4th Semester

COURSE UNIT DESCRIPTION

Course Title :	Course-No. :	Semester :
Transfer Phenomena	**TF 4000/TF 4100**	**4th**
Course Type :	Hours/Weeks/SS	Number of credits
Lecture – Laboratory	**4+2**	**7**

Lecturer: Dr. Vasilis Dimitriou, Lecturer

Institute/Department: TEI-Technological Educational Institute of Crete, Department of Natural Resources and Environment.

Course Description:

The objective of this course is covering the phenomena that are related with the transport of mass and heat at the development of natural activities that takes place in the management of Natural Resources and Environment. The course includes Fluid Mechanics aspects and Heat Transfer also.

Course Outline:

- Introduction to fluid properties (density, viscosity, surface tension).
- Fluid statics. Static pressure, pressure and flow measurements.
- Elementary fluid dynamics--the Bernoulli equation
- Control volume analysis, Mass conservation, Momentum conservation, Energy conservation, Practical applications
- Differential fluid flow analysis, Continuity (mass conservation), Navier-Stokes equation (momentum conservation)
- Internal flows, pipe flow, frictional losses. Turbulent flows. External flows.

- Fundamentals of heat transfer
- Conduction.
- Convection.
- Radiation.
- Steady and transient heat conduction in solids. Forced and free convection in fluids.

Laboratory Outline:

- Hydrostatic pressure
- Bernoulli's theorem demonstration

- Impact of a jet
- Flow meter demonstration
- Energy losses in pipes
- Computational Fluid mechanics – Aerodynamics
- Conduction
- Convection factor for metals etc
- Radiation

Bibliography:

- Fluid Mechanics by Avlonitis A.Stamatis, Avlonitis A. Dimitris, ION 2006
- Fluid Mechanics by Koronakis Periklis, ION 2003
- Transfer Phenomena by B. Gkekas, Proimaki
- Fundamentals of Thermal-Fluid Sciences by Cengel A.Yunus , Turner H.Robert
- Fundamentals of Heat and Mass Transfer by Incropera P.Frank , DeWitt P. David
- Transfer Phenomena by R. S. Brodkey, H. C. Hershey
- Fluid Mechanics, Second Edition by Pijush K. Kundu, Ira M. Cohen
- An Introduction to Computational Fluid Dynamics: The Finite Volume Method by H. K. Versteeg, W. Malalasekera
- The Finite Element Method In Heat Transfer and Fluid Dynamics 2nd Edition by J. N. Reddy, David K. Gartling

Teaching method: Lectures (2 per week), experimental exercises (1 per week).

Assessment: Theory: final examination.

Laboratory: homework (30%), final examination (70%).

COURSE UNIT DESCRIPTION

Course Title :	Course-No. :	Semester :
Microcontrollers	**TF 4001/TF 4101**	**4th**
Course Type :	Hours/Weeks/SS	Number of credits
Lecture – Laboratory	**3+2**	**5**

Lecturer: Dr. Skounakis E.

Institute/Department: TEI-Technological Educational Institute of Crete, Department of Natural Resources and Environment.

Course Description:

The objective of this course is the introduction of microcontroller's fundamentals, as sequence to previous courses "Analog and Digital electronics", in order to provide the necessary background to the students. Many energy & environment application are implemented based on electronic devices, fact that enhance the importance of this course.

Course Outline:

- Cross assembler simulator introduction
- Assembly programming of 89C51
- High level programming techniques
- Control of the keypad 16 characters and LCD two line display
- Real time clock applications

Laboratory Outline:

- Torque control of electric machine
- Rotation control of DC motor
- Serial communication of two microcontrollers with LCD
- Sinus waves creation using D/A converter
- Temperature and light measurements using A/D converter

Bibliography:

- Microcontroller 8051Programming, M. Predko, Tziolas 1999
- PIC Microcontroller 8051Programming, M. Predko, Tziolas 1999
- The 8051 microcontroller, I. Scott Mackenzie, Maxwell Macmillan, 1992
- The 8051 Microcontroller, Architecture programming and Applications, Kenneth J. Ajala, West publishing , 1991
- Programming and Interfacing the 8051 microcontroller, Sencer Yeralan, Ashutosh Ahluwalia, Addison Wesley, 1993

Teaching method: Lectures (1 per week), experimental exercises (1 per week).

Assessment: Theory: final examination.

Laboratory: homework (40%), final examination.

COURSE UNIT DESCRIPTION

Course Title :	Course-No. :	Semester :
Metrology	**TF 4002/TF 4102**	**4th**
Course Type :	Hours/Weeks/SS	Number of credits
Lecture – Laboratory	**2+2**	**5**

Lecturer: Dr Vassilis Saltas, Assistant Professor

Institute/Department: Technological Educational Institute of Crete, Department of Natural Resources & Environment, Branch of Chania

Course Description:

Primary objectives are the basic understanding of correct measuring procedures and in-depth knowledge of measurement accuracy, errors, uncertainties and their statistical analysis. Another aim is to introduce the operational principles of common sensors and transducers, discuss their fundamental characteristics and specifications and present their wide range of applications. Furthermore, the course is intended to familiarize the students with measurement standards, calibration processes and accreditation. At the end of the course, students should be able to perform successful experiments and to estimate the accuracy of their measurements and thoroughly understand the basic concepts of metrology discipline.

Course Outline:

- Experimental Errors and Uncertainties.
- Statistical Analysis of Experimental Data.
- Introduction to Measurement Systems, Sensors and Transducers.
- Signal Conditioning techniques.
- Displacement, Pressure, Temperature, Strain and Motion Measurement.
- Calibration and Accreditation.
- Measurement Standards.

Laboratory Outline:

- Special software for data presentation and analysis
- *Experiments*

Study of Electromagnetic Seismic Sensors.

Study of Flux-Gate Magnetometer.

Turbidity, Conductivity and Temperature Measurements in Liquids.

Study and Calibration of NTC Thermistor.

Study and Calibration of Various Types of Thermocouples.

Study of Linear Variable Differential Transformer.

Stress – Strain Measurements of materials.

Study of soil moisture sensor.

Study of photodiode.

Bibliography:

1. Experimental Methods for Engineers, 7th edition, J. P. Holman, McGraw-Hill 2001.
2. Measurement Systems, R. E. King, Tziolas, 2001..
3. Microsensors Principles and Applications, J. W. Gardner, J. Wiley & Sons, 1994.
4. Électronique des Systémes de Mesures, T. T. Lang, Masson Paris, 1992.
5. Sensors and Signal Conditioning, R. Pallas-Areny & J. G. Webster, J. Wiley & Sons, 1991.

Teaching method: Lectures (1 per week), assignments (optional), experimental exercises (1 per week).

Assessment: Theory: midterm test (optional, 40%), final examination.

Laboratory: homework (30%), final examination.

COURSE UNIT DESCRIPTION

Course Title :	Course-No. :	Semester :
Geophysics	**TF 4003/TF 4103**	**5th**
Course Type :	Hours/Weeks/SS	Number of credits
Lecture – Laboratory	**2+4 / 10**	**5**

Lecturer: Filippos Vallianatos, Professor. (Theory)

Filippos Vallianatos & Ilias Papadopoulos (Laboratory)

Institute/Department: TEI-Technological Educational Institute of Crete, Department of Natural Resources and Environment.

Course Description:

Along with the general principle of Earth Physics, this course describes the methods involved in applied geophysics, which include gravity, magnetic, seismic, electrical, electromagnetic, radioactivity and well-logging methods. All aspects of these methods are described including basic theory, field equipment, techniques of data acquisition, data processing and interpretation.

Course Outline:

- Introduction
- The Dynamic Earth.
- Seismic Methods
- Resistivity Methods
- Electromagnetic Methods
- Gravity Methods
- Magnetic Methods
- Geophysical Well Logging

Laboratory Outline:

- Introduction
- Cartography Methods
- Seismic Methods
- Electromagnetic Methods
- Resistivity Methods
- Seismological Networks/Earthquake Analysis

- Exercises with data from several geophysical case studies.

Bibliography:

1. Applied Geophysics, 2nd ed, Telford, W.M., Geldart, L.P., Sheriff, R.E., Cambridge University Press, 1994.
2. Electromagnetics, 4th ed., Kraus, D.J., McGraw Hill International Editions, 1992.
3. Exploration Seismology, 2nd ed., Sheriff, R.E., Geldart, L.P., Cambridge University Press, 1995.
4. Physics of the Earth, 3rd ed., Stacey, F.D., Brookfield Press, Australia, 1992.
5. Seismic Modeling of Earth Structure, Boschi, E., Ekstrom, G., Morelli, A., Instituto Nazionale di Geofisica, 1996.

Teaching method: Lectures (3hours/ week), experimental exercises –practical (2 hours/ week).

Assessment: Theory: midterm test (optional, 40%), final examination.

Laboratory: homework (30%), final examination.

COURSE UNIT DESCRIPTION

Course Title :	Course-No. :	Semester :
Introduction to the Agricultural Environment	**TF 4004**	**4th**
Course Type :	Hours/Weeks/SS	Number of credits
Lecture –	**2**	**4**

Lecturer: Professor George Stavroulakis

Institute/Department: TEI-Technological Educational Institute of Crete, Department of Natural Resources and Environment

Course Description:

The course provides the introductory knowledge on sustainable management of the agricultural environment parameters.

Course Outline:

Basic parameters of the agricultural environment. Soil erosion. Desertification. Water quality of agricultural use. Water management. Flora. Fauna. Pest control. Conventional, biological and integrated agricultural practices. Renewable energy resources in agriculture. Sustainable use of natural resources in agricultural production. Environment pollution and contamination. Pollutant toxicity. Eutrophycation. Precision agriculture.

Bibliography:

Environment I , II. J. Miller

Technology and global environmental problems - Makofske-Karlin

Teaching method:

Lectures, supported by transparencies and computer demonstrations.

Assessment:

Coursework (40%) and final examination (60%).

COURSE UNIT DESCRIPTION

Course Title :	Course-No. :	Semester :
Energy Economy	**TF 4005**	**4th**
Course Type :	Hours/Weeks/SS	Number of credits
Lecture	**2 hours per week**	**4**

Lecturer: Dr. Emmanuel Karapidakis, Asc. Professor

Course Description:

Introduction to main principles of energy systems and presentation of the basic calculations of technical balances, energy analysis of technical systems and corresponding units and definitions. The course is targeting to reveal and analyze energy systems as some of the driving forces to the economic development of every country. Furthermore, within the course the connections between energy, economy and environment are examined in parallel with issues as energy policy, rational use of energy, energy adequacy and cost of energy. Concluding, the course focuses to the Greek energy system.

Course Outline:

- Introduction:
- Introduction to the energy problem, some history notes on energy
- Basic principles of energy systems:
- Basic calculations of technical balances, Energy analysis of technical systems, basic units of energy systems, main systems of energy production, , Design financing and implementation of investments.
- Energy, Economy and Environment:
- Economic development and use of energy, energy policy and rational use of energy, energy adequacy and cost of energy, energy and economy crisis, energy and environment
- The Greek Energy System.
- Lignite deposits in Greece, mining and future development. Transport and distribution systems. Renewable energy sources and perspectives in Greece, deregulation of the energy market in Greece and Europe.
- The European Energy System:
- Reserves, production, demand and imports of oil, natural gas, solid fuels, and nuclear energy. Renewable energy sources in the European Union and other European Countries.

Bibliography:

- Lecture notes
- Environmental Economics, An Introduction, B. C. Field, McGraw Hill
- The political economy of world Energy, John G. Clark, Harvester Wheatsheaf

Teaching method: Lectures, supported by transparencies.

Assessment: Final examination (100%).