Constitution of matter - course description

General information

Course name	Constitution of matter
Course ID	13.2-WF-FizP-CM-S18
Faculty	Faculty of Physics and Astronomy
Field of study	WFiA - oferta ERASMUS
Education profile	-
Level of studies	Erasmus programme
Beginning semester	winter term 2023/2024

Course information

Semester	1
ECTS credits to win	6
Course type	obligatory
Teaching language	english
Author of syllabus	• dr hab. Piotr Lubiński, prof. UZ

Classes forms

The class form	Hours per semester (full-time)	Hours per week (full-time)	Hours per semester (part-time)	Hours per week (part-time)	Form of assignment
Lecture	30	2	-	-	Exam
Class	30	2	-	-	Credit with grade

Aim of the course

The course is designed to acquaint students with the basic information on the matter constitution within the fields of atomic and molecular physics, nuclear physics, particle physics and astrophysics.

Prerequisites

Knowledge of basic classical and relativistic mechanics, thermodynamics, optics, electricity and magnetism, astronomy.

Scope

1. History of discoveries leading to the modern concepts of matter constitution in atomic physics, molecular physics, nuclear physics, particle physics and astrophysics.
2. Basic properties of atoms.
3. Atomic models: classical and developed within old quantum theory.
4. Atomic transitions and atomic spectra, quantum numbers.
5. Basic properties of molecules.
6. Experimental methods of atomic physics.
7. Basic properties of atomic nuclei.
8. Nuclear interactions.
9. Models of atomic nuclei.
10. Radioactive decays.
11. Basic properties of elementary particles.
12. Experimental methods of high-energy physics.
13. Matter in space: baryonic (including plasma), dark matter, dark energy.

Teaching methods

Formal lecture, classes with exercises.

Learning outcomes and methods of theirs verification

Outcome description	Outcome symbols	Methods of verification	The class form
Student has skills of extending his/her knowledge of physics related to the matter consitution subject.		• a discussion • an exam - oral, descriptive, test and other	• Lecture • Class
Student is able to use various sources of information in order to extend his/her knowledge of the matter constitution.		• a discussion • a test • an exam - oral, descriptive, test and other • an ongoing monitoring during classes	• Lecture • Class
Student is aware of a need of learning and knows possibilities of rising his/her competence.		• a discussion	• Lecture • Class

Outcome description	Outcome symbols	Methods of verification	The class form
Student is able to analyse basic problems in the matter constitution subject.		• a discussion • a test • an exam - oral, descriptive, test and other • an ongoing monitoring during classes	• Lecture • Class
Student understands and is able to explain basic phenomena related to the atomic and nuclear transitions.		• a discussion • an ongoing monitoring during classes	• Lecture • Class
Student knows basic facts related to the constitution of the atoms and atomic nuclei.		• a discussion • a test • an exam - oral, descriptive, test and other • an ongoing monitoring during classes	• Lecture • Class

Assignment conditions

Lecture: Oral or written exam. Assignment condition – a positive grade on exam.
Classes: An active participation in classes, assignment of two tests with calculation exercises.
Before attending the exam student must get a positive grade for classes.
End-of-course grade: weighted mean of the grades on exam (60%) and two tests (20% each).

Recommended reading

[1] D. Halliday, R. Resnick, J. Walker, Fundamentals of Physics, John Wiley & Sons, 2010.

[2] K.S. Krane, Introductory Nuclear Physics, 3rd Edition, John Wiley & Sons, 1998.

[3] A. Bettini, Introduction to Elementary Particle Physics, Cambridge University Press, 2014.

[4] U. Fano, L. Fano, Physics of Atoms and Molecules; An Introduction to the Structure of Matter, Springer, 2014.

Further reading

1] H. Haken, H. Wolf, Atomy i kwanty. Wprowadzenie do współczesnej spektroskopii atomowej, Wydawnictwo Naukowe PWN, Warszawa, 2012

[2] A. Hennel, W. Szuszkiewicz, Zadania z fizyki atomu, cząsteczki i ciała stałego, Państwowe Wydawnictwo Naukowe, Warszawa, 1985.

[3] F. Shu, Galaktyki, gwiazdy, życie. Fizyka Wszechświata, Prószyński i S-ka, Warszawa, 2003.

Notes

Modified by dr Marcin Kośmider (last modification: 06-02-2023 22:42)