COURSE OUTLINE "CHEMICAL BIOLOGY"

1. GENERAL

SCHOOL	NATURAL SCIENCES AND HEALTH SCIENCES		
ACADEMIC UNIT	CHEMISTRY AND MEDICINE		
LEVEL OF STUDIES	POSTGRADUATE (MSc)		
COURSE CODE	CHB 202	**SEMESTER**	SECOND
COURSE TITLE	CHEMICAL BIOLOGY		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures		4	5
COURSE TYPE	Special Background (Semi-optional course)		
PREREQUISITE COURSES:	There are not prerequisite courses. It is, however, recommended that students should at least have basic knowledge of Organic Chemistry and Biochemistry.		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. The powerpoint material of the course is however in English. Teaching may be performed in English in case of foreign students participate in the postgraduate program.		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	-		

2. LEARNING OUTCOMES

Learning outcomes

At the end of this course student should be able to:

- Apply the chemical biology approach, which often starts with the analysis of a biological phenomenon in order to deduce structural information, for instance about biomacromolecules or small molecules which interact with them. Whereas traditional disciplines, such as organic chemistry and biochemistry, have a vertical focus, applying techniques to discipline specific questions, chemical biology has a more horizontal focus, borrowing tools from organic chemistry, biochemistry, analytical chemistry, molecular biology, structural biology and/or cell biology to study biological questions at the molecular level.
- On the basis of this information, unsolved chemical / biological problems are identified and the ability of the synthetic chemist to design and prepare tailor-made reagents and tool compounds, that is proteins equipped with reporter groups and tags or potent and selective small molecule modulators of protein functions and interactions, is employed as key enabling technology for subsequent research.
- To determine the biochemical and biophysical properties of these reagents for the proper design and execution of biological experiments, giving new insights into the originally motivating biological phenomenon.

General Competences

By the end of this course the student will, furthermore, have developed the following skills (abilities):

- Ability to demonstrate knowledge and understanding of the essential facts, concepts, theories and applications related to the Chemical Biology, which is an area of research in which chemical and biological concepts and tools interact synergistically in the pursuit of new

discoveries or technologies.

- Ability to apply this knowledge and understanding to solve problems related to the Chemical Biology of non-familiar nature
- Ability to apply this knowledge for understanding other biological processes
- Ability to adopt and apply methodology for solving non-familiar problems
- Study skill needed for continuous professional development
- Ability to interact with others in solving problems of chemical/biochemical or multidisciplinary nature

Generally, by the end of this course the student will have developed the following general abilities:

- 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
- Working in an interdisciplinary environment

3. SYLLABUS

Lectures of selected studies-cases (CS, case-studies) of Chemical Biology such as:

- NATIVE CHEMICAL LIGATIONS-A TOOL FOR CHEMICAL PROTEIN SYNTHESIS
- CLICK CHEMISTRY IN CHEMICAL BIOLOGY
- THE INTRODUCTION OF CHEMICAL REPORTER GROUPS BY BIO-ORTHOGONAL LIGATION REACTIONS FOR THE IMAGING OF CELL-SURFACE GLYCANS
- THE USE OF PHOTOAFFINITY LABELING FOR THE IDENTIFICATION OF THE BINDING SITE OF THE ANTIBIOTIC LINEZOLID
- NUCLEIC ACIDS-BASED THERAPEUTICS: FROM SMALL MOLECULE MODULATORS TO GENE THERAPY APPROACHES
- THE CASE OF STI571 (GLIVEC) SUSPENSION IN PDGFR AND C-KIT SUSPENSION IN CHRONIC MELLIGNATIVE MATHEMATICS (CML) AND GASTRIC GASTRIC
- AROMATHASES IN THE TREATMENT OF HORMONOLOGY BREAST CANCER
- MODULATION OF PROTEIN-PROTEIN INTERACTIONS BY SMALL MOLECULES
- MICROARRAY-BASED STRATEGIES TO IDENTIFY UNKNOWN PROTEIN INTERACTIONS
- REAL-TIME AND CONTINUOUS SENSORS OF PROTEIN KINASE ACTIVITY UTILIZING CHELATION-ENHANCED FLUORESCENCE
- SELECTIVE TARGETING OF PROTEIN INTERACTIONS MEDIATED BY BET BROMODOMAINS

4. TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	Face to face	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of ICT (powerpoint) in teaching and in the communication with the students.	
TEACHING METHODS	***Activity***	***Semester workload***

	Lectures	32
	Final examination	6
	Private study of the course material throughout the lecturing period. Collaborative problem-solving work by the students working in teams of two, following the end of lecturing period. Preparation for the final examination.	87
	Course total ***(25 work load for each ECTS credit)***	***125***
STUDENT PERFORMANCE EVALUATION	1. Following the end of the lecture period, a collaborative problem-solving work from the Chemical Biology research area (including synthetic organic chemistry, biochemistry, structural biology, pharmaceutical chemistry) is presented (using ICT) by each pair of students. This work includes two problems – the chemical and the biological - based on the taught material. 2. Oral examination on the material of the work of each student individually by a three-member committee. The committee evaluates the quality of the ICT, the presentation and the overall performance of each student. Greek grading scale: 1 to 10. Minimum passing grade: 5. Grades ≤ 3 correspond to ECTS grade F. Grade 4 corresponds to ECTS grade FX. For the passing grades, the following equivalence normally holds with the ECTS passing grades: 5 = E, 6 = D, 7 = C, 8 = B and ≥ 9 = A 3. Examination is delivered normally in Greek. Examination may be given in English, if foreign students attend the course. 4. Students with writing problems can be examined orally at the same day and hour with the written examination.	

5. ATTACHED BIBLIOGRAPHY *(apart from the literature provided during each lecture)*

1. H. Waldmann, P. Janning, "Chemical Biology: Learning through Case Studies", Eds., Wiley-VCH, Weinheim, 2009.
2. H. Waldmann, P. Janning, "Concepts and Case Studies in Chemical Biology", Eds., Wiley-VCH, Weinheim, 2014.
3. H.C. Kolb, M.G. Finn, and K. Barry Sharpless, 'Click Chemistry: Diverse Chemical Function from a Few Good Reactions', *Angew. Chem. Inter. Ed.*, 2001, *40*, 2004-2021 and references cited therein.
4. C.R. Becer, R. Hoogenboom, and U.S. Schubert, 'Click Chemistry beyond Metal-Catalyzed Cycloaddition', *Angew. Chem. Inter. Ed.*, 2009, *48*, 4900-4908 and references cited therein.
5. a) C.R. Bertozzi et al, *J. Am. Chem. Soc.*, 2008, *130*, 11486-11493; b) C.R. Bertozzi et al, *J. Am. Chem. Soc.*, 2010, *132*, 3688-3690 and references cited therein.
6. G.J. Boons et al, *Angew. Chem. Int. Ed.*, 2008, *47*, 2253-2255.
7. J.M. Fox et al, *J. Am. Chem. Soc,* 2008, *130*, 13518-13519.
8. K.N. Houk et al, *J. Am. Chem. Soc,* 2012, *134*, 17904-17907.