COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Environment		
ACADEMIC UNIT	Department of Environment		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**220KEY**	**SEMESTER**	**6**
COURSE TITLE	Laboratory course in Transport of Mass and Energy		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures/Laboratory	4	
Total credits		**5**

COURSE TYPE	Skills development
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	http://www.env.aegean.gr/spoudes/proptychiakes-spoudes/programma-spoudon/ergastirio-metaforas-mazas-kai-energeias/

(2) LEARNING OUTCOMES

Learning outcomes
With the completion of the course the students: a. Will have acquired specific knowledge regarding the basic concepts of environmental measurements, especially meteorological and energy ones and basic statistical principles for their analysis. b. They will have been familiarized with the use and operation of relevant sensors for meteo instrument, the monitoring data loggers and their software. c. They will have developed a first-hands expertise with the design, install and conduction of a programme of measurements for evaluating basic meteorological quantities, such as solar radiation, wind energy characteristics, CO2 , radon concentration and hydrocarbon combustion pollutants. They will also be able to analyse results and estimate energy potential in a specific location. **d.** Finally they will be in a position to appreciate the significance of the experimental procedure as a vital part, together with mathematical modelling, of the research and development phase of a project.

General Competences

- *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 interdisciplinary environment*
- *Project planning and management*
- *Respect for the natural environment*
- *Criticism*
- *Production of free, creative and inductive thinking*

(3) SYLLABUS

1. INTRODUCTION. Basic principles of measurements, significance, indoor and outdoors procedures, design of experiment and analysis of results. Design of experimental protocols, internet sites and software (Excel, Statgrafix, SPSS).
2. DATA LOGGING SYSTEMS. Basic principles, operation, programming, examples.
3. TEMPERATURE. Measurement techniques, thermocouples, platinum resistance thermometers, infrared thermometers, calibration.
4. HEAT TRANSFER. Measurements of heat transfer in building elements. Measurement of relative humidity. Mollier diagramme.
5. WIND.Measurement of wind speed and direction. Statistical analysis of measurements, Estimation of wind potential.
6. FLOW RATE. Measurements of gas and liquids flow rates. Venturi instruments. Electronic and mechanical instruments for flow rate measurements.
7. CARBON DIOXIDE. Measurement of carbon dioxide. Basic principle of instruments, statistical analysis of results.
8. OZON MEASUREMENTS. Description of the basic operation of the instrumentation , statistical analysis of results.
9. NITRON OXIDES. Description of the instrument. Statistical analysis of results.
10. SULPHUR DIOXIDE. Description of the instrument and statistical analysis of results.
11. SOLAR RADIATION. Pyranometers, Pyrheliometers, Measurement of total, diffuse and beam radiation on a horizontal and inclined surface.
12. RADON. Instruments, measurement of protocols and analysis of results.
13. Integrated framework for experimental and theoretical approach. The basic principles of modelling.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY.	FACE-TO-FACE
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	The language of evaluation is in Greek. The methods evaluation comprise: reports, problem solving, short-answer questions, report writing.

Activity	***Semester workload***
LECTURES/LAB	39
STUDY	40
BIBLIOGRAPHY ANALYSIS	11
PROJECT	20
ESSAY WRITING	30
Course total	***140***

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- *Harrison M. W., "Handbook of Statistical Methods for Engineers and Scientists", McGraw Hill, New York, 1989.*
- *Experimental Methods for engineers, J.P.Holman, McGraw Hill, 1994.*
- *An introduction to experimentation, B.J.Brinkworth, UK.*
- *Planning of experiments, D.R.Cox, Wiley International edition.*

- Related academic journals:

- SOLAR ENERGY
- WIND ENERGY
- BIOMASS