# Syllabus

## *Course Description*

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| **Course Title** | General and inorganic Chemistry |
| **Course Code** | 42102 |
| **Course Title Additional** | |
| **Scientific-Disciplinary Sector** | CHEM-03/A |
| **Language** | German |
| **Degree Course** | Bachelor in Industrial and Mechanical Engineering |
| **Other Degree Courses (Loaned)** | |
| **Lecturers** | Dr. Mag. Michael Oberhuber,<br>Michael.oberhuber2@unibz.it<br>https://www.unibz.it/en/faculties/engineering/academic-staff/person/39871 |
| **Teaching Assistant** | |
| **Semester** | First semester |
| **Course Year/s** | 1 |
| **CP** | 6 |
| **Teaching Hours** | 36 |
| **Lab Hours** | 36 |
| **Individual Study Hours** | 78 |
| **Planned Office Hours** | 18 |
| **Contents Summary** | The aim of the course is to provide students with an adequate command of general chemical principles.<br>- Atomic theory, the chemical bond, and the periodic table<br>- States of matter and phase transitions<br>- Stoichiometry, reaction equations, basic thermodynamics and catalysis<br>- Chemical reactions (solvation, acid-base, redox incl. electrochemistry)<br>- The chemical equilibrium<br>- Crystal structures<br>- Macromolecular chemistry and nanotechnology |

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| | - Biomolecules<br>- Reaction kinetics |
| **Course Topics** | This course provides students with a foundational understanding of general chemical principles, aiming to build a comprehensive knowledge of matter and its transformations at the atomic and molecular levels.<br><br>The course begins with an introduction to atomic theory, chemical bonding, and the periodic table, laying the groundwork for the study of more complex topics. The physical states of matter and phase transitions are explored, along with the principles of stoichiometry and the formulation of balanced chemical equations. Students will gain insight into fundamental thermodynamics and the role of catalysis in chemical reactions.<br><br>Core types of chemical reactions—such as solvation, acid-base interactions, redox processes, and electrochemistry—are examined in detail. The concept of chemical equilibrium is addressed, highlighting its significance in both theoretical and applied contexts.<br><br>The structure and properties of crystalline solids are also covered, offering an introduction to crystallography. Additionally, the course delves into macromolecular chemistry. Reaction kinetics is discussed to provide a framework for understanding the rates and mechanisms of chemical processes.<br><br>Overall, the course equips students with essential tools and concepts to analyze chemical systems and processes across a broad range of scientific disciplines. |
| **Keywords** | General and inorganic chemistry, stoichiometry, chemical reactions, thermodynamics, kinetics |
| **Recommended Prerequisites** | None. |
| **Propaedeutic Courses** | |
| **Teaching Format** | Frontal lectures, exercises, labs. |
| **Mandatory Attendance** | Not mandatory |
| **Specific Educational Objectives and Learning** | The course is part of the courses in the area of basic sciences and specifically in the context of chemical sciences. |

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| **Outcomes** | The purpose of the course is to provide the basic knowledge on the structure of matter as well as the thermodynamic and kinetic principles that regulate its transformation. Special attention will be given to a molecular understanding of the properties of matter through the study of the structural and functional aspects of simple molecules with relevance for the bio-geo-chemical cycles of the elements. In addition, the knowledge acquired in this course will be useful to understand topics from materials science and energy production.<br><br>Intended Learning Outcomes (ILO)<br>Knowledge and understanding:<br>1. Structure-properties-relationship of matter<br>2. Chemical transformation of matter<br>3. Chemical equilibrium, principles of thermodynamics and kinetics<br>4. Electrochemistry<br>5. Chemical properties of selected materials and metals<br>Applying knowledge and understanding:<br>6. to chemical calculations<br>7. to laboratory experiments<br>8. to material science relevant to engineering<br><br>Making judgments:<br>9. Chemical aspects of material science<br>10. On laboratory experiments and their outcomes.<br>Communication skills:<br>11. Express chemical problems in writing<br>12. Writing reports on laboratory experiments<br>Learning skills<br>13. Understanding invisible and intangible phenomena and concepts without equivalent on the macroscale (molecules, quantum mechanics etc.)<br>14. Laboratory experiments. |
| **Specific Educational Objectives and Learning Outcomes (additional info.)** | |
| **Assessment** | Examination of the course is conducted via a written exam. The written exam is a multiple-choice test and consists of three parts: |

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| | i) theory questions to assess the knowledge and understanding of the course topics and the theoretical aspects, ii) questions, where the ability to apply the theoretical knowledge to given problems, and iii) exercises with chemical calculations.<br>- Summative assessment:<br>40% Written exam theory: 40 minutes; ILOs assessed: 1,2,3,4,5,8,9,10,11,13;<br>30% written exam problems: 40 minutes; ILOs assessed: 1,2,3,4,5,6,8,9,10,11,13;<br>30% written exam exercises: 40 minutes; ILOs assessed: 1,2,3,4,5,6,8,9,10,11,13.<br>In class exercises (incl. laboratory): 6 x 240 minutes; ILOs assessed: 2,3,6,7,11,12,13,14. |
| **Evaluation Criteria** | Grading with a single final grade.<br>Criteria for grading: comprehension, problem-solving skills, technical competence. Laboratory reports: the ability to summarize the experiment, describe essential steps, clarity and linguistic quality of the response, and correct calculation of results will be evaluated. |
| **Required Readings** | Guido Kickelbick „Chemie für Ingenieure“, Pearson Verlag. |
| **Supplementary Readings** | Charles E. Mortimer und Ulrich Müller „Chemie: Das Basiswissen der Chemie“, Themie Verlag. |
| **Further Information** | |
| **Sustainable Development Goals (SDGs)** | Affordable and clean energy |