

Bioinorganic Materials

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 734	SEMESTER	7 th Semester
COURSE TITLE	Bioinorganic Materials		
TEACHING ACTIVITIES	Lectures, tutorials/problem sessions, laboratory/computer exercises (where applicable), case studies and guided self-study.	TEACHING HOURS PER WEEK	ECTS CREDITS
		Lectures: 3 Tutorial: 1 Total: 4	6
COURSE TYPE	Scientific Area, Skill Development		
PREREQUISITES	No prerequisites		
TEACHING AND EXAMINATION METHODS	English		
COURSE OFFERED TO ERASMUS STUDENTS			
COURSE URL	https://elearning.auth.gr/course/view.php?id=xxxxx		

2. LEARNING OUTCOMES	
Learning Outcomes	<p>By the end of this course, students are expected to:</p> <ul style="list-style-type: none"> • be aware of the role of the trace elements • be aware of the role of the metals in life and as drugs • know some important metalloproteins and their significance. • be aware of applications of inorganic nanoparticles of biological interest. • be up to date on technological and medical applications of inorganic nanoparticles. • get to know inorganic nanoscale materials, their synthetic approaches and characterization techniques. • get to know post-synthetic approaches for functional inorganic-based nanoarchitectures materials for biomedical applications.
General Skills	<p>By the end of this course, students will be:</p> <ul style="list-style-type: none"> • familiar with trace elements and their biological relevance. • familiar with functionalized inorganic-based nanoarchitectures.

	<ul style="list-style-type: none"> familiar with bioinorganic materials used for clinical and biomedical applications.
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3. COURSE CONTENT

- Introduction to Bioinorganic Chemistry.
- Metalloproteins and their biological functions.
- Metals and inorganic compounds in biological systems.
- Metal-based drugs.
- Introduction to the properties of Inorganic-based materials at the nanoscale.
- Inorganic-based Nanomedicine and Nanopharmaceuticals.
- Functionality of Inorganic-based nanoarchitectures and chemical modifications.
- Magnetic nanoparticles for therapy and diagnosis: Drug carriers, hyperthermia, magnetomechanical induction, contrast agents in MRI and PET.
- Inorganic Nanoparticles as antimicrobial, photodynamic agents.

4. LEARNING & TEACHING METHODS – EVALUATION

Teaching method	Face-to-face.														
Use of ICT	<p>Use of ICT in Course Teaching, Use of ICT in Communication with Students</p> <p>Description: Use of Information and Communication Technologies (ICT) in teaching the course with tools of modern distance learning (ZOOM) and asynchronous education (eclass).</p> <p>Use of learning aids based on ICT: Excel, Word, Power Point</p> <p>Use of ICT in student assessment: Electronic grading (eclass, universis).</p> <p>Use of ICT in communication with students: eclass, email, ZOOM.</p>														
Teaching organization	<p>The supervised and unsupervised workload per activity is indicated below (total workload complies with ECTS standards).</p> <table border="1" data-bbox="523 1550 1200 1868"> <thead> <tr> <th>Activity</th> <th>Workload/semester (hours)</th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td>39</td> </tr> <tr> <td>Tutorials / problem sessions</td> <td>13</td> </tr> <tr> <td>Bibliographic Research and analysis</td> <td>55</td> </tr> <tr> <td>Writing of assignments</td> <td>40</td> </tr> <tr> <td>Final written exam</td> <td>3</td> </tr> <tr> <td>Total</td> <td>150</td> </tr> </tbody> </table>	Activity	Workload/semester (hours)	Lectures	39	Tutorials / problem sessions	13	Bibliographic Research and analysis	55	Writing of assignments	40	Final written exam	3	Total	150
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Total	150														
Student evaluation	<p>Assessment Language: English</p> <p>Assessment Methods:</p> <ul style="list-style-type: none"> • Written exam with (a) short answer questions, (b) extended answer questions and (c) problem solving 														

- Presentation of Assignment.

5. SUGGESTED BIBLIOGRAPHY

Course Bibliography

Robert R. Crichton, Biological Inorganic Chemistry: An Introduction, Third Edition, Academic Press, 2018
Rosette M. Roat-Malone, Bioinorganic Chemistry: A Short Course, Third Edition, Wiley, 2020
Xuan Wang, Sajid Bashir, Jingbo Louise Liu, Nanochemistry: From Theory to Application for In-Depth Understanding of Nanomaterials, De Gruyter GmbH, Berlin/Boston, 2023
Zhyrgul Abdullaeva, Synthesis of Nanoparticles and Nanomaterials: Biological Approaches, Springer, 2017

Additional bibliography for study

Professors' notes