ANALYTICAL TECHNIQUES IN AGRICULTURE AND ENVIRONMENT

1. GENERAL

SCHOOL	AGRICULTURAL SCIENCES		
ACADEMIC UNIT	AGRICULTURE		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	AGRI EX12	**SEMESTER**	7th or 9th
COURSE TITLE	ANALYTICAL TECHNIQUES IN AGRICULTURE AND ENVRONMENT		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
(the credits are awarded for the whole course)	2 (Lectures) + 2 (Lab. work)	5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized General Knowledge (Modern chemical analysis techniques and sensor applications in Agriculture, Environment and Work Safety)
PREREQUISITE COURSES:	There are no prerequisite courses. However, the students should already have a basic knowledge on General & Analytical Chemistry
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be performed in English in case of foreign students
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of*

the European Higher Education Area

- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

By the end of this course the student will be able to:

- understands the terms and basic concepts of real-time monitoring and chemical analysis
- knows the necessity of using sensors in field measurements
- knows the basic chemical sensors as well as sensors measuring physicochemical parameters
- knows the procedures for the calibration and verification of instruments for physicochemical and chemical analysis necessary for the study of environmental and food quality
- deepens the basic concepts of chemical analysis (accuracy, precision, limit of quantification, limit of detection)
- choose the appropriate method and analytical tecnique and design the work plan for the monitoring parameters
- knows the most common analytical techniques in field analyses

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

By the end of this course the student will, furthermore, have developed the following skills (abilities):

- Ability to write and present work related to the subject
- Ability to plan real-time analysis (real-time monitoring)Ability to interact for issues of interdisciplinary nature
- Ability to search specifications for purchase and calibration of analytical instruments
- Ability to properly design a protocol for monitoring physicochemical and chemical parameters in agriculture and the environment
- Study skills needed for continuing professional development

Generally by the end of this course the student will have developed the following general abilities (from the above list)

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Decision-making
Working independently
Team work
Respect for the natural environment
Criticism and self-criticism

3. SYLLABUS

- Basic Concepts in Analytical Chemistry-Real Time Analysis
- Introduction to analytical techniques for field measurements
- Chemical sensors
- Chemical analysts
- Biosensors
- Analytical field devices
- Design a process for monitoring quality parameters in the field
- Specifications and supply of analytical instruments
- Maintenance of analytical instruments
- Calibration of analytical instruments
- Verification of analytical instruments
- ISO17025-Quality Assurance
- ISO17025-Procedures for Accreditation of Analytical Methods

Laboratory Exercises

1. Processing experimental data to assess fidelity and accura
2. Design of an experimental procedure for the measurement of physicochemical parameters in the field (e.g. measurement of pH and conductivity in water
3. Design of a working protocol for the measurement of physicochemical parameters in the field (e.g. measurement of pH and conductivity in water)
4. Chemical sensors based on inorganic and organic polymers
5. Methods of preparing thin film materials for use as sensors
6. Chemical analyzers in chromatographic techniques
7. Fiber optic and fluorescence biosensors
8. Design specifications for the supply of analytical devices for recording physicochemical parameters in the field
9. Calibration of analytical instruments-Examples of calibration
10. Designing specifications for the verification of analytical instruments
11. Design procedures for quality monitoring according to ISO17025
12. Design procedures for the accreditation of analytical methods according to ISO17025

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face. During the course, students are asked to write and present a brief bibliography project on actual pollution problems as well as water quality techniques. Laboratory exercises on the analysis of environmental and water quality parameters.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of ICT (powerpoint) in teaching • Use of ICT (powerpoint) in laboratory exercises • Use of ICT in Student Communication (Learning Support through the e-class platform)
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory*	

Activity	***Semester workload***
Lectures	26
Laboratory practice	26
Writing short lab reports	13

practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc. *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	<table><tr><td>Writing and presentation of a brief project</td><td>13</td></tr><tr><td>Final examination</td><td>3</td></tr><tr><td>Private study time of the students for the lab preparation and final examination</td><td>56</td></tr><tr><td>Course total (25 work load for each ECTS credit)</td><td>125</td></tr></table>
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	1. Project (A) 2. Laboratory work (Average score of individual reports of laboratory exercises) (B) 3. Written final examination (C) *Each case is graded on a scale of 0-10* Final grade (FG): FG = 0.15A + 0.35B + 0.5C *Minimum passing grade: 5 (Grade: 0-10)* Greek language is used. For foreign students (e.g. Erasmus students) it can be done in English In the case of failure, the grade of the work (A) and the individual laboratory exercises (B) is retained and only the final written examination is repeated

5. ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

Skoog, Holler, Crouch, 'Principles of instrumental Analysis', 7th Edition

- *Related academic sources and journals:*

- Standard Methods for the examination of water and wastewater, 24th Edition (2023)
- ISO/IEC 17025