**COURSE OUTLINE**

1. **GENERAL**

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| **SCHOOL** | HEALTH SCIENCE |
| **ACADEMIC UNIT** | DEPARTMENT OF BIOLOGICAL APPLICATIONS AND TECHNOLOGIES |
| **LEVEL OF STUDIES** | undergraduate  |
| **COURSE CODE** | **ΒΕΕ717** | **SEMESTER** | **7 AND 9** |
| **COURSE TITLE** |  LABORATORY OF ΕΝΖΥΜΕ BIOTECHNOLOGY AND NANOBIOTECHNOLOGY |
| **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** |
|  | 3 | 4 |
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| *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* | Specialised general knowledgeSkills Development |
| **PREREQUISITE COURSES:** | BIOCHEMISTRY |
| **LANGUAGE OF INSTRUCTION and EXAMINATIONS:** | Greek |
| **IS THE COURSE OFFERED TO ERASMUS STUDENTS** | Yes |
| **COURSE WEBSITE (URL)** | http://ecourse.uoi.gr/enrol/index.php?id=420 |

1. **LEARNING OUTCOMES**

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| **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*
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| The aim of the course is the understanding the basic techniques and methods of enzyme Biotechnology and Nanobiotechnology and especially biotechnological applications and processes at the nanoscale.This course presents the basic techniques and methodologies such methods for investigation the structure and function of enzymes, immobilization of enzymes and cells in nanomaterials and organized nanostructures, biocatalysis in nonconventional systems and development nanobiocatalytic processes for producing high added value products, the development of biosensors and cell biofuels.Upon completion of this course, students will be able to understand the basic techniques and methods of Enzyme Biotechnology and Nanobiotechnology |
| **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…**…….* |
| Search for, analysis and synthesis of data and information, with the use of the necessary technology Working independently Team work |

1. **SYLLABUS**

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| 1. Application of pymol a molecular modeling program for the study of the structure of enzymes. 2 Methods for the determination of enzyme activity in aqueous solutions and organized nanostructures3. Biocatalytic processes and nanobiovcatalytic systems in non conventional media4. Determination of enzymes thermostability 5. Investigation of the structural and functional characteristics of the enzymes by expasy database, and other databases6. Isolation of tyrosinase from mushrooms and preparation of crosslinked enzyme aggregates (cleas) 7. Determination of the kinetic constants of the enzyme using the program Enzyme Iab8. Identification of structural features enzymes in organized nanostructures with the technique of circular dichroism, UV-Vis spectroscopy and fluorescent spectroscopy |

1. **TEACHING and LEARNING METHODS - EVALUATION**

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| **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* | Use of specific educational software for enzyme structure and function analysis Use of various enzymes databases. Support the learning process through the electronic platform e-course Electronic communication 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* |

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| ***Activity*** | ***Semester workload*** |
| laboratory practice | 24 |
| Project | 35 |
| Study and analysis of bibliography | 41 |
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| Course total  | 100 |

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| **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.* | *short-answer questions, (60%)**problem solving, written work, (40%)* |

1. **ATTACHED BIBLIOGRAPHY**

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| *- Suggested bibliography:**- Related academic journals:*Practicum of Enzyme Biotechnology and Nanobiotechnology H. Stamatis University of Ioannina press 2015 Enzyme Biotechnology I Clonis UCP Basic Biotechnology, Third Edition Edited by Colin Ratledge , Bjørn Kristiansen, 2006, Cambridge University Press Biotechnology, Academic Cell Update David P. Clark, Nanette J. Pazdernik 2012 Elsevier IncMODERN BIOTECHNOLOGY Connecting Innovations in Microbiology and Biochemistry to Engineering FundamentalsNathan S. Mosier, Michael R. Ladisch, 2009 by John Wiley & Sons*Related academic journals:*Journal of Molecular Catalysis B: Enzymatic, - Applied Biochemistry and Biotechnology, - Journal of Chemical Technology and Biotechnology, - Βiocatalysis and Βiotransformation - Enzyme and Microbial Technology- Biotechnology Progress- Journal of Applied and Polymer Science- Process Biochemistry- Biotechnology and Βioengineering- Food Biotechnology- European Journal of Lipid Science and Technology- Journal of Biochemical Engineering- Bioresource Technology- International Journal of Biological Macromolecules- Colloids and Surfaces B Biointerfases - Microbial Cell Factories- Biochemical Engineering Journal- ISRN Biotechnology- Journal of Biomolecules- Trends in Biotechnology- Small- Nanobiotechnology |