COURSE OUTLINE

(1) GENERAL

SCHOOL	Agricultural Sciences		
ACADEMIC UNIT	AGRICULTURE		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	AGRI EX17	**SEMESTER**	7th or 9th
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	2	
Tutorials	2	
Laboratory	0	
TOTAL	**4**	**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*	Skills Development
PREREQUISITE COURSES:	There are no prerequisite courses. However, students must have basic knowledge of General and Inorganic Chemistry, Organic Chemistry, Agricultural Physical Chemistry
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek .-For Erasmus students in English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/

(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 purpose of the course is to acquaint the students with enzyme purification techniques, their mechanisms of action as well as possible molecules that can be used to inhibit them. Additionally, applications of the kinetics and inhibition of enzyme reactions are emphasized. Upon successful completion of the course, the student will be able to: • Knows the basic categories of enzymes and can predict their catalytic action. • Knows the basic principles and main mechanisms of enzyme catalysis. • Understands the basic principles of enzyme reaction kinetics and the factors that influence it. • Deepens his knowledge of the structure of enzymes and the structure-catalysis relationship. • Evaluates and analyzes kinetic data and kinetic constants for an enzyme. • Knows the principles of enzyme inhibition and the concepts of activator-allosteric modifier. • Knows enzymes that are molecular targets for drug design. • Knows the defense enzymes of organisms and the enzymes that recognize and modify nucleic

acids. • Understands the principles of enzyme engineering and modification of the enzyme molecule. • Designs molecular modifications to the enzyme molecule by applying biocomputational methods and recombinant DNA technology. • Designs new forms of enzymes with desired catalytic and structural characteristics by applying evolutionary principles.

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, analysis and synthesis of data and information, also using the necessary technologies
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Generating new research ideas
Respect for the natural environment
Exercise criticism and self-criticism
Promotion of free, creative and inductive thinking

(3) SYLLABUS

1. General principles of enzymology (Historical review, nomenclature and classification of enzymes).
2. Kinetics of enzymes (Basic principles of the kinetics of enzyme reactions, kinetic constants and order of enzyme reactions, equilibrium point, Michael-Menten equation, evaluation and analysis of kinetic data and kinetic constants).
3. Effect of temperature, pH and substrate concentration on the speed of the enzyme reaction.
4. Isotopes in the study of enzyme mechanisms.
5. Enzyme engineering (Molecular dynamics and mechanics, structural rearrangements and movements of the enzyme molecule).
6. Principles of reengineering the molecular and functional characteristics of the enzyme molecule.
7. Molecular methods of in vitro directed and random mutagenesis.
8. Design of new forms of enzymes with desired catalytic and structural characteristics, applying evolutionary principles.
9. Methods for ultra-rapid selection of mutant enzyme forms.
10. Hybrid and artificial enzymes. De novo creation of new functional enzymes.
11. Chemical modification of enzymes.
12. Applications of enzymes (Applications in Brewery, Juice factories, Wineries, Fats and oils industry, production of dairy products)
13. animal feed and pesticides industry.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face deliveries.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of ICT (power point) in Teaching • Video presentation • 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*	
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	1. The main assessment criteria focus on understanding and correlating the knowledge that students gain from the course with knowledge from other courses. The evaluation is continuous and dynamic. It mainly includes short project work, solving problems or answering open questions. Exams are conducted orally or in writing or a combination of the two, with or without pre-examination of the key topics of the course, with or without progressions and by other inventive methods, depending on the dynamics and the needs of the audience

Activity	***Semester workload***
Lectures	26
Tutorials	26
Study and literature survey	30
Exams	10
Unguided study	33
Course total	**125**

(5) RECOMMENDED LITERATURE in Greek

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

Scientific 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