



## **COURSE SYLLABUS**

### **General information**

Course title:	<b>ENVIRONMENTAL PROTECTION TECHNOLOGY</b>
ISVU course code:	266805
Course instructor:	
Course assistant:	
Study programme and specialization in which the course is taught:	Professional undergraduate study of food technology
ECTS credits:	5.0
Semester of the course execution:	III.
Exam prerequisites:	-
Course objectives:	The aim of the course is to acquaint students with the basics of environmental protection in the production of food products and the primary production of raw materials. By means of an understanding of the issues of environmental protection, legal acts and the possibilities that the profession faces, the aim of the course is to make students aware of the problems caused by environmental pollution and the use of technologies for environmental protection, i.e. primarily technologies for the treatment of waste water and the processing of by-products.

### **Course structure**

<b>Teaching mode</b>	<b>Number of contact hours per semester:</b>	<b>Student's requirements per teaching mode</b>
Lectures:	30	Attendance at lectures - 80%
Exercises (auditory, linguistics):		
Exercises (laboratory, practical):	22	Attendance at exercises - 100%
Field work:	8	Attendance at field exercises - 100%
Other:		
<b>TOTAL:</b>	<b>60</b>	

### **Monitoring of students' work and knowledge evaluation during the course**

<b>OUTCOMES</b>		<b>Oral examination 1</b>	<b>Oral examination 2</b>	<b>Present ation</b>	<b>Written Colloquium</b>	<b>Total</b>	<b>Pass</b>	<b>Time frame for the recognition of the outcome</b>
Outcome 1	Recognize the negative effects of man and industry on the environment, group sources of pollution and discuss new knowledge in the field of pollution and environmental protection.	15%				15%	7,5%	Two academic years



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Outcome 2	Assess the impact of individual pollutants from multiple sources on air quality.	15%				15%	7,5%	Two academic years
Outcome 3	Choose an environmentally friendly solution for waste water treatment, and determination water quality.			30%		30%	15%	Two academic years
Outcome 4	State possible pollution and applicable procedures in wastewater treatment, describe the operation of real wastewater treatment systems (after visiting the devices).		20%			20%	10%	Two academic years
Outcome 5	Assess the impact of individual pollutants from multiple sources on soil quality.		10%			10%	5%	Two academic years
Outcome 6	Find a way to dispose of waste products from the food industry by using them in further processing		10%			10%	5%	Two academic years
Total % grade points		30	40	30		100	50	
Share in ECTS		1,6	1,8	1,6		5		

### Knowledge evaluation on exams

Exam prerequisites					
OUTCOMES		Written exam	Oral exam	Total	Pass
Outcome 1	Recognize the negative effects of man and industry on the environment, group sources of pollution and discuss new		20%	20%	10%



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	knowledge in the field of pollution and environmental protection.				
Outcome 2	Assess the impact of individual pollutants from multiple sources on air quality.		10%	10%	5%
Outcome 3	Choose an environmentally friendly solution for the treatment of waste water and determine the quality of water.		20%	20%	10%
Outcome 4	State possible pollution and applicable procedures in wastewater treatment, describe the operation of real wastewater treatment systems (after visiting the devices).		20%	20%	10%
Outcome 5	Assess the impact of individual pollutants from multiple sources on soil quality.		10%	10%	5%
Outcome 6	Find a way to dispose of waste products from the food industry by using them in further processing.		20%	20%	10%
Total % of grade points			100	100	50
Share in ECTS			5	5	

### **Review of units per week with associated learning outcomes**

<b>Week</b>	<b>Lecture course content and learning outcomes:</b>	<b>Outcome</b>	<b>Exercises course content and learning outcomes:</b>	<b>Outcome</b>
1.	Factors that significantly change the environment.	l1	Instructions for exercises and discussion on new knowledge in the field of pollution and environmental protection.	l1
2.	Pollution of water, air and soil by waste, heat, radioactivity, chemicals, etc.	l1	Determination of physical, chemical and microbiological indicators of soil and air pollution.	l2
3.	Meteorological conditions for the spread of pollution.	l1	Determination of total water pollution indicators.	l3
4.	Air quality standards. Quality control network ray.	l2	Biological methods of water quality assessment.	l4
5.	Sources and most common air pollutants. Emission and immission.	l2	Demonstration of nitrogenous compounds in wastewater.	l3
6.	Air pollution and impact on the environment and nature.	l2	Određivanje klorida, sulfata i ukupnog onečišćenja u otpadnim vodama.	l3
7.	Methods of air quality protection, deposition, separation and filtration and Legal regulations in the domain of air quality protection.	l2	Alkalinity, biological, physical and chemical pollution and water hardness. Purification of waste water through a filter and re-analysis, Alkalinity, biological pollution and water hardness.	l3
8.	Legal regulations in the field of environmental protection and ISO standard, ISO 14001: 2015.	l2	Soil analysis. Qualitative evidence of carbonates in the soil. Determination of soil pH value from different locations.	l5



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9.	Water pollution by natural processes. Waste water; origin, type and processing.	13	Analysis of soil depleted by monoculture over a four-year period.	15
10.	Physico-chemical, microbiological and biological characteristics of wastewater, COD, BOD and others.	13	Biološka obrada otpadnih voda- morska voda (mikro I nano plastika) .	14
11.	Drainage systems and wastewater treatment. Deposition, equalization, neutralization.	14	Expert visit to biological purifiers waste water - field teaching.	14
12.	Aerobic and anaerobic treatment of waste water.	14	Professional visit to the purification plant municipal water and plant for disposal of waste of animal origin - field teaching.	16
13.	Types and quality of soil. Soil pollution and its remediation.	15	Final discussion on the assigned project (zero waste day) Instructions for writing papers and taking exams.	16
14.	Disposal of waste generated by food processing processes. Utilization of waste from the food industry.	16	Conducted student discussion on the topic of a visit to waste water purifiers and a plant for the disposal of waste of animal origin (knowledge check on the acquired knowledge from field classes).	16
15.	Environmental Protection Act, Nature Protection Act, Water Act, Waste Act.	16	Conducted student discussions on new knowledge in the field of environmental protection (laws, norms and existing technologies), then passing the final colloquium from laboratory exercises.	12 i 16

### **References (compulsory / additional)**

#### **compulsory**

1. Bitton, G. Wastewater Microbiology, John Wiley & Sons, New York, 2005.
2. Casey, T. J. Unit treatment processes in water and wastewater engineering, John Wiley & Sons, New York, 1997.
3. Glancer-Šoljan, M. Biološka obradba otpadnih voda I. izdanje, Prehrambeno-biotehnološki fakultet u Zagrebu, Zagreb, 2001.
4. Grupa autora, knjiga 2. Šubarić, D., Babić, J. (ur.). Neke mogućnosti iskorištavanja nusproizvoda prehrambene industrije- knjiga 2. Prehrambeno-tehnološki fakultet Sveučilišta Josipa Jurja Strossmayera u Osijeku . ISBN: 978-953-7005-64-1. 2. izdanje, Osijek, 2019.
5. Kalambura S., Krička, T., Kalambura, D. Gospodarenje otpadom, I. izdanje. Veleučilište Velika Gorica. Zagreb. 2011. ISBN 9789537716172.
6. Kalambura S. Kafilerije i alkalna hidroliza skripta I. izdanje, Agronomski fakultet Sveučilišta u Zagrebu i Zoro d.o.o. Zagreb, Zagreb, 2011.
7. Popović, N. Priručnik za vježbe iz tehnologije zaštite okoliša I. izdanje. Veleučilište u Karlovcu. Karlovac, 2004.
8. Udovičić, B. Krička, T. Čovjek i okoliš I. izdanje, Kigen, Zagreb. Zagreb, 2009. ISBN 978-953-6970-89-6.

#### **additional**

1. Tušar, B. Ispuštanje i pročišćavanje otpadnih voda I. izdanje. Croatia knjiga, Zagreb. Zagreb, 2004.
2. Mayre, D. Kvaliteta i zaštita podzemnih voda. I. izdanje. Hrvatsko društvo za zaštitu voda i mora, Zagreb, 1993.



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3. Vuković, M. Disertacija, Fakultet kemijskog inženjerstva i tehnologije, Zagreb. Zagreb, 2006.
4. Wang, K., Pereira, N. C., Hung, Y.-T. Biological treatment processes, Humana Press, New York, 2009.