COURSE OUTLINE

1. GENERAL

SCHOOL	School of Plant Sciences		
ACADEMIC UNIT	Department of Crop Science		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**3280**	**SEMESTER**	**7**
COURSE TITLE	PRINCIPLES OF INSTRUMENTAL CHEMICAL ANALYSIS		

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**
Lectures and laboratory exercises	5	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*	specialised general knowledge
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
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*

The objective of the Instrumental Analysis course is to acquaint the students with the modern methods of instrumental chemical analysis at a theoretical and practical level. More specifically in the theoretical courses, emphasis is placed on the principle of each method, on its organization, on the interpretation of the provided graphs or spectra, as well as on the processing of the results for qualitative and quantitative measurements. Particular emphasis is placed at the end on the choice of method/or methods for solving specific analytical practical problems from research or from industrial practice.

The objective of laboratory exercises is to familiarize students with the organization and applications of Instrumental Analysis Methods (which are usually used in research laboratories, in public or private control laboratories). At the same time, laboratory exercises are aimed to:

• The direct connection of theoretical knowledge with practical application.
• Learning how to properly prepare the sample before analyzing it.
• The understanding of the basic operational parameters on which each method of

instrumental analysis depends.
• Learning the correct process of measuring, receiving, processing the data and estimating the final result.
At the same time as the previous ones, students are trained in writing laboratory reports.

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…*
	…….

• Working independently
• Decision making
• Generation of new research ideas
• Production of free, creative and inductive thinking

3. SYLLABUS

1. Introduction to Instrumental Chemical Analysis
2. Sampling- Sample Preparation before analysis
3. Extraction techniques
4. Distillation techniques
5. Chromatographic analysis techniques
6. Gas Chromatography (GC)
7. High Performance Liquid Chromatography (HPLC)
8. Spectroscopic analysis techniques
9. Ultraviolet-Visible Spectrophotometry (UV-Vis)
10. Infrared Spectroscopy (IR)
11. Raman spectroscopy
12. Nuclear Magnetic Resonance Spectroscopy (NMR) (^{1}H, ^{13}C NMR)
13. Mass Spectrometry (MS)
14. Exercises

Laboratory exercises:
Exercise 1 Electronic-computer and network technologies in Chemistry - Stereochemistry
In silico study.
Exercise 2 Ultraviolet Visible Spectroscopy
Quantification of quality characteristics of saffron.
Exercise 3 Infrared Spectroscopy
Determination of functional groups-identification of organic compounds using infrared spectroscopy.
Exercise 4 Raman Spectroscopy
Determination of ethanol and methanol in alcoholic beverages.
Exercise 5 Nuclear Magnetic Resonance Spectroscopy
Determination of compound structure-Interpretation of spectra.
Exercise 6 Obtaining essential oil by distillation
Exercise 7 Gas chromatography – Mass spectrometry
Qualitative and quantitative determination of essential oil components by gas chromatography.
Exercise 8 Liquid chromatography
Separation and quantification of caffeine in soft drink/ stimulants by high performance liquid chromatography.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	*Face-to-face*
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	**Using Powerpoint presentations. Communication with students via e-mail. Learning process support through e-class access, online databases, etc.**
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory 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*	
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.*	I. Final written exam in the theory of the course which includes: 1. Short Answer Questions (40%) 2. Evaluation of theory elements (40%) 3. Problem Solving (20%) II. The examination in the laboratory part of the course consists of: 1. the students' participation in the workshop: a) oral exams before and during the exercises (25%) b) evaluation of laboratory reports processing laboratory results (25%). 2. final written exam (50%): Final exam in the laboratory part of the course which includes: a) Short answer questions b) Multiple choice test

Activity	*Semester workload*
Lectures	40
Laboratory practice	30
independent laboratory work (report of results)	35
Written individual assignments	20
Total	**125**

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Related academic journals:

1. Principles of Instrumental Analysis. D. A. Skoog, F. James Holler, T. A. Nieman (Translation: M. I. Karagiannis, K. I. Efstathiou, N. Haniotakis).
2. ANALYTICAL CHEMISTRY, G. Christian, P. Dasgupta, K. Schug, Odysseus Publishing Ltd.
3. INSTRUMENTAL ANALYSIS, G. N. Jill, G. II M. Robert, Y. M. Hank, S. D. Karl, Broken Hill Publishers.
4. ANALYTICAL CHEMISTRY, LIODAKIS STYLIANOS, A. PAPASOTIRIOU & SIA I.K.E., 2nd edition.
5. P. A. Tarantilis, M. Polysiou, C. Pappas. Instrumental Chemical Analysis, University Notes.