

**AGH**AGH UNIVERSITY OF SCIENCE
AND TECHNOLOGY

Module name: Selected Problems in Nanoscience and Nanotechnology

Academic year: 2019/2020 Code: ZSDA-3-0078-s ECTS credits: 4

Faculty of: Szkoła Doktorska AGH

Field of study: Szkoła Doktorska AGH Specialty: —

Study level: Third-cycle studies Form and type of study: Full-time studies

Lecture language: English Profile of education: Academic (A) Semester: 0

Course homepage: —

Responsible teacher: dr Kryshtal Oleksandr (kryshtal@agh.edu.pl)

Module summary

The course aims to provide students with advanced knowledge of key topics of nanoscience and technology. The major focus is on discussion of the state of the art, the challenges and trends in synthesis, characterization, and application of nanomaterials. The seminars intended to develop the necessary skills in research, each student will be encouraged to study individually a specific topic and present it to the class in a short lecture.

Description of learning outcomes for module

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Connections with FLO	Method of learning outcomes verification (form of completion)
Social competence: is able to			
M_K001	Communicate on the scientific topics in English	SDA3A_K03, SDA3A_U03, SDA3A_U02	Presentation, Participation in a discussion, Involvement in teamwork, Activity during classes
Skills: he can			
M_U001	Can critically assess the promise and hazards of nanomaterials	SDA3A_U03, SDA3A_U02, SDA3A_U05, SDA3A_U01, SDA3A_U04	Presentation, Participation in a discussion, Activity during classes
M_U002	Present and discuss the results of a research project in a public.	SDA3A_U03, SDA3A_U02, SDA3A_U05	Presentation, Participation in a discussion
Knowledge: he knows and understands			

M_W001	Knows the key methods of synthesis and characterization of nanomaterials	SDA3A_W03, SDA3A_W02	Presentation, Participation in a discussion, Activity during classes
--------	--	----------------------	--

Number of hours for each form of classes

Suma	Form of classes										
	Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Fieldwork classes	Workshops	Prace kontrolne i przejściowe	Lektorat
45	15	30	0	0	0	0	0	0	0	0	0

FLO matrix in relation to forms of classes

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Form of classes										
		Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Fieldwork classes	Workshops	Prace kontrolne i przejściowe	Lektorat
Social competence: is able to												
M_K001	Communicate on the scientific topics in English	-	+	-	-	-	-	-	-	-	-	-
Skills: he can												
M_U001	Can critically assess the promise and hazards of nanomaterials	+	+	-	-	-	-	-	-	-	-	-
M_U002	Present and discuss the results of a research project in a public.	+	+	-	-	-	-	-	-	-	-	-
Knowledge: he knows and understands												
M_W001	Knows the key methods of synthesis and characterization of nanomaterials	+	-	-	-	-	-	-	-	-	-	-

Student workload (ECTS credits balance)

Student activity form	Student workload
Udział w zajęciach dydaktycznych/praktyka	45 h
Preparation for classes	10 h
przygotowanie projektu, prezentacji, pracy pisemnej, sprawozdania	30 h
Realization of independently performed tasks	10 h
Contact hours	5 h
Inne	6 h
Summary student workload	106 h
Module ECTS credits	4 ECTS

Additional information

Module content

Lectures

- 1.Introduction. The state of the art and the challenges of nanotechnology
- 2.Basics of nanoscience
- 3.Functional Nanomaterials
 - a.Carbon-based
 - b.Metal, alloys, oxides
 - c.Semiconductors
 - d.Biomaterials
- 4.Selected physical and chemical methods of synthesis of nanomaterials
- 5.Microscopic and spectroscopic characterization of nanomaterials
- 6.Thermal, optical and mechanical properties of nanomaterials
- 7.Hazards of nanomaterials.

Auditorium classes

Each student will be encouraged to study individually a specific topic and present it to the class in a short lecture. Topics will be suggested according to students background and scientific interests.

Teaching methods and techniques:

Lectures: Lecturing, class discussions

Auditorium classes: presentation and discussion, self-learning, debates, reading scientific literature.

Warunki i sposób zaliczenia poszczególnych form zajęć, w tym zasady zaliczeń poprawkowych, a także warunki dopuszczenia do egzaminu:

participation in class and discussion. Presentation of the project.

Zasady udziału w poszczególnych zajęciach, ze wskazaniem, czy obecność studenta na zajęciach jest obowiązkowa:

Lectures:

- Attendance is mandatory: No
 - Participation rules in classes: Nie określono
- Auditorium classes:
- Attendance is mandatory: Yes
 - Participation rules in classes: Nie określono

Method of calculating the final grade

Class Participation and Preparedness - 30%
Project presentation (70%).

Sposób i tryb wyrównywania zaległości powstałych wskutek nieobecności studenta na zajęciach:

individual project report

Prerequisites and additional requirements

Prerequisites and additional requirements not specified

Recommended literature and teaching resources

- 1.R. W. Cahn, P. Haasen, E. J. Kramer, Materials Science and Technology: a comprehensive treatment, VCH, New York, 1992.
- 2.G. Cao, Y. Wang, Nanostructures and nanomaterials: Synthesis properties and applications (2nd ed.) World Scientific, Singapore, 2011.
- 3.Charles P. Poole, Jr., Frank J. Owens, Introduction to Nanotechnology, John Wiley & Sons, May 30, 2003.
- 4.D. L. Schodek, P. Ferreira, M. F. Ashby, Nanomaterials, Nanotechnologies and Design: An Introduction for Engineers and Architects, Butterworth-Heinemann, 2009.

Scientific publications of module course instructors related to the topic of the module

Additional scientific publications not specified

Additional information

None