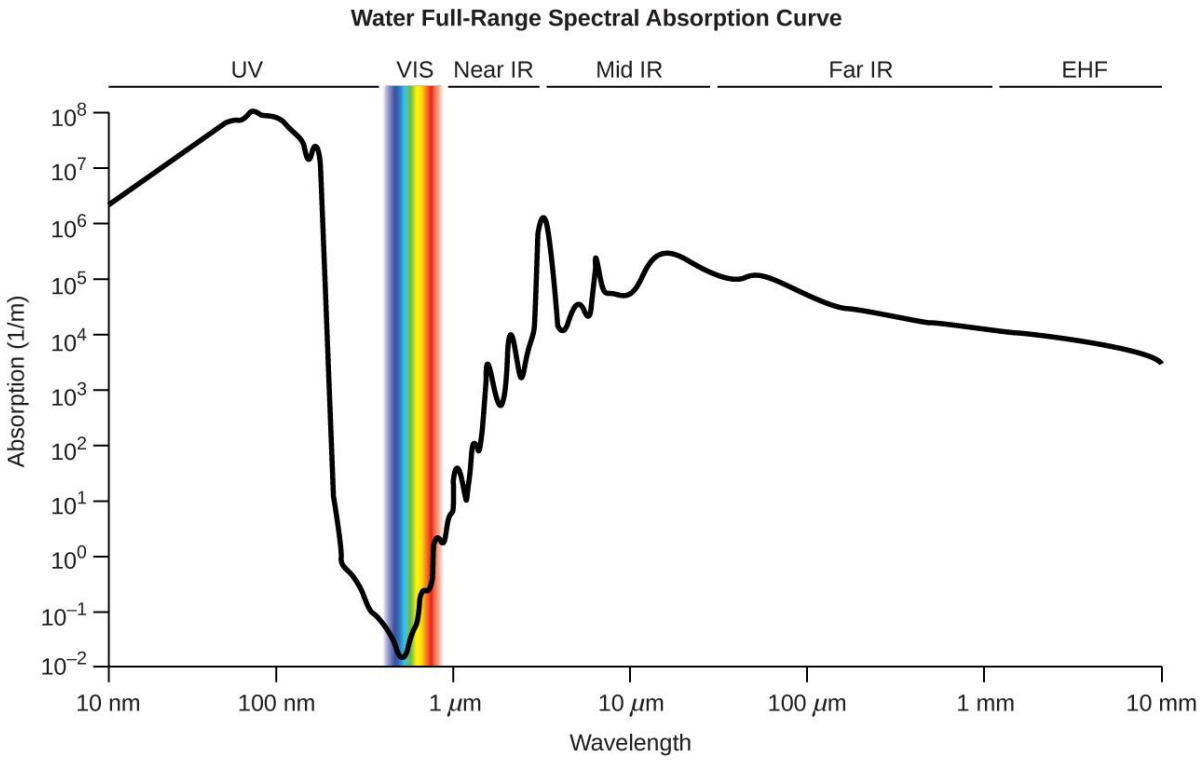
COURSE DESCRIPTION CARD – SPECIMEN

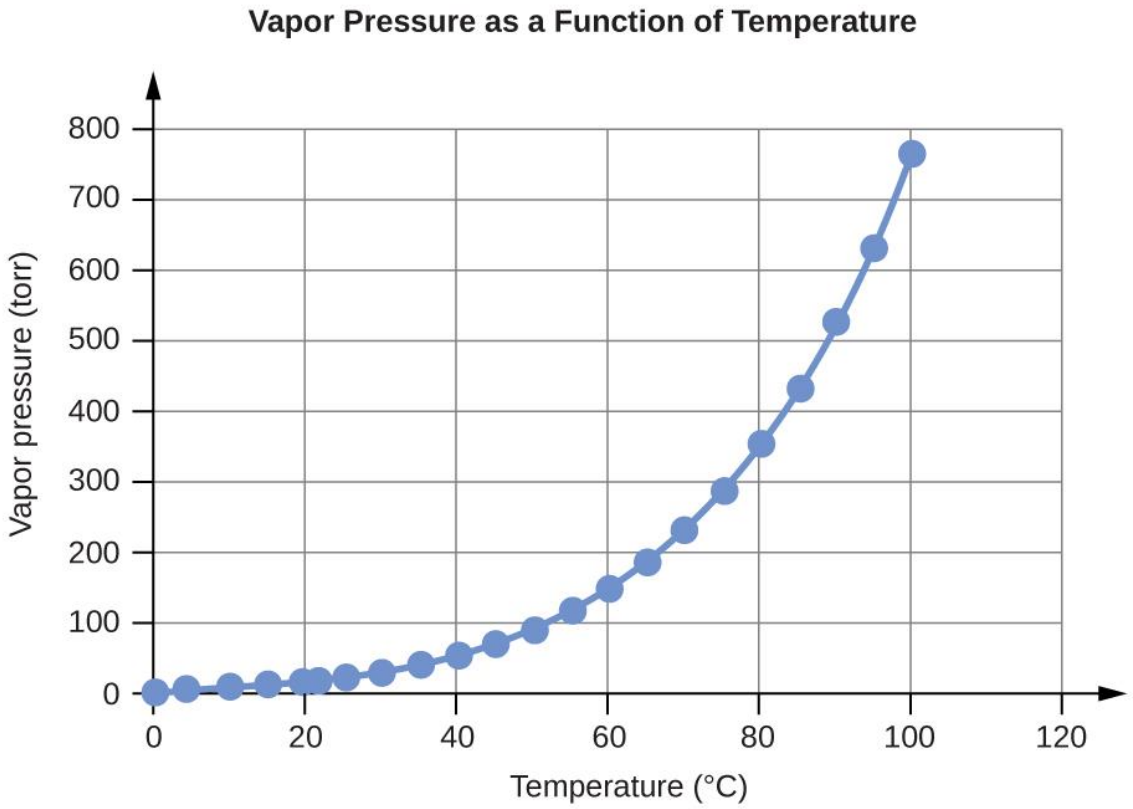
<table>
<tr><td colspan="10">Faculty of Civil Engineering and Environmental Sciences</td></tr>
<tr><td>Field of study</td><td colspan="6">Environmental Engineering</td><td colspan="2">Degree level and programme type</td><td>Bachelor'sdegree</td></tr>
<tr><td>Specialization/ diploma path</td><td colspan="6">-</td><td colspan="2">Study profile</td><td>Academic profile</td></tr>
<tr><td rowspan="2">Course name</td><td colspan="6" rowspan="2">Sanitary chemistry</td><td colspan="2">Course code</td><td>19284220H</td></tr>
<tr><td colspan="2">Course type</td><td></td></tr>
<tr><td rowspan="2">Forms and number of hours of tuition</td><td>L</td><td>C</td><td>LC</td><td>P</td><td>SW</td><td>FW</td><td>S</td><td>Semester</td><td>IV Summer</td></tr>
<tr><td>1</td><td></td><td>1</td><td></td><td></td><td></td><td></td><td>No. of ECTS credits</td><td>3</td></tr>
<tr><td>Entry requirements</td><td colspan="9">basic knowledge of chemistry, sanitary biology, water management and water protection, water and wastewater technology</td></tr>
<tr><td>Course content</td><td colspan="9">To familiarize students with the chemical structure of the water molecule, chemical bonds, and resulting properties. Introduce students with natural water and wastewater chemistry, chemical reactions, parameters affecting their course, disturbing factors and methods of their elimination. To introduce and familiarize students with the cycles of major elements in the environment. Learning the correct classification of natural waters based on water quality indicators (surface and groundwater). The basic definitions and classifications of pollution. To teach the most important water and wastewater laboratory analysis methods, which are the basis for the selection of technological processes.To familiarize students with methods of verification and interpretation of obtained test results and their statistical elaboration.</td></tr>
<tr><td>Teaching methods</td><td colspan="9">Lectures, Laboratory classes (working independently, in pairs or as part of a small team)</td></tr>
<tr><td>Assessment method</td><td colspan="9">discussion of obtained research results during classes; written reports in research; written tests checking the learning outcomes</td></tr>
<tr><td>Symbol of learning outcome</td><td colspan="8">Learning outcomes</td><td>Reference to the learning outcomes for the field of study</td></tr>
<tr><td>LO1</td><td colspan="8">A graduate knows phenomena, processes and objects which are the basis for identifying sources of water pollution; has the knowledge of physico-chemical and biochemical transformations taking place in natural waters and sewage; can correctly draw conclusions</td><td>IS1_W01
IS1_W02
IS1_W07
IS1_U14</td></tr>
<tr><td>LO2</td><td colspan="8">A graduate knows and understands the phenomena, processes occurring in water and sewage; can analyze, evaluate and predict the consequences of the presence of pollutants and toxic substances in them</td><td>IS1_W02
IS1_W07
IS1_U08</td></tr>
<tr><td>LO3</td><td colspan="8">A graduate knows and understands the issues of basic</td><td>IS1_W02</td></tr>
</table>

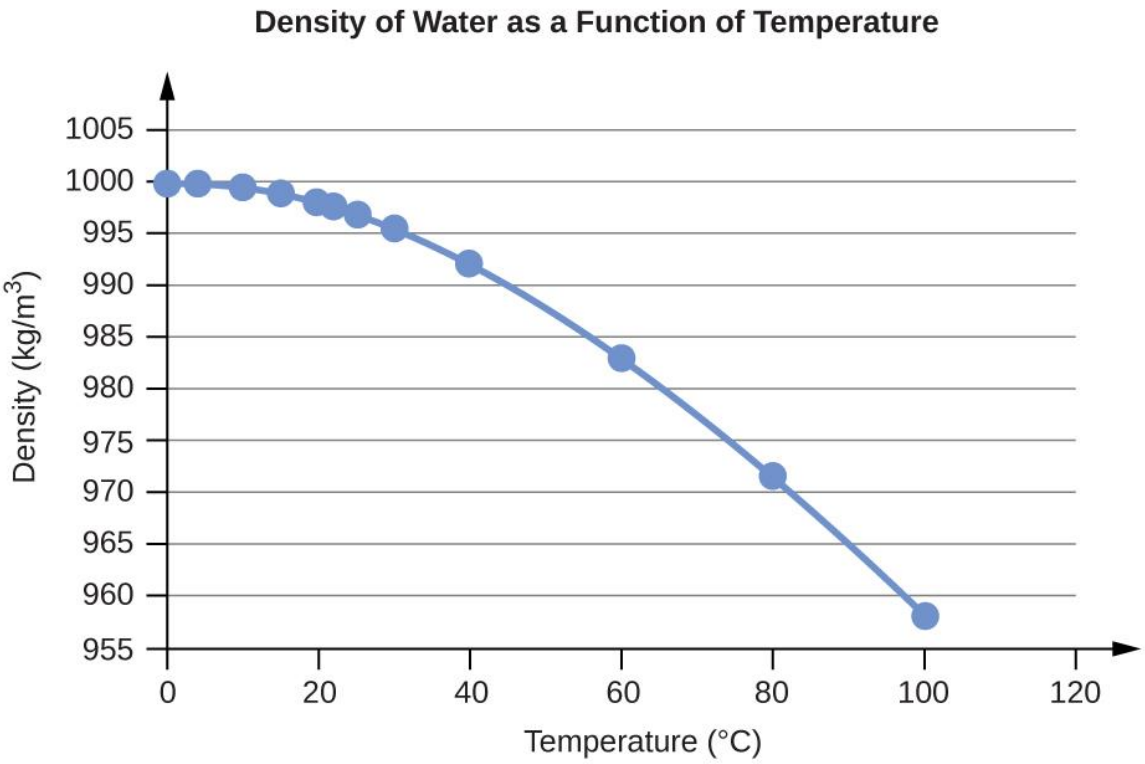
	laboratory techniques used in environmental engineering; knows the methodology of physico-chemical analyses which are the basis for the assessment of water and wastewater quality; knows how to carry out the tests respecting the principles of safety and hygiene	IS1_W07 IS1_U02 IS1_K07
LO4	A graduate has knowledge and is able to use theoretical fundamentals of chemistry to write about chemical reactions, calculations necessary in the course of research and their interpretation	IS1_W02 IS1_U01
LO5	A graduate has knowledge and is able to use the literature, legal acts, subject standards, databases in order to draw conclusions, conduct experiments properly, as well as to evaluate the verification and interpretation of research results obtained	IS1_W07 IS1_U14
LO6	A graduate is ready to analyze content from a variety of sources and to critically evaluate his/her knowledge.	IS1_K01
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	discussions during classes, written tests, exercise reports, oral or written colloquia	L, LC
LO2	discussions during classes, written tests, exercise reports, oral or written colloquia	L, LC
LO3	discussions during classes, written tests, exercise reports, oral or written colloquia	L, LC
LO4	discussions during classes, written tests, exercise reports, oral or written colloquia	L, LC
LO5	discussions during classes, written tests, exercise reports, oral or written colloquia	L, LC
LO6	discussions during classes, written tests, exercise reports, oral or written colloquia	L, LC
Student workload (in hours)		No. of hours
Calculation	Lecture attendance	16
	participation in classes	16
	preparation for classes, projects, seminars, etc.	12
	working on projects, reports, etc.	10
	participation in student-teacher sessions related to the classes/seminar/project	10
	implementation of project tasks	5
	preparation for and participation in exams/tests	12
	TOTAL:	81
Quantitative indicators		HOURS / No. of ECTS credits
Student workload – activities that require direct teacher participation		37 / 1,5

Student workload – practical activities		**53**	**2,1**
Basic references	**1.Manahan S.E. Environmental Chemistry. Taylor & Francis/CRC Press, 2009; 2.Andrews J.E., Brimblecombe P., Jickells T.D., Liss P.S., Reid B. J. An Introduction to Environmental Chemistry. Blackwell Publishing, 2004 3.Miroslav RadojevicVladimir N Bashkin; V. N: Practical environmental analyses, Royal Society of Chemistry (Great Britain), 2006; 4.R M Harrison, P Monks; Stephen J De Mora; J. G Farmer; M. C Graham; C Hulsall; Ian D Pulford: Principles of environmental chemistry, Society of Chemistry (Great Britain) 2007**		
Supplementary references	**Crowe J., BradshawT.,Chemistry for the Bioscience, Oxford University Press, Oxford, 2010.**		
Organisational unit conducting the course	**Department of technology in environmental engineering**	**Date of issuing the programme**	
Author of the programme	**Joanna SzczykowskaPhD Eng.**	**2022**	

L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW - field work, S – seminar


Water Full-Range Spectral Absorption Curve
UV
VIS
Near IR
Mid IR
Far IR
EHF
Absorption (1/m)
10^{8}
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10 nm
100 nm
1 μm
10 μm
100 μm
1 mm
10 mm
Wavelength


Vapor Pressure as a Function of Temperature
Vapor pressure (torr)
800
700
600
500
400
300
200
100
0
0
20
40
60
80
100
120
Temperature (°C)


Density of Water as a Function of Temperature
Density (kg/m3)
1005
1000
995
990
985
980
975
970
965
960
955
0
20
40
60
80
100
120
Temperature (°C)