COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF SCIENCES		
DEPARTMENT	DEPARTMENT OF CHEMISTRY		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	EN2	**SEMESTER**	7th or 8th Semester
COURSE TITLE	Bioanalytical Chemistry		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
Theory	3	3
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	• Scientific Area
PREREQUISITES:	No
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	No
COURSE URL:	

(2) LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

Upon successful completion of the course, the student is expected to:

- Understand the fundamental principles underlying modern analytical techniques developed in recent years
- Comprehend the theoretical basis and main applications of bioanalytical chemistry
- Evaluate the performance characteristics and quality parameters of bioanalytical techniques
- Select and successfully apply modern analytical techniques depending on sample type and analytical requirements
- Assess the suitability of each technique for the target analytes
- Interpret and present (bio)analytical data accurately and effectively

Knowledge

- Students will acquire:
- Understanding of modern chromatographic techniques and specialized spectroscopic methods (e.g., ICP, XRF)
- Familiarity with hyphenated and automated analytical techniques, as well as immunochemical and biosensor-based methods
- Knowledge of the advantages and limitations of each analytical technique
- Understanding of method selection criteria according to analytical requirements
- Comprehension of the principles and performance characteristics of bioanalytical methods
- Knowledge of quantitative approaches and validation procedures used in bioanalysis

- Awareness of the scope and application fields of bioanalytical chemistry in environmental, clinical, and food analysis

Competences /Skills

Students will gain:

- Experience in problem-solving and critical evaluation of analytical data.
- Familiarity with good laboratory practice (GLP) and quality assurance systems (ISO/IEC 17025).
- Awareness of ethical issues, safety, and environmental responsibility in bioanalytical work.
- Ability to design analytical methodologies applicable to a wide range of biological samples (solid, liquid, and gaseous matrices).
- Ability to perform analytical determinations effectively, from the stage of sample collection to the presentation and interpretation of results.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,	*Project design and management*
ICT Use	*Equity and Inclusion*
Adaptation to new situations	*Respect for the natural environment*
Decision making	*Sustainability*
Autonomous work	*Demonstration of social, professional and moral responsibility and*
Teamwork	*sensitivity to gender issues*
Working in an international environment	*Critical thinking*
Working in an interdisciplinary environment	*Promoting free, creative and inductive reasoning*
Production of new research ideas	

Through the lectures and laboratory exercises, students are expected to acquire the following general competences:

- Search, analysis, and synthesis of new concepts and information
- Ability to transform theory into practice
- Ability to apply knowledge to solve problems in analytical chemistry
- Presentation, and evaluation of experimental results; quality assurance, etc.
- Capacity for independent work during the collection and processing of analytical parameters
- Ability to collaborate effectively within a team to achieve educational goals
- Decision-making ability
- Ability to exercise critical thinking and self-evaluation
- Ability to work in an interdisciplinary environment
- Acquisition of theoretical and practical knowledge necessary for the further education of students at higher levels of studies

(3) COURSE CONTENT

Theoretical part

Week 1: Introduction to Bioanalytical Chemistry (definition, scope, types of biological samples, challenges in bioanalysis)

Week 2: Quantification and Validation approaches in bioanalysis

Week 3: Quality control and regulatory requirements (FDA, EMA, ISO standards)

Week 4: Sample Preparation of biological samples

Week 5: Separation and Detection Techniques in bioanalysis, Part I (LC and GC-MS)

Week 6: Separation and Detection Techniques in bioanalysis, Part II (High-resolution mass spectrometry (HRMS) and non-targeted screening)

Week 7: Separation and Detection Techniques in bioanalysis, Part III (Capillary electrophoresis and microfluidic systems)
Week 8: Separation and Detection Techniques in bioanalysis, Part IV (ICP-MS in bioanalysis)
Week 9: Biomolecular Methods - Immunochemical Methods
Week 10: Data Processing and Chemometrics
Week 11: Bioanalytical applications I (Determination of pharmaceuticals and metabolites in biological samples, Pharmacokinetic and toxicological applications)
Week 12: Bioanalytical applications, Part II, Biomonitoring of environmental contaminants
Week 13: Bioanalytical applications, Part III, Food and clinical bioanalysis

(4) LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	Workload/semester
Lectures	39
Bibliographic research & analysis	8
Preparation for the final exams	25
Final Exam	3
Total	75

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	**Student evaluation languages** Greek **Method (Formative or Concluding)** Summative **Student evaluation methods** • Multiple-choice questions • True/False questions with clear justification • Short-answer questions • Critical thinking questions • Problem-solving exercises **100**

(5) SUGGESTED BIBLIOGRAPHY

Eudoxus

1. Bioanalytical Chemistry, G. Theodoridis, S. Girousi, G. Zachariadis, A.-S. Zotou, V. Samanidou, *Kallipos Open Academic Editions (Electronic Book),* ISBN: 978-960-603-052-9, Eudoxus Book Code: 320271

2. Pharmaceutical Analysis, D.G. Watson, *Parisianos Publications,* ISBN: 978-960-583-762-4 Eudoxus Book Code: 122087063

3. Introduction to Pharmaceutical Analytical Chemistry, Stig Pedersen-Bjergaard, Bente Gammelgaard, Trine Gronhaug Halvorsen, ISBN: 978-960-583-606-1, Eudoxus Book Code: 102123706

Relevant scientific Journals:

- Analytical Chemistry
- Analytica Chimica Acta
- Analytical Bioanalytical Chemistry
- Journal of Chromatography A
- Journal of Chromatography B
- Journal of Pharmaceutical and Biomedical Analysis
- Analyst
- Analytical Methods
- Analytical Letters
- Journal of Electroanalytical Chemistry
- Microchimica Acta
- Microchemical Journal
- Talanta