COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Biosystems & Agricultural Engineering		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**BAE_807**	**SEMESTER**	**8th**
COURSE TITLE	**MOLECULAR ENZYMOLOGY**		

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	0	
Laboratory	0	
TOTAL	**3**	**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 and Scientific Area
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*

This course aims at acquiring knowledge on:

- The main class of enzymes and on prediction of their catalytic activity.
- The basic principles and key mechanisms of enzymatic catalysis.
- The basic principles of kinetics of enzymatic reactions and the factors affecting the catalytic activity of the enzymes.
- The structural features of the enzymes and structure-catalysis relationships.
- The analysis of kinetic data.
- The principles of enzyme inhibition and the concepts of allosteric activator or inhibitor.
- Enzymes that are molecular targets for drug design.
- Detoxifying enzymes and enzymes that recognize and modify nucleic acids.
- The principles of enzyme engineering and the modification of the enzyme molecule.
- The principles of designing structural modifications on the enzyme molecule by applying biocomputing methods and recombinant DNA technology.
- The principles of designing new forms of enzymes with desired catalytic and structural properties by applying evolutionary methods.

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…*
	…….

At the end of this course the student will have further developed the following general skills:
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
Production of new research ideas
Respect for the natural environment
Criticism and self-criticism
Production of free, creative and inductive thinking

(3) SYLLABUS

- Principles of enzymology (Historical background, nomenclature and classification of enzymes)
- Enzyme kinetics (The principles of enzyme kinetics, kinetic parameters and reaction equilibrium, Michaelis-Menten equation and methods of plotting enzyme kinetics data).
- Effect of pH and temperature on enzyme stability and activity.
- Isotopes in enzyme reaction rate determination
- Enzyme engineering (Molecular dynamics and mechanics, structural rearrangements and fluctuations of the enzyme molecule).
- The principles of designing structural modifications on the enzyme molecule.
- Molecular methods for in vitro directed and random mutagenesis.
- The principles of designing new forms of enzymes with desired catalytic and structural properties by applying evolutionary methods.
- High-throughput screening methods for enzyme selection.
- De novo design of new functional enzymes.
- Chemical modification of enzyme structure.
- Applications of engineered enzymes in agriculture.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures in the amphitheatre.
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 Tutorial 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*	

Activity	*Semester workload*
Lectures	39
Tutorials	

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*	Writing short reports of laboratory exercises- Exams	41
	Study hours and preparation for the laboratory exercises and the final examination	45
	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.*	1. The examination in the theory of the course is done with a comprehensive questioner or a multiple-choice questioner that focus on the understanding of the course giving weight to the student's critical ability. 3. Oral exams may take place in cases of students who have been exempted from the writing exams and always the same time and day as the writing exams. 4. The above are done in the Greek language. For foreign language students (eg Erasmus students) conducted in English	

(5) ATTACHED BIBLIOGRAPHY (In Greek)

- Suggested bibliography:

15. Ιωάννης Κλώνης (2007) Ενζυμολογία, Έμβρυο.
16. Yon-Kahn, Jeannine, Hervé, G. (2010) Molecular and Cellular Enzymology. Springer USA.
17. Hans Bisswanger (2011) Practical Enzymology, 2nd Edition, Wiley-Blackwell.
18. Sheldon J. Park, Jennifer R. Cochran (2010) Protein Engineering and Design. Taylor and Francis Group.
19. Stefan Lutz, Uwe T. Bornscheuer (2011) Protein Engineering Handbook, Volume 1 & Volume 2, Wiley-VCH Verlag GmbH & Co. KGaA.

-Suggested journals:

1. Biochimica et Biophysica Acta (BBA) - Protein Structure and Molecular Enzymology
2. Journal of molecular catalysis
3. Journal of molecular recognition
4. Biochemical journal
5. The journal of biological chemistry
6. Protein Engineering, Design and Selection