Nanotechnology

Basic information

Field of study Materials Science	**Didactic cycle** 2021/2022
Speciality All	**Subject code** CIMA00S.II2S.295770a268ac3ac830c905aefdcd8e8b.21
Department Faculty of Materials Science and Ceramics	**Lecture languages** English
Study level Second-cycle studies	**Mandatory** Elective
Study form Full-time studies	**Block** Major Modules
Education profile General academic	**Subject related to scientific research** No

Subject coordinator	Robert Filipek
Lecturer	Robert Filipek

Period Semester 2	**Examination** Exam **Activities and hours** Lecture: 15, Seminars: 15	**Number of ECTS points** 2.0

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	Has an in-depth knowledge of nanomaterials	IMT2A_W01	Activity during classes, Participation in a discussion

W2	Has basic knowledge of chemistry necessary to describe the properties of substances and determine their chemical composition	IMT2A_W01	Activity during classes, Participation in a discussion, Essay, Presentation
Skills – Student can:			
U1	Has the ability to understand and accurately describe physical phenomena and create their models	IMT2A_U01	Activity during classes
U2	Can obtain information from literature, databases and other properly selected sources, also in English	IMT2A_U05	Essay, Presentation
Social competences – Student is ready to:			
K1	He understands the need and knows the possibilities of continuous training, including improving professional competences	IMT2A_K03	Activity during classes

Programme content that ensure achieving learning outcomes for the module

Has an ordered and theoretically founded knowledge in the field of nano-technologies, knows development trends in the field of modern technologies. He can use chemical knowledge to develop, implement and control technological processes, in particular nanotechnology. Is able to use the knowledge of colloids in ceramic technologies.

Calculation of ECTS points

Activity form	**Average amount of hours* needed to complete each activity form**
Lecture	15
Seminars	15
Preparation for classes	20
Examination or Final test	2
Contact hours	5
Preparation of project, presentation, essay, report	3
Student workload	**Hours** 60
Workload involving teacher	**Hours** 30

* hour means 45 minutes

Study content

No.	**Course content**	**Subject learning outcomes**	**Activities**

1.	Colloid Chemistry and Nanotechnology: Part I : Physicochemical Basis - interactions in supramolecular chemistry - interface tension and consequences - surfactants - self assembly and structure formation - types of colloidal systems - rheology - adsorption Part II : Case Studies - paints and inks - ceramics and metals - concrete and binders - biomaterials - food - photonic structures - nanoelectronics and plasmonics	W1, W2, U1, U2, K1	Lecture, Seminars

Course advanced

Teaching methods:

Lectures, Multimedia presentation, Discussion, Case study, Project based learning

Activities	Examination methods	Credit conditions
Lecture	Activity during classes, Participation in a discussion	participation in lecture + discussion
Seminar classes	Activity during classes, Essay, Presentation	essay on nanomaterials and nanotechnology, giving a presentation

Requirements and method of completing particular forms of classes

After the first part (teaching the basics), students would get small pieces of homework to be presented in the second series. These presentations will be part of the final assessment. Activity during classes will be taken into account.

Method of calculating the final grade

Presentation will be part of the final assessment. Activity during classes will be also taken into account.

Method and procedure for compensating for missed coursework resulting from student absence from classes

Each case will be considered individually

Entry requirements

Basic knowledge in chemistry and physics.

Attendance requirements for particular classes, with indication whether student attendance is compulsory

Lecture: Students participate in the classes, learning about the next content of teaching in accordance with the subject syllabus. Students should ask questions and explain doubts on an ongoing basis. Audiovisual recording of the lecture requires the consent of the lecturer.
Seminar classes: Students present on the forum of the group the topic indicated by the teacher and participate in the discussion on this topic. Both the substantive value of the presentation and the so-called soft skills.

Literature

Obligatory

1. Jean-Marie Lehn,“Supramolecular Chemistry”, VCH
2. Robert J. Hunter, “Foundations of Colloid Science”, “Introduction to Modern Colloid
3. Chemistry, Oxford University Press
4. Fennell Evans, Hakan Wennerstr ˚ om, “The Colloidal Domain”, VCH ¨Jonathan W. Steed,
5. Jerry L. Atwood,“Supramolecular Chemistry”, Wiley
6. Gerhard Gompper, Michael Schick, “Soft Matter”, vol.1-4, Wiley-VCH

Optional

1. Lecture notes

Directional learning outcomes

Code	Content
IMT2A_K03	Ma świadomość ważności i zrozumienia pozatechnicznych aspektów i skutków działalności inżynierskiej, w tym jej wpływu na środowisko i związanej z tym odpowiedzialności za podejmowane decyzje, przestrzega zasady etyki zawodowej oraz rozumie znaczenie wpływu inżynierii materiałowej na rozwój nowoczesnych technologii
IMT2A_U01	Potrafi pozyskiwać informacje z literatury, baz danych i innych źródeł; potrafi integrować uzyskane informacje, dokonywać ich interpretacji i krytycznej oceny, a także wyciągać wnioski oraz formułować i wyczerpująco uzasadniać opinie
IMT2A_U05	Potrafi przygotować i przedstawić opracowanie naukowe w języku polskim i angielskim na temat realizacji zadania projektowego lub badawczego oraz poprowadzić dyskusję dotyczącą przedstawionych wyników
IMT2A_W01	Ma poszerzoną i pogłębioną wiedzę w zakresie nauk podstawowych niezbędną do zrozumienia zjawisk występujących przy wytwarzaniu, badaniu oraz eksploatacji materiałów inżynierskich