**COURSE OUTLINE**

1. **GENERAL**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **SCHOOL** | HEALTH SCIENCE | | | | |
| **ACADEMIC UNIT** | DEPARTMENT OF BIOLOGICAL APPLICATIONS AND TECHNOLOGIES | | | | |
| **LEVEL OF STUDIES** | undergraduate | | | | |
| **COURSE CODE** | **ΒΕΥ602** | **SEMESTER** | | **6** | |
| **COURSE TITLE** | BIOTECHNOLOGY | | | | |
| **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** |
|  | | | 6 | | 7 |
|  | | |  | |  |
|  | | |  | |  |
| *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:** |  | | | | |
| **LANGUAGE OF INSTRUCTION and EXAMINATIONS:** | Greek | | | | |
| **IS THE COURSE OFFERED TO ERASMUS STUDENTS** | Yes | | | | |
| **COURSE WEBSITE (URL)** | http://ecourse.uoi.gr/course/view.php?id=419l | | | | |

1. **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 is the basic introductory course on the concepts of biotechnology. The aim of this course is the understanding the basic principles governing the  Biotechnology and particularly the fields such as the application of enzymes and microorganisms for the production of high added value biotechnological products (pharmaceuticals, medicals, nutraceutical, specialty chemicals, biofuels, etc.), food production, environmental protection and agriculture. This course presents the basic biotechnological techniques and methodologies such as cultivation of microbial, animal and plant cells for the production of biotechnological products, recombinant DNA technology techniques, enzymes and cells immobilization methods, protein engineering approaches, biotransformations and bioseparations. Emphasis is given to the methods for the improving of the properties of enzymes and use of cells as cell factories for the production of biotechnological products.  Upon completion of this course, students will be able to understand the contribution of biotechnology for the production of improved products and goods (such as food, medicals, specialized biomolecules and high added value products, biofuels, etc.), protection of environment, and the contribution for the improvement the quality of life  Moreover students will be trained in basic cell growth techniques, bioreactors, isolation and characterization of biotechnological products, enzyme immobilization, development of bioprocesses and analysis of the function of gene and proteins by bioinformatic tools. | |
| **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**

|  |
| --- |
| Theory  • Microbial fermentations - Microbial Production of Biotechnological Products  • Bioreactor Operation  • Basic principles of recombinant DNA technology-DNA engineering  • Biotechnological products from genetically modified organisms  Synthetic biology  • Production and Purification of Enzyme  • Industrial Applications of Enzymes  • Basic principles of protein and enzyme engineering  • Biocatalytic processes and bioconversion  • Immobilization of enzymes and cells  • Biotechnological Products Recovery  • Technology Monoclonal Antibodies -  • Selected biotechnological products (monocyte protein, biofuels, bioplastics, polysaccharides, antibiotics and drug molecules, therapeutic proteins, vaccines)  • Environmental Biotechnology Applications (bioremediation, biodegradation of wastes and pollutants)  • Nanobiotechnology  • Cultures of plant and animal cells, Transgenic Animals and Plants  •Gene therapy  • Social and Ethical Perspectives on Biotechnology  Laboratory Exercises  Exercise 1 Determination of cell growth  Exercise 2 Bioreactor function  Exercise 3 Simulation of penicillin production in bioreactor  Exercise 4 Isolation enzymes  Exercise 5 Simulation of protein purification using Protein Iab software  Exercise 6 Environmental biotechnology applications: Enzymatic hydrolysis of cellulosic waste  Exercise 7: Immobilization of cells and enzymes in natural biopolymers -application for the production of bioethanol  Exercise 8: Enzymes in organized nanostructures. Biocatalytic hydrolysis of triglycerides and production of biodiesel in reverse micelles  Exercise 9 Application of bioinformatics tools for the investigation of gene and protein function |

1. **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* | Use of specific educational software for the simulation of bioreactors operation and for protein purification Use of various protein and gene 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* | |  |  | | --- | --- | | ***Activity*** | ***Semester workload*** | | Lectures | 39 | | laboratory practice | 27 | | seminars | 25 | | projects | 24 | | Study and analysis of bibliography | 60 | |  |  | |  |  | |  |  | |  |  | | Course total | ***175*** | |
| **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.* | written work, short-answer questions, , problem solving (60%)  laboratory work (10%)  multiple choice questionnaires (15%)  public presentation of project (15%) |

1. **ATTACHED BIBLIOGRAPHY**

|  |
| --- |
| *- Suggested bibliography:*  *- Related academic journals:*  Basic Biotechnology H. Stamatis University of Ioannina press 2015  Laboratory of Biotechnology Practicum 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 Inc  MODERN BIOTECHNOLOGY Connecting Innovations in Microbiology and Biochemistry to Engineering Fundamentals  Nathan 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 |