

Nanomaterials and Nanotechnologies

1. GENERAL			
SCHOOL	Faculty of Sciences in collaboration with Faculty of Engineering, Aristotle University of Thessaloniki		
DEPARTMENT	Materials Science and Engineering		
LEVEL OF STUDIES	ISCED level 7 (5-year Integrated Master's programme) ISCED level 6 (4-year BSc programme)		
COURSE CODE	MSEN 722	SEMESTER	7th Semester
COURSE TITLE	Nanomaterials and Nanotechnologies		
TEACHING ACTIVITIES	Lectures, tutorials/problem sessions, laboratory/computer exercises (where applicable), case studies and guided self-study.	TEACHING HOURS PER WEEK	ECTS CREDITS
		4 (3L + 1T)	6
COURSE TYPE	Scientific area / Skill development		
PREREQUISITES			
TEACHING AND EXAMINATION METHODS	Lectures and tutorials; analysis of powder characterization data; final written exam and a short technical report.		
COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE URL	https://elearning.auth.gr/course/view.php?id=xxxxx		

2. LEARNING OUTCOMES	
Learning Outcomes	<p>Upon successful completion of the course, undergraduate students will be able to:</p> <ul style="list-style-type: none"> • Describe the fundamental concepts and characteristics of nanomaterials. • Identify common types of nanomaterials, including nanoparticles, nanowires, nanotubes, and nanostructured thin films. • Explain how size and nanoscale structure influence physical, chemical, mechanical, and electronic properties. • Understand basic synthesis, fabrication, and characterization methods for nanomaterials. • Recognize key applications of nanomaterials in electronics, energy, catalysis, biomedical devices, and advanced coatings. • Relate nanoscale phenomena to the performance of simple functional devices and systems.
General Skills	<ul style="list-style-type: none"> • Experimental data interpretation and reporting • Quantitative reasoning on process parameters

	<ul style="list-style-type: none"> • Awareness of industrial constraints and quality assurance • Independent learning from standards and technical literature
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3. COURSE CONTENT

This course provides a comprehensive introduction to the science, properties, and applications of nanomaterials. Topics include the synthesis, structure, and characterization of nanoparticles, nanowires, nanotubes, and thin nanostructured films. Students explore size-dependent physical, chemical, mechanical, and electronic properties, as well as the principles underlying quantum effects at the nanoscale. The course also covers fabrication techniques, self-assembly, and integration of nanomaterials into functional devices and systems. Applications in electronics, energy storage and conversion, catalysis, biomedical devices, and advanced coatings are emphasized throughout.

4. LEARNING & TEACHING METHODS - EVALUATION

Teaching method	Face-to-face.																
Use of ICT	<p>ICT will be used in teaching the course, and in communication with students:</p> <ul style="list-style-type: none"> • teaching of the course with modern distance learning (ZOOM) and asynchronous education tools via elearning platform of AUTH, <p>communication with students via email, ZOOM, and elearning platform of AUTH.</p>																
Teaching organization	<p>The supervised and unsupervised workload per activity is indicated below (total workload complies with ECTS standards).</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;">Activity</th> <th style="width: 30%;">Workload/semester (hours)</th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td style="text-align: center;">39</td> </tr> <tr> <td>Tutorials / problem sessions</td> <td style="text-align: center;">13</td> </tr> <tr> <td>Data analysis / short report</td> <td style="text-align: center;">16</td> </tr> <tr> <td>Independent study</td> <td style="text-align: center;">64</td> </tr> <tr> <td>Exam preparation</td> <td style="text-align: center;">16</td> </tr> <tr> <td>Final written exam</td> <td style="text-align: center;">2</td> </tr> <tr> <td>Total</td> <td style="text-align: center;">150</td> </tr> </tbody> </table>	Activity	Workload/semester (hours)	Lectures	39	Tutorials / problem sessions	13	Data analysis / short report	16	Independent study	64	Exam preparation	16	Final written exam	2	Total	150
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Student evaluation	<p>Assessment language: English. Methods: written final exam (60%), technical report/data-analysis assignment (25%), quizzes/problem sets (15%). Students are informed via the course guide and e-learning announcements.</p>																

5. SUGGESTED BIBLIOGRAPHY

EUDOXUS

To be specified in EUDOXUS.

Additional bibliography for study

- Teaching material slides