COURSE OUTLINE

1. GENERAL

SCHOOL	Agricultural Sciences		
ACADEMIC UNIT	Animal Production, Fisheries & Aquaculture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**AS_5001**	**SEMESTER**	9^{o} - 10^{o}
COURSE TITLE	Algae culture		

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**
	4 (2h-lectures + 2h lab. training)	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*	Special background
PREREQUISITE COURSES:	Botany, Aquaculture, Hydrobiology
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek, 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 student, at the end of the relevant Learning Process, is able:

To classify macroalgae and recognize basic genera.

To locate the toxic phytoplankton.

To distinguish cyanobacteria from eukaryotic microalgae.

Be able to cultivate microalgae and control their growth.

To distinguish commercial microalgae strains.

To use techniques to isolate species of microalgae from a mixture of species.

Be able to use photobioreactors,

Apply operation protocols.

To recognize and evaluate micro-biotechnology products

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

Respect for the natural environment
Decision making
Autonomous work
Teamwork
Application of knowledge
Search, analyze and synthesize data and information, using the necessary technologies
Adapt to new situations

3. SYLLABUS

1. The algae as primary producers. Glossary.
2. The mechanism of photosynthesis and energy conversions.
3. Biology of microalgae strains of commercial interest (Spirulina, Chlorella, Dunaliella, etc).
4. Biology of macroalgae strains of commercial interest (Porphyra, Laminaria, Undaria, etc.).
5. Applications of macroalgae (Nori, Fycocolloids, Decontamination, Cosmetics, Bioactive Substances).
6. Toxic microalgae.
7. Micro-algae biotechnology (photobioreactors, lagoon technology, extremophiles, life support systems-LSS, pollution abatement
8. Algae culture for food supplements, food products, nutritional dyes, dietary fat, cosmetics, bioactive substances, etc,

9. Innovations of the future (biofuels, fatty acids, desertification, human nutrition, etc.).
10. Identification of cyanobacterial-eukaryotic microalgae-macroalgae.
11. Monitoring biomass production via photobioreactors,
12. Estimating algal productivity.
13. Specific culture of commercial strains (Dunaliella in high-salinity, Spirulina in alkaloid environment, Chlorella in mixotrophic medium). Stains of microalgae (live-dead-carbohydrate-lipid) cells.

Laboratory exercises

1, 2. Recognition by microscopy of the main plant species.
3, 4. Preparation of nutrients for cultivation of microalgae.
5, 6. Techniques for isolation of microalgae species.
7, 8, 9, 10. Microalgal cultures and growth monitoring.
11, 12. Spectrophotometric examination techniques.
13. Calculations on culture growth.

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*	**ICT for teaching and communicating with students**
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*
1. Lectures 2 hours x 13 weeks. 2. Further study, search and study of lecture material, associated with (1) (2 hours x 13 weeks)	26 26
3. Laboratory Exercises 2 hours x 13 weeks. 4. Writing of brief reports of laboratory exercises or laboratory examination related to (3) (1 x 6 hrs) 5. Self-assessment exercises in e-class (1 x 6 weeks) 6. Writing of short work presentation (1 x 13 weeks)	26 6 6 13
7. Hours of study and preparation for laboratory exercises, assessment of progress	19

	(s) and final examination	
	8. Final examination	3
	Course total	***125***

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.*	• Greek (Teaching, Examination) • English (Teaching, Exam) 1. Solving Problems Based on Learned (Formative - Concluding) (A) 2. Report / Report (Concluding) (B) 3. Written Final Examination (Concluding) (C) Each case is graded on a scale of 0-10 Final Grade (TB): 0.3A + 0.2B + 0.5C C takes place during the current exam period, which is taught in the course and its iteration (September) (period where A, B & C scores are maintained). In case of failures of the course the student repeats the educational process.

4. ATTACHED BIBLIOGRAPHY

Suggested Bibliography:

- Voultsiadou, E., Abatzopoulos, Th., Antonopoulou, E., Gania, K., Gelis, S., Staikou, A., Triantaphyllidis, A. 2015. AQUACULTURE - Organizations, production systems, prospects. SEAV, ISBN: 978-960-603-184-7.
- Borowitzka, M. & Borowitzka, L. 1992. Micro-Algal Biotechnology. Cambridge Univ. Press.
- Graham, L., Graham, J. & amp; Wilcox, L. 2011. ALGAE-FYKI. Translation in Greek: Oikonomou-Amilli Athena. Kostarakis Publications, Athens. ISBN: 978-960-87655-9-7.
- FAO, 2015. Cultured Aquatic Species Information Program, Aquaculture Fact Sheets. In: FAO Fisheries and Aquaculture Department [online]. Rome. Available: http://www.fao.org/fishery/culturedspecies/search/en
- Hotos, G. 2016. Plankton Culture. TEI Of Western Greece, Department of Fisheries-Aquaculture Technology. http://www.tay.teiwest.gr/ghotos/wp-content/uploads/sites/11/2018/08/PLANKTON-CULTURE- HOTOS-2016.pdf
- Hotos, G. 2018. Technological Applications of Algae. http://www.tay.teiwest.gr/ghotos/?p=675
- Hotos, G. 2018. Biology - Systematics of the Algae (Part 1). http://www.tay.teiwest.gr/ghotos/?p=691
- Hotos, G. 2018. Biology of Algae (part 2). http://www.tay.teiwest.gr/ghotos/?p=714
- Hotos, G.. 2018. Reproduction of Algae. http://www.tay.teiwest.gr/ghotos/?p=728
- Hotos, G.2018. Phycology-Algal flagella. http://www.tay.teiwest.gr/ghotos/?p=753
- Hotos, G. 2018. Phycology - Acquisition of Inorganic Carbon in Algae. http://www.tay.teiwest.gr/ghotos/?p=773

- Hotos, G. 2019. Phycology - Part 1. The Cell and the Water. http://www.tay.teiwest.gr/ghotos/?p=875

- Hotos, G.2019. Phycology - Part 2. Metabolism, Photosynthesis, Carbon Acquisition, Calcification, Nutrition. http://www.tay.teiwest.gr/ghotos/?p=882

- Hotos, G. 2019. Phycology ics - Part 3. Cyanobacteria. http://www.tay.teiwest.gr/ghotos/?p=901

- - Related scientific journals:

- Phycology

- Aquaculture

- Fisheries Research