Title:	LAB FOR MASS AND ENERGY TRANSPORT		
Code number:		**Type:**	Optional
Level:	Undergraduate		
Year:	3d	**Semester:**	F
ECTS Units:	4	**Teaching Units:**	3
Lecturer(s):	D. Haralambopoulos and G.Biskos		
Content outline and weekly schedule:	1. Introduction to experimentation. Basic concepts, importance, indoor and outdoor measurements, conversion of units, diagrams, scales, calibration, statistical analysis. Design of experiments, analysis of results. Design of measurement protocols, internet addresses, software available επεξεργασίας (Excel, Statgrafix, SPSS). 2. DATA LOGGERS. Basic operation and connection to sensors, programming, examples. 3. TEMPERATURE. Techniques for measuring temperature, thermocouple, thermistors, platinum resistance thermometers. Infrared thermometers, calibration procedures. 4. HEAT. Heat flow sensors. Measuring heat flows in a brick wall. HUMIDITY. Measuring humidity (relative and absolute), Mollier diagram. 5. WIND. Measuring wind speed and direction. Sensors, statistical analysis to determine wind potential. Weather station. 6. FLOW. Measuring flow in a tube. Determining velocity profile. 7. CARBON DIOXIDE. Measurement principle, statistical analysis of data. 8. OZONE. Measuring ozone concentration. Description of measuring device. 9. NITRON OXIDES. Measuring NOx concentration. Description of measuring device. 10. SULPHUR DIOXIDE. Measuring SO2. Description of measuring device, statistical analysis of measurements. 11. SOLAR RADIATION. Pyranometers, pyrheliometers, Measuring total, direct and diffuse solar radiation on a horizontal and on an inclined surface. Analysis of data. 12. RADON. Meauring device, protocol of measurements, analysis of data. 13. MODELLING and SIMULATION. Framework for theoretical and experimental analysis and modeling of physical processes.		
Learning Outcomes:	The student will acquire a working knowledge regarding various measuring devices, the basic principles of experimentation and the subsequent analysis of data. She/he will be able to organize a set of measurements, get the data, analyse them and provide with a statistical analysis of results. The series of experiments will familiarize the student with the meteorological data and the estimation of solar and wind conditions and potential, as well as the basic emissions like CO2, NOx, SO2 from a power plant burning fossil fuels.		
Prerequisites:	Statistics		
Recommended Reading:	**Lecture notes:**	Handouts by D.Haralambopoulos/G.Biskos, pp 20.	
	Basic textbooks:	• Harrison M. W. , “Handbook of Statistical Methods for Engineers and Scientists”, McGraw Hill, New York, 1989.	

	Additional References:	• 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.	
	Internet links:	www.cas.lancs.ac.uk/glossary_v1.1/dexanova.html Design of experiments and ANOVA, www.margaret.net/doe/	
Learning Activities and Teaching Methods:	**Lectures (hours/week):**		--
	Practicals-Tutorials (hours/week):		4
	Other learning activities:		
Assessment/Grading:	Weekly assignments		
Instruction Language:	Greek		
Mode of delivery:	Lab demonstration and lectures.		