Introduction to Sustainable Chemistry & Physics

Educational subject description sheet

Basic information

Field of study Joint Bachelor in Sustainability **Speciality** - **Organizational unit** Faculty of Law and Administration **Study level** first cycle (joint degree programme) **Study form** full-time degree programme **Education profile** General academic **Mandatory** obligatory	**Education cycle** 2025/26 **Subject code** UJ.WPAJBSS.820.16349.25 **Lecture languages** english **Subject related to scientific research** Yes **Disciplines** Chemical sciences, Physical sciences **ISCED classification** 0588 Interdisciplinary programmes involving broad field 05 **USOS code**

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Lecturer	Ditte Taipale, Mohammad Alzeer, Bernhard Reischl, Timo Leskinen, Pedro Camargo, Marlena Gryl

Period	**Examination**	**Number of ECTS points**
Semester 2	exam **Activities and hours** Lecture with elements of a discussion class: 36	4.0

Goals

C1	The aims of the course are to give students a comprehensive overview of what the study track in sustainable chemistry and physics contains, how it is to study in Helsinki, what it requires of a student to successfully complete the study track, what are the career possibilities after completing the study track, and why chemistry and physics are important for a sustainable future. The course covers fundamental chemistry and physics concepts and calculations which are pre-requirements for entering the study track in sustainable chemistry and physics.

Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
Knowledge – Student knows and understands:			
W1	the fundamental chemistry and physics concepts taught in the course.	JBS_K1_W06	written exam
W2	the content, structure, requirements, and career opportunities of the study track in sustainable chemistry and physics as well as the MA programmes it gives access to and how it is to study at UH.	JBS_K1_W06	written exam
W3	why chemistry and physics are important for a sustainable future.	JBS_K1_W03, JBS_K1_W06, JBS_K1_W07	written exam
Skills – Student can:			
U1	perform simple calculations and problem-solving tasks related to the topics taught in the course.	JBS_K1_U03	written exam
Social competences – Student is ready for:			
K1	to evaluate their own interests and competencies required to proceed with the chemistry and physics study track	JBS_K1_K04	written exam

Calculation of ECTS points

Activity form	Activity hours*	
Lecture with elements of a discussion class	36	
tasks solving	35	
essay preparation	10	
preparation for the exam	27	
Student workload	**Hours** 108	**ECTS** 4.0

* hour means 45 minutes

Study content

No.	Course content	Subject's learning outcomes
1.	Intro to the course + Description of the study track (What courses and topics does the study track include? Recommended structure of the study track and overview of elective courses and regulations. Master's degree programs that our graduates can enter. What kind of experts do we aim to train? Potential fields of employment). Introduction of teachers.	W2
2.	Inspirational plenary on why we need experts in sustainable chemistry and climate physics - including examples from our study track	W3

No.	Course content	Subject's learning outcomes
3.	Concepts and methods in natural sciences (Phys+Chem)	W1, U1
4.	Important physical quantities and their units, measurements and uncertainties (Phys)	W1, U1
5.	Classical Mechanics (Phys)	W1, U1
6.	Energy and momenta, conservation laws (Phys)	W1, U1
7.	Thermodynamics: temperature and heat, thermal properties, energy conversion (Phys)	W1, U1
8.	Inspirational plenary on why we need experts in sustainable chemistry and climate physics - including examples from our study track	W3
9.	Phase equilibria and phase transitions (Phys)	W1, U1
10.	Waves and particles, optics, radiation (Phys)	W1, U1
11.	Atomic structure and bonding theories (Chem)	W1, U1
12.	States of matter (Chem)	W1, U1
13.	Chemical equilibrium (Chem)	W1, U1
14.	Chemical kinetics (Chem)	W1, U1
15.	Acids, bases and ionic equilibrium (Chem)	W1, U1
16.	Chemical thermodynamics (Chem)	W1, U1
17.	International student in Helsinki 101 – how to survive in Helsinki and Finland? Exiting activities and experiences offered in Helsinki.	W2, K1
18.	Panel discussion more than one teacher (one or two short presentations followed by open discussion to address students' thoughts and questions)	W3, K1

Course advanced

Teaching methods :

conversation lecture, solving tasks

Activities	Examination methods	Credit conditions
Lecture with elements of a discussion class	written exam	Students need more than 45% of total points to pass the exam and the course (graded); additionally, students are to submit a reflective essay (ungraded)

Entry requirements

None

Literature

Obligatory

1. Lecture notes Nivaldo J. Tro, Chemistry: A Molecular Approach (Prentice Hall), 3rd or 4th edition

Effects

Code	Content
JBS_K1_K04	The graduate can critically assess and verbalize own competencies and skills related to different aspects of sustainability as well as their need for development.
JBS_K1_U03	The graduate can apply adequate methods and tools, including selected IT tools, to solve problems related to data collection, analysis, and management in the context of sustainability.
JBS_K1_W03	The graduate can give examples of sustainability-related dilemmas and hypothesize on the optimal course of action.
JBS_K1_W06	The graduate can describe interconnections between various aspects of sustainability and identify their significance in the context of natural and social sciences, with a special focus on disciplines included in the selected specialisation track (law and politics; chemistry and physics; chemistry and biology; economics and geography; economics, management and engineering; humanities).
JBS_K1_W07	The graduate can apply the theory and methodology of disciplines included in the selected specialisation track to sustainability-related problems, taking into consideration practical limitations such as protection of intellectual property.