COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Biosystems & Agricultural Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	BAE_811	**SEMESTER**	8th
COURSE TITLE	**NANOPARTICLES-NANOBIOTECHNOLOGY AND APPLICATIONS IN AGRICULTURE**		
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	3	
	Tutorials	2	
	Laboratory	0	
	TOTAL	**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*	Background (Fundamental Principles of Environmental Hydraulics & Hydrology) Skills Development (Water quality control)		
PREREQUISITE COURSES:	There are no prerequisite courses.		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek .-For Erasmus students in English		
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*

The course aims at learning and understanding the concepts of Nanobiotechnology, Nanoparticles as well as understanding the applications of nanotechnology and nanoulites in the Agricultural industry. Upon successful completion of the course the student will be able to:

• acquiring knowledge of the basic principles of nanotechnology in Agriculture
• the mathematical ability to describe the phenomena of these scientific fields
• introduction to Nanoparticles and their applications in Agriculture and health sciences
• discussion, critical analysis, synthesis of opinions and suggestions on bioethics problems
• Introduction to reading, understanding and critical evaluation of international scientific literature

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*
	Criticism and self-criticism

Team work	*Production of free, creative and inductive thinking*
Working in an international environment	*……*
Working in an interdisciplinary environment	*Others…*
Production of new research ideas	*…….*

In general, upon completion of this course the student will have further developed the following general skills (from the list above):
Search, analysis and synthesis of data and information, using the necessary technologies
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Respect for the natural environment
Exercise criticism and self-criticism

(3) SYLLABUS

The course involves study of:
1 Nanotechnology and the Environment
2 Nanotechnology and Our Energy Challenge
3 Nanomaterials Fabrication
4 Methods for Structural and Chemical Characterization of Nanomaterials
5 Reactive Oxygen Species Generation on Nanoparticulate Material
6 Principles and Procedures to Assess Nanomaterial Toxicity
7 Nanoparticle Transport, Aggregation, and Deposition
8 Nanomaterials for Remediation
9 Membrane Processes in the foods
10 Nanomaterials as Adsorbents
11 Toxicological Impacts of Nanomaterials
12 Ecotoxicological Impacts of Nanomaterials
13 Assessing Life-Cycle Risks of Nanomaterials

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY
Face-to-face, Distance learning, etc.

Face to face deliveries.
Laboratory exercises in Physical Chemistry

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students

- Use of ICT (power point) in Teaching
- Use of ICT (power point) in Laboratory Training
- Use of ICT in Communication with students (Learning process support through the electronic platform e-class).

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

Activity	***Semester workload***
Lectures	39
Tutorials	26
Writing short reports of laboratory exercises	13
Final Exams	3
Study hours and preparation for the laboratory exercises and the final examination	44
Course total	**125**

STUDENT PERFORMANCE EVALUATION

Description of the evaluation procedure
Language of evaluation, methods of evaluation, summative or conclusive, multiple

1. The laboratories participate by 30% in the final grade. In order to be examined in theory, the student must have completed all the laboratories and have been successfully examined in them.
2. The main assessment criteria focus on understanding and correlating the knowledge that students gain from the course with other knowledge. Particular emphasis is placed on whether they have developed the ability to apply this knowledge to crop selection and to assess the impact of these changes on the

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.*	environment. Emphasis is also placed on demonstrating critical ability and justifying the choices they make in each problem. 3. Evaluation is dynamic. It mainly involves problem solving. is done orally or in writing or with a combination of the two, with or without pre-examination on the basic principles of the course, with or without exculpatory advances and with other test or inventive methods, depending on the composition of the dynamics and the needs of the audience. 4. The above are done in the Greek language. For foreign language students (eg Erasmus students) conducted in English

(5) RECOMMENDED LITERATURE

Suggested bibliography:

- Βιβλίο [77114123]: Νανοδομές - Νανοϋλικά, Κωνσταντίνος Α. Χαριτίδης Λεπτομέρειες

-Complementary bibliography:

- Βιβλίο [73230631]: Bio-Applications of Nanoparticles [electronic resource], Warren C. W. Chan Λεπτομέρειες
- Environmental Nanotechnology: Applications and Impacts of Nanomaterials (1st Ed) M. Wiesner, J.-Y. Bottero, McGraw-Hill Education, 2007.
- Nanobiotechnology in Agriculture: An Approach Towards Sustainability (Nanotechnology in the Life Sciences) 1st ed. 2020 Edition
- Nanotechnology for Agriculture: Crop Production & Protection
- Nanotechnology in Agriculture Energy and Environment