

Course code: .....

Plan position: .....

### A. INFORMATION ABOUT THE COURSE

#### B. Basic information

Name of course	Instrumental analysis
Field of studies	Agriculture / agrotechnologies
Level of studies	I
Profile of studies	general academic
Form of studies	full-time studies
Specialty	-
Unit responsible for the field of studies	Department of Agriculture and Biotechnology
Name and academic degree of teacher(s)	dr inż. Piotr Wojewódzki (21 h) prof. dr hab. inż. Mirosław Kobierski (9 h)
Introductory courses	No requirements
Introductory requirements	Basic chemistry

#### C. Semester/week schedule of classes

Semester	Lectures (W)	Auditorium classes (Ć)	Laboratory classes (L)	Project classes (P)	Seminar (S)	Field classes (T)	Number of ECTS points
	10	-	20	-	-	-	6

### 2. LEARNING OUTCOME

No.	Learning outcomes description	The reference to the learning outcomes of specific field of study	The reference to the learning outcomes for the area
<b>KNOWLEDGE</b>			
W1	Student knows the basic equipment of the laboratory - small equipment and apparatus		
W2	Student has basic knowledge in the field of instrumental methods of quality analysis of environmental samples		
W3	Student has basic knowledge of selected quality parameters of the environment and agri-food products		
<b>SKILLS</b>			
U1	Can use basic laboratory equipment - pipettes, burettes, analytical weigh, weighing-dryer, magnetic stirrers, aerometer, pycnometer		

U2	Can operate apparatus and devices: AAS, laser particle size analyzer, UV-VIS spectroscope, refractometer, polarimeter, conductivity meter, pH-meter, lyophilizer		
U3	Is able to assess the pH of the analyzed samples, the level of salinity, the content of dry matter and moisture in the samples, examine the angle of refraction and rotation of polarized light in solutions, the concentration of solutions based on absorbance, the density of liquid and solid materials, the granulometric composition of solid samples, contamination of samples (soil) heavy metals		
<b>SOCIAL COMPETENCES</b>			
K1	Student recognizes the progress of knowledge and technology, understands by this the need for permanent learning throughout life.		
K2	Student is aware of knowledge and skills, understands the need for further education in the field of the learned and performed profession.		

### 3. TEACHING METHODS

#### A. Traditional methods used \*\*\*

Lecture, presentation, laboratory work

#### B. Distance learning methods used \*\*\*

**Synchronous method:** not applicable

**Asynchronous method:** not applicable

### 4. METHODS OF EXAMINATION

Test, manual tasks in the laboratory, laboratory tasks - reports

### 5. SCOPE

Lectures	Principles of instrumental analysis of chosen soil quality parameters. Apparatus for X-ray analysis. Determination of heavy metals – atomic absorption spectrometry. Instruments for the analyses of light refraction and rotation in liquid solutions. Instruments for assessing electroconductivity and acidity. Spectrometric methods – the Beer-Lambert law. Instrumental methods for investigation dry mass, water content and density of solid and liquid materials.
Laboratories	<ol style="list-style-type: none"> <li>1. Soil grain size composition</li> <li>2. X-ray analyses of environmental samples</li> <li>3. AAS – analysis of heavy metals / trace elements</li> <li>4. Refractometry</li> <li>5. Polarimetry</li> <li>6. Conductometry</li> <li>7. pH</li> <li>8. UV-VIS spectrometry</li> <li>9. Analysis of water content and dry mass</li> <li>10. Analysis of solids and liquids density</li> </ol>

## 6. METHODS OF VERIFICATION OF LEARNING OUTCOMES

LEARNING OUTCOME	Form of assessment					
	Oral examination	Test	Manual tasks	Laboratory tasks - reports	Presentation	.....
W1		x		x		
W2		x		x		
W3		x		x		
U1			x	x		
U2			x	x		
U3			x	x		
K1				x		
K2				x		

## 7. LITERATURE

Basic literature	<p>Instrumental Techniques for analytical chemistry, ed. Frank Settle, Prentice Hall 1997, <a href="https://www.researchgate.net/profile/Zainab-Raheem-2/publication/334612301_Handbook_Of_Instrumental_Techniques_For_Analytical_Chemistry_PDFDrivecom/links/5d35c955299bf1995b415151/Handbook-Of-Instrumental-Techniques-For-Analytical-Chemistry-PDFDrivecom.pdf">https://www.researchgate.net/profile/Zainab-Raheem-2/publication/334612301_Handbook_Of_Instrumental_Techniques_For_Analytical_Chemistry_PDFDrivecom/links/5d35c955299bf1995b415151/Handbook-Of-Instrumental-Techniques-For-Analytical-Chemistry-PDFDrivecom.pdf</a></p> <p>Principles of Instrumental Analysis, D. Skoog, J. Holler, S.R. Crouch, Cengage, 2017 <a href="https://www.chemcome.com/wp-content/uploads/2020/11/Principles-of-Instrumental-Analysis-7th-edition-Skoog-by-Douglas-A.-Skoog-F.-James-Holler-Stanley-R.-Crouch-z-lib.org_.pdf">https://www.chemcome.com/wp-content/uploads/2020/11/Principles-of-Instrumental-Analysis-7th-edition-Skoog-by-Douglas-A.-Skoog-F.-James-Holler-Stanley-R.-Crouch-z-lib.org_.pdf</a></p>
Supplementary literature	<a href="https://books-library.net/files/download-pdf-ebooks.org-kupd-1928.pdf">https://books-library.net/files/download-pdf-ebooks.org-kupd-1928.pdf</a>

## 8. TOTAL STUDENT WORKLOAD REQUIRED TO ACHIEVE EXPECTED LEARNING OUTCOMES EXPRESSED IN TIME AND ECTS CREDITS

Student's activity		Student workload— number of hours
Classes conducted under a direct supervision of an academic teacher or other persons responsible for classes	Participation in classes indicated in point 1B	30
	Supervision hours	5
Student's own work	Preparation for classes	20
	Reading assignments	20
	Other (preparation for exams, tests, carrying out a project etc)	20
Total student workload		
Number of ECTS points		6