

COURSE OUTLINE

(1) GENERAL

SCHOOL	NATURAL SCIENCE		
ACADEMIC UNIT	BIOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE - ELECTIVE		
COURSE CODE	BIO_GE06	SEMESTER	5/7
COURSE TITLE	PHYSICAL CHEMISTRY		
INDEPENDENT TEACHING ACTIVITIES <i>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</i>	WEEKLY TEACHING HOURS	CREDITS	
	3 (lectures)	3	
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>			
COURSE TYPE <i>general background, special background, specialised general knowledge, skills development</i>	Field of Science (Physical Chemistry)		
PREREQUISITE COURSES:	There are not prerequisite courses		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching could be performed in English, in case foreign students attend the course		
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*

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

- Have a concise knowledge on the basic concepts of Kinetics and Thermodynamics.
- Distinguish between a descriptive and an interpretative theory
- Describe how a descriptive and how an interpretative theory emerges. 4. Predict the ideal gas behavior and interpret deviations of real gasses from it.
- Predict the phase changes of a system consisting of one component.
- Interpret physical phenomena, such as diffusibility of gasses, osmosis and boiling point elevation after dissolving a nonvolatile solid.

- Assemble a distillation apparatus (simple or fractional) and interpret how the separation of the different components of a mixture can be performed.
- Predict the reactions spontaneity at constant T and P.
- Explain the significance of a rate law and the rate constant of a reaction.
- Integrate the rate laws for first- and second order reactions.
- Write the rate laws for elementary unimolecular and bimolecular reactions.
- Write the Arrhenius equation and use it for the Arrhenius equation parameters calculation.
- Understand and use the steady-state approximation for simplifying the analysis of a kinetic scheme.
- Describe the Michaelis-Menten mechanism of enzyme action.

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...

.....

At the end of the course the student will have further developed the following skills/competences:

- Ability to demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating physical chemistry
- Ability to apply such knowledge and understanding to the solution of qualitative and quantitative problems nature.
- Ability to adopt and apply methodology to the solution of unfamiliar problems.

Ability to interact with others on inter- or multidisciplinary problems

(3) SYLLABUS

- **Scientific Method, the method by which Science advances:** Kinetic Molecular Theory, as an example of a descriptive theory. Formulating a theory starting from empirical laws. The Ideal Gas Law as an outcome of Scientific Method. Interpretation of empirical laws and predictions of ideal gas behavior. Real gasses (virial and van der Waals equations).
- **Thermodynamics, as an example of an interpretative theory:** Basic definitions needed to describe a thermodynamic system. The First Law of Thermodynamics. The principle of maximum Entropy and the second Law of

Thermodynamics. Equilibrium conditions, spontaneous changes and equilibrium. Legendre's transformations. Definition and properties of new thermodynamic functions (F, H and G). Thermodynamic degrees of freedom. Gibbs-Duhem equation. Phase diagrams of pure substances and ideal solutions. The freezing point depression and boiling point elevation. Osmotic pressure. The temperature composition diagram and fractional distillation. Spontaneous Reactions at constant T and P.

- **Empirical rate laws:** Reaction rates. Reaction order and molecularity. Rate constant of a reaction. Order determination of a reaction: The integrated method. The Differential Method. Rate laws from the mechanism of a reaction. The steady-state approximation. The temperature dependence of reaction rates. Theories of elementary reactions.
- **Kinetic of enzyme catalyzed reaction-**The Michaelis - Menten mechanism. Temperature dependence of the rate of enzyme catalyzed reactions. Concentration dependence of rate of enzyme catalyzed reactions. The pH influence on the rate of enzymes' reactions.

(4) TEACHING and LEARNING METHODS - EVALUATION

<p style="text-align: center;">DELIVERY <i>Face-to-face, Distance learning, etc.</i></p>	<ul style="list-style-type: none"> Lectures using slides for overhead projector and/or power-point presentations. Problem-solving seminars for the instructive solution of synthetic problems. 	
<p style="text-align: center;">USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i></p>	<ol style="list-style-type: none"> Lectures are supported by problem-solving modules, which are not compulsory. Students who have attended successfully these modules, get a bonus if they secure the minimum passing mark in the final written examinations. Written examination 	
<p style="text-align: center;">TEACHING METHODS <i>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.</i></p> <p><i>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</i></p>	<i>Activity</i>	<i>Semester workload</i>
	<ul style="list-style-type: none"> Lectures (3 conduct hours per week × 13 weeks) Problem solving by students 	39
	Hours for private study of the student and optional problems solving given in each lecture	33
	Final written examination at the end of semester (3 conduct hours × 1 time)	3
Course total	75	
<p style="text-align: center;">STUDENT PERFORMANCE EVALUATION <i>Description of the evaluation procedure</i></p> <p><i>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</i></p> <p><i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></p>	<ul style="list-style-type: none"> Lectures are supported by problem-solving modules, which are not compulsory. Students who have attended successfully these modules, get a bonus if they secure the minimum passing mark in the final written examinations. Written examination Greek grading scale: 1-10. Minimum passing grade: 5. Grades ≤ 3 corresponds to ECTS grade F and grade 4 to FX. For the passing grades the following correspondence normally holds: 5 = E, 6 = D, 	

	$7 = C, 8 = B \text{ and } \geq 9 = A.$
--	---

(5) ATTACHED BIBLIOGRAPHY

- - *Suggested bibliography:* «Physical Chemistry» G. Karaiskakis, Eds.: P. Travlos-E. Kostarakis, Athens, 1995.
- «Physical Chemistry», N. Katsanos, Ed. Papazisi, 3rd ed. έκδοση, Athens 1993.

- *Related academic journals:* “Atkins’ Physical Chemistry” P. Atkins and J. de Paula, 8th ed., Oxford University Press, 2006.