70%) and grade from the class (30%).

## Literatura podstawowa

[1] D. Halliday, R. Resnick, J. Walker, *Podstawy fizyki, T. III, Elektryczność i magnetyzm*, Wydawnictwo Naukowe PWN, Warszawa (any edition).

[2] Materials prepared and supplied by lecturer (available in electronic form).

## Literatura uzupełniająca

[1] H. Rawa, *Elektryczność i magnetyzm w technice*, Wydawnictwo Naukowe PWN (any edition).

[2] D. J. Griffiths, *Podstawy elektrodynamiki*, Wydawnictwo Naukowe PWN, (any edition).

## Uwagi

Zmodyfikowane przez dr hab. Piotr Lubiński, prof. UZ (ostatnia modyfikacja: 19-02-2020 17:21)

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