COURSE OUTLINE

(1) GENERAL

SCHOOL	Health Sciences		
ACADEMIC UNIT	Department of Biological Applications & Technology		
LEVEL OF STUDIES	*Undergraduate*		
COURSE CODE	BEE808	**SEMESTER**	8th
COURSE TITLE	Research Methods in Genetic Engineering		

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, Laboratory courses	5	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*	Elective Course (Specialised general knowledge / Skills Development)
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
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 aim of this laboratory course is to provide theoretical and practical training in molecular biology and genetics techniques as well as to familiarize the students with modern technologies and research methodologies of Genetic Engineering. Special emphasis is placed on understanding how the basic knowledge of Molecular Biology and Molecular Genetics can be applied to generate new knowledge and new technology, both for the better understanding of fundamental biological mechanisms, and the development of more sophisticated technologies which are used in an ever-increasing number of applications in our life.

After the course, the students (*according to the descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning*):

a. will have knowledge of the tools and modern technologies used in genetic engineering
b. should be able to understand the details of designing and interpreting a molecular biology experiment in a relevant research lab
c. will have increased their confidence and competences to carry out laboratory

work

d. will have learned to perceive their own weaknesses and circumvent potential failed experiments
e. will be able to comprehend the value of interdisciplinary approaches in Science

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
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
- Adapting to new situations
- Decision-making
- Working independently
- Team work
- Criticism and self-criticism
- Production of free, creative and inductive thinking

(3) SYLLABUS

1. A New Toolbox for Recombinant DNA

Methods for rapid and accurate assessment of gene regulation. Useful sequences can be appended to DNA molecules and specific mutations can be generated by synthetic oligonucleotides. Recombination technologies allow rapid exchange of DNA fragments. Advanced systems for the conditional induction of gene expression. Precise genetic alterations using specific recombinases and mechanisms of homologous recombination. Transfer of embryonic stem cell lines into embryos to produce chimeric mice with germline transmission.

2. Genetic Interference by the Use of Appropriate Genetic Elements and the Employment of Basic Mechanisms of Gene Regulation

Te use of transposons as genetic tools for mutagenesis and transgenesis in organisms representing established genetic models. A transposon is resurrected for mutation experiments in mammalian cells. Employment of the RNAi machinery for the knock-down of gene expression in many different organisms. Selective modulation of gene function by miRNAs.

3. From Genome Sequence to Gene Functions

mRNA profiling with microarrays reveals new relationships beween cellular pathways. Chromatin immunoprecipitation and other genome-wide methods can be used to assay modifications in the structure of chromatin in living cells. Determine the locations of proteins in cells and tissues. Arrayed antibodies are used to measure protein levels in cells.

4. The Contribution of Genetic Engineering in Understanding the Genetic Basis of Diseases

Recombinant DNA techniques allow the identification of genes that are responsible for human diseases. The contribution of genetic engineering for targeting growth factor receptors in cancer cells. Microarrays and new technologies offer large scale sequence-based diagnosis. Comparative analysis of mouse models and genomic analysis lead to the discovery of new oncogenes.

5. DNA Fingerprinting

Hypervariable or variable tandem repeat loci can be used to identify genetically associated individuals. Short tandem repeats become the standard for forensic applications.

Mitochondrial DNA profiling. Multiplex PCR amplification and fluorescent tags are used to analyze the profile of tandem repeats.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face, in the lecture halls, the learning laboratories and in the Lecturer's office
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of powerpoint presentations for teaching, computer software for the laboratory training, announcements at the Department's website, direct communication with students through e-mails
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 – Experiments	95
Lab book writing	18
Study and analysis of bibliography	12
Poster Presentation Workshop	25
Course total	150

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.*	*Language of evaluation*: Greek *Method of evaluation:* I. Written test (60%) II. Performance of the student in the laboratory activities and poster presentation (40%)

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- Watson JD, Caudy AA, Meyers RM, Witkowski ***Recombinant DNA: Genes and Genomes*, Ανασυνδυασμένο DNA**, 2007, Ακαδημαϊκές Εκδόσεις Ι. Μπάσδρα & Σία Ο.Ε. ISBN 978-960-88412-5-3
- Benjamin Lewin ***Genes VIII***, 2004, Ακαδημαϊκές Εκδόσεις Ι. Μπάσδρα & Σία Ο.Ε. ISBN 978-960-99895-9-6