

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF EDUCATION		
ACADEMIC UNIT	DEPARTMENT OF PRIMARY EDUCATION		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE	ΔΦΕ-Υ5	SEMESTER	B
COURSE TITLE	Teaching Concepts of Science in Laboratory		
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	10	
<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>	Special background, skills development		
PREREQUISITE COURSES:	No		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)			

(2) LEARNING OUTCOMES

<p>Learning outcomes</p> <p><i>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</i></p> <ul style="list-style-type: none"> • 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 						
<p>By the end of the course, students should be able:</p> <ol style="list-style-type: none"> 1. To experiment in laboratory settings in terms of physics teaching. 2. To use the basic concepts of physics as a useful tool for exploring issues and planning for matters and concerns related to Physics . 3. To describe physics phenomena and situations in the context of laboratory work. 4. To apply conceptual description of phenomena and problem-solving approach to issues related to the sciences curriculum of primary education in conjunction with the potential of school textbooks and provided educational tools for laboratory work. 						
<p>General Competences</p> <p><i>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?</i></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"><i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i></td> <td style="width: 50%; border: none;"><i>Project planning and management</i></td> </tr> <tr> <td style="border: none;"><i>Adapting to new situations</i></td> <td style="border: none;"><i>Respect for difference and multiculturalism Respect for the natural environment</i></td> </tr> <tr> <td style="border: none;"><i>Decision-making</i></td> <td style="border: none;"><i>Showing social, professional and ethical responsibility and</i></td> </tr> </table>	<i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i>	<i>Project planning and management</i>	<i>Adapting to new situations</i>	<i>Respect for difference and multiculturalism Respect for the natural environment</i>	<i>Decision-making</i>	<i>Showing social, professional and ethical responsibility and</i>
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<i>Adapting to new situations</i>	<i>Respect for difference and multiculturalism Respect for the natural environment</i>					
<i>Decision-making</i>	<i>Showing social, professional and ethical responsibility and</i>					

<i>Working independently</i>	<i>sensitivity to gender issues Criticism and self-criticism</i>
<i>Team work Working in an international environment</i>	<i>Production of free, creative and inductive thinking</i>
<i>Working in an interdisciplinary environment</i>	<i>Others...</i>
<i>Production of new research ideas</i>	<i>.....</i>

Adapting to new situations
Respect for the natural environment
Search for, analysis and synthesis of data and information
Working independently
Team work
Production of new research ideas
Observation, planning of laboratory experiment
Experiments with everyday materials

(3) SYLLABUS

- The experiment in the educational process, The importance of the experiment in the teaching of physics, Experimental skill development, The role of experiment in constructivism, Experiment conducted by student, Demonstration experiment, Hypothetical experiment, Experiments using New Technologies
- Practical Work: Definition and Content, Forms of Practical Work, The Role of the Teacher in Practical Work, Practical Work in School Reality

The basic modules of Science taught are:

➤ **Physics:**

- Properties of matter
- Mechanics
- Fluid Mechanics – Pressure
- Waves- Vibrations
- Sound
- TEMPERATURE – HEAT
- Phase Change (Melting, Freezing, Evaporation, Boiling)
- Expansion - contraction (liquids, solids and gases)
- Heat transfer
- Insulators
- ELECTRICITY - MAGNETISM
- Static Electricity (Electric Forces, Conductors and Insulators, Charging, Electric Potential)
- Electricity (Voltage Sources, Electrical Resistance, Ohm's Law, Direct Current and Alternating Current, Electric Power, Electric Circuits, Fuses)
- Magnetic forces
- Magnetic field
- Electromagnetism (Electromagnetic Induction, Generators, Power Production, Transformers)
- OPTICAL
- Properties of light – Shadow
- White Light, Colors
- Reflection – Refraction
- Contribution with two sources
- Wave properties of light

- Contribution with multiple slots
- Diffraction and contribution
- Polarization

- **Chemistry:**
 - Discrimination of phenomena
 - Mixtures
 - Acids, bases, salts
 - Solubility
 - Solutions
 - Electrolysis

- **Biology:**
 - Observing plant and animal cells
 - Photosynthesis
 - Detecting fats, sugar & starch in food
 - Observing flowers

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY <i>Face-to-face, Distance learning, etc.</i>	Face to face	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i>	Use of ICT in teaching	
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> <i>The student's study hours for each learning activity are given as well as the hours of nondirected study according to the principles of the ECTS</i>	Activity	Semester workload
	Laboratory work	100
	Study and analysis of bibliography	50
	Additional work (experiments, exercises)	50
	Presentations	50
	Course total	250
STUDENT PERFORMANCE EVALUATION <i>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.</i> <i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i>	Presentations	

(5) ATTACHED BIBLIOGRAPHY

Suggested bibliography

- Αρναουτάκης Ι., Καρανίκας, Γ., Καραπαναγιώτης, Β., Κόκκοτας, Π., & Κουρέλης, Γ. (2005). Πειράματα φυσικής για το Δημοτικό, το Γυμνάσιο και το Λύκειο. Αξιοποίηση του πειράματος στη διδακτική πράξη. Εκδόσεις Γρηγόρη, Αθήνα.
- Βελλοπούλου, Α. (2000). Μάθηση και δημιουργικότητα. Εκπαιδευτικές δραστηριότητες για την εξοικείωση παιδιών ηλικίας 5-8 ετών με έννοιες της Φυσικής, Εκδ. Ελληνικά Γράμματα, Αθήνα.
- Γιούρη-Τσοχατζή, Αικ. (1994). Σχολικά πειράματα Χημείας από τη μακρο-στη μικροκλίμακα. Εκδόσεις Ζήτη.Κουμαράς, Π. (2009). Οδηγός για την πειραματική διδασκαλία της Φυσικής. Εκδόσεις Χριστοδουλίδη, Θεσσαλονίκη.
- Κουμαράς, Π. (2015). Μονοπάτια της σκέψης στον κόσμο της Φυσικής, εκδ. GUTENBERG, Αθήνα.
- Μανουσάκης, Γ., Γιούρη-Τσοχατζή, Αικ. (1994). Σχολικά πειράματα Χημείας. Κυριακίδη Αφοί Α.Ε.
- Arons, A. (1992). Οδηγός διδασκαλίας της Φυσικής, (μετάφραση Α. Βαλαδάκης) εκδ. Τροχαλία, Αθήνα.
- Charpak, G. (2003). Μαθητές Ερευνητές και Πολίτες. Μια πρωτοποριακή διδασκαλία των επιστημών (μετάφραση, Μήτσικα Ε., Τσικρίκας Ν.) εκδ. Σαββάλας, Αθήνα.
- Harlen W., & Elstgeest, J. (2005). Unesco. Διδασκαλία και μάθηση των φυσικών επιστημών στην πρωτοβάθμια εκπαίδευση. Γ. ΔΑΡΔΑΝΟΣ - Κ. ΔΑΡΔΑΝΟΣ Ο.Ε.
- Hewitt, P. (2006). Οι έννοιες της Φυσικής. Πανεπιστημιακές Εκδόσεις Κρήτης.
- McDermott, C.L., & Shaffer, S.P. (2011). Μαθήματα Εισαγωγικής Φυσικής, Εκδόσεις Τυπωθύτω.
- Walker, J. (2001). Το πανηγύρι της Φυσικής (2η έκδοση), Εκδόσεις Κάτοπτρο.

Διεθνή και ελληνικά περιοδικά

European Journal of Teacher Education

International Journal of Mathematical Education in Science and Technology

Studies in Science Education

Instructional Science

International Journal of Science and Mathematics Education

International Journal of Science Education

Journal of Research in Science Teaching

Journal of Science Education and Technology

Journal of Teacher Education

The Physics Teacher

Research in Science & Technological Education

Research in Science Education

School Science and Mathematics

Science & Education

Science Education

American Journal of Physics

Journal of Baltic Science Education

International Journal of Innovation in Science and Mathematics Education

Eurasia Journal of Mathematics, Science and Technology Education

Journal of Turkish Science Education

International Journal of Cognitive Research in Science, Engineering and Education

Canadian Journal of Science, Mathematics and Technology Education

Journal of Technology and Science Education
Interdisciplinary Journal of Environmental and Science Education
Journal of Research in Education Sciences
International Journal of Science, Mathematics and Technology Learning
Journal of Science Teacher Education
Φυσικές Επιστήμες στην Εκπαίδευση
Θέματα Επιστημών και Τεχνολογίας στην Εκπαίδευση
Διδασκαλία των Φυσικών Επιστημών: Έρευνα & Πράξη