

## Fundamentals of Chemistry Laboratory

1. GENERAL			
<b>SCHOOL</b>	Faculty of Sciences in collaboration with Faculty of Engineering, Aristotle University of Thessaloniki		
<b>DEPARTMENT</b>	Materials Science and Engineering		
<b>LEVEL OF STUDIES</b>	ISCED level 7 (5-year Integrated Master's programme) ISCED level 6 (4-year BSc programme)		
<b>COURSE CODE</b>	<b>MSEN 202</b>	<b>SEMESTER</b>	2 <sup>nd</sup> Semester
<b>COURSE TITLE</b>	<b>Fundamentals of Chemistry Laboratory</b>		
<b>TEACHING ACTIVITIES</b>	<b>TEACHING HOURS PER WEEK</b>	<b>ECTS CREDITS</b>	
Lectures, tutorials/problem sessions, laboratory/computer exercises (where applicable), case studies and guided self-study.			
	Lectures: 1 Lab work: 3 Total: 4	6	
<b>COURSE TYPE</b>	Background, General Knowledge		
<b>PREREQUISITES</b>	No prerequisites		
<b>TEACHING AND EXAMINATION METHODS</b>	English		
<b>COURSE OFFERED TO ERASMUS STUDENTS</b>	Yes		
<b>COURSE URL</b>	<a href="https://elearning.auth.gr/course/view.php?id=xxxxx">https://elearning.auth.gr/course/view.php?id=xxxxx</a>		

2. LEARNING OUTCOMES	
<b>Learning Outcomes</b>	<p>Upon successful completion of this course, students will be able to:</p> <ul style="list-style-type: none"> <li>• Fundamental knowledge across organic, inorganic, and physical chemistry</li> <li>• Understand the concept of inorganic and organic molecules, materials, their physicochemical properties</li> <li>• Practice on common techniques to clean and isolate inorganic and organic materials.</li> <li>• Practice on spectroscopy for structure determination of organic compounds and materials</li> <li>• These exercises are internationally and widely accepted and known and are taught in the first semester of studies in the Departments of Chemistry and Chemical Engineering.</li> </ul>
<b>General Skills</b>	<ul style="list-style-type: none"> <li>• Applying knowledge in practice</li> <li>• Searching, analyzing and synthesizing data and information, using the necessary spectroscopic technologies</li> <li>• Decision-making</li> </ul>

	<ul style="list-style-type: none"> <li>• Independent work</li> <li>• Teamwork</li> <li>• Generate new research ideas</li> <li>• Promoting free, creative and inductive thinking</li> </ul>
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### 3. COURSE CONTENT

- Laboratory safety rules, hazards of reagents, and techniques for measuring mass and volume. Expression of **solution** concentration and preparation of solutions with specified concentrations.
- Study of homogeneous and heterogeneous **equilibria**, including the effects of concentration and temperature. Equilibria in aqueous electrolyte solutions.
- Understand nature of **weak acids and bases**. **pH** and its measurement in aqueous solutions. **pK** of weak **acids and bases**. Preparation and evaluation of **buffer solutions** and their buffering capacity. Estimation of the hydrolysis constant of salts in aqueous solutions.
- Fundamentals and techniques of **volumetric analysis**. Preparation of standard solutions. Types of titrations: acid-base (acidimetry and alkalimetry), complexometric, and redox analysis.
- **Redox reactions** and the reactivity series of metals and non-metals. Oxidizing properties of common oxidants in aqueous solutions. Voltaic cells and electrolysis, including laws governing electrolysis and their applications.
- Recognize and use the **fundamental equipment** for **designing Organic Reaction**.
- Clean Organic liquid Materials via **Distillation techniques**. Isolation of clean low boiling organic materials.
- Isolation of different Acid/Base Organic Materials via **Extraction techniques**. Separation of a mixture of organic materials.
- Experimental investigation of the surface tension, viscosity, and refractive index of liquid systems, using standard physicochemical measurement techniques.
- Study of the effect of temperature on the solubility of solids in liquids, including construction and interpretation of solubility–temperature curves.
- Analysis of the relationship between molecular interactions and macroscopic properties such as flow behavior, interfacial phenomena, and optical response. Development of experimental skills in data collection, uncertainty estimation, and interpretation of physicochemical property measurements.

### 4. LEARNING & TEACHING METHODS - EVALUATION

<b>Teaching method</b>	Face-to-face.
<b>Use of ICT</b>	<p>ICT will be used in teaching the course, and in communication with students:</p> <ul style="list-style-type: none"> <li>• teaching of the course with modern distance learning (ZOOM) and asynchronous education tools via elearning platform of AUTH,</li> <li>• communication with students via email, ZOOM, and elearning platform of AUTH.</li> </ul>

<b>Teaching organization</b>	The supervised and unsupervised workload per activity is indicated below (total workload complies with ECTS standards).														
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<b>Student evaluation</b>	<p><b>Assessment language</b> The assessment language is English.</p> <p><b>Assessment methods</b> The course uses the following methods:</p> <ul style="list-style-type: none"> <li>• <b>Multiple choice tests:</b> two midterm exams to check recall of definitions, concepts, and terminology on core concepts on inorganic materials.</li> <li>• <b>Problem solving assignments:</b> two written assignments in which students review a class of inorganic materials, analyze literature data, and solve problems on inorganic materials.</li> <li>• <b>Final written exam:</b> it combines short answers, problem solving, and data interpretation questions to evaluate cumulative understanding on core concepts of inorganic materials.</li> </ul> <p>Weighting</p> <ul style="list-style-type: none"> <li>• Multiple choice tests): 20%</li> <li>• Problem solving assignments: 20%</li> <li>• Final written exam: 60%</li> </ul> <p><b>Student information</b> Students are informed about the assessment process through:</p> <ul style="list-style-type: none"> <li>• The course outline distributed in the first lecture.</li> <li>• Detailed instructions for the written assignment and presentation posted on the course website.</li> <li>• A dedicated assessment briefing during tutoring time where expectations and criteria are explained.</li> <li>•</li> </ul>														
<b>5. SUGGESTED BIBLIOGRAPHY</b>															
<b>EUDOXUS</b>															
Andrew Burrows, John Holman, Andrew Parsons, Gwen Pilling, Gareth Price, Chemistry <sup>3</sup> : Introducing inorganic, organic and physical chemistry															
<b>Additional bibliography for study</b>															
<ul style="list-style-type: none"> <li>• Teaching material slides</li> </ul>															