COURSE OUTLINE

(1) GENERAL

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>ENGINEERING SCHOOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>MECHANICAL ENGINEERING DEPARTMENT</td>
</tr>
<tr>
<td>LEVEL OF STUDIES</td>
<td>UNDER GRADUATE</td>
</tr>
<tr>
<td>COURSE CODE</td>
<td>2703006</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>INDUSTRIAL MEASUREMENTS: PRINCIPLES AND APPLICATIONS</td>
</tr>
</tbody>
</table>

**INDEPENDENT TEACHING ACTIVITIES**

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.

<table>
<thead>
<tr>
<th>Weekly Teaching Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory</td>
<td>3</td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
</tr>
</tbody>
</table>

Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).

**COURSE TYPE**

- General background
- Special background, specialised general knowledge, skills development

**PREREQUISITE COURSES:**

- Engineering Mathematics I & II, Statics & Dynamics, Structured Programming and at least concurrent attendance of Fluid Mechanics and Thermodynamics

**LANGUAGE OF INSTRUCTION and EXAMINATIONS:**

- Greek (official)

**IS THE COURSE OFFERED TO ERASMUS STUDENTS:**

- YES (English language for ERASMUS students)

**COURSE WEBSITE (URL):**

- [http://mtlab.teipir.gr](http://mtlab.teipir.gr)

(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

The purpose of this introductory course is to provide to the students the fundamental knowledge, skills and experience for selecting the proper measuring techniques and systems, to use data acquisition systems, to statistically analyze the data, to present the results in a clear and concise format and apply all the above in the measurement of specific physical quantities.

Upon the course completion the students will be able to:

- Distinguish between precision and bias measurement errors and their sources (calibration errors, reading errors, etc.).
- Estimate the uncertainty of independent variables from sampled sets of measurements and of variables which are dependent on the measured data sets.
(propagation of error).

- Describe time varying signals in both the time and frequency domains.
- Describe the underlying physical principles governing the behavior of commonly used sensors.
- Understand the relationship between the physical properties of a sensor and its time and frequency response when used in a measurement system.
- Process a signal from a sensor by using appropriate processing techniques (amplification, filtering, etc.), record the signal using an electronic data acquisition system (analog or digital), convert it to the appropriate units, and calibrate the sensor and data acquisition system.
- Make engineering measurements of physical quantities such as temperature, force and strain, using multiple instruments.
- Present data in an appropriate manner through the use of tables and graphs.
- Communicate effectively in written form information relating to the design and/or results of an engineering experiment.

### 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 | Project planning and management |
| Adapting to new situations | Respect for difference and multiculturalism |
| Decision-making | Respect for the natural environment |
| Working independently | Showing social, professional and ethical responsibility and sensitivity to gender issues |
| Team work | Criticism and self-criticism |
| Working in an international environment | Production of free, creative and inductive thinking |
| Working in an interdisciplinary environment | Others... |
| Production of new research ideas | ...... |

- Adapting to new situations
- Decision-making
- Working independently
- Team work

### Course Content

#### Theory:

- Basic concepts and Terminology of Measurement Methods
- Static and dynamic characteristics of signals (Frequency Analysis)
- Statistical Analysis of Signals
- Uncertainty analysis
- Signal Conditioning
- Sampling, Digital Devices and Data Acquisition
- Response of Measurement Systems
- Strain or Temperature Measurements
- Technical Writing

#### Lab:

The course includes practical training in the lab and extensive use of SCADA and data/numerical analysis software (LabVIEW, MATLAB/OCTAVE/SCILAB).
**DELIVERY**
Face-to-face, Distance learning, etc.

**USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY**
Use of ICT in teaching, laboratory education, communication with students

**TEACHING METHODS**
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.

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

**STUDENT PERFORMANCE EVALUATION**
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

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>26</td>
</tr>
<tr>
<td>Preparation for homework on case studies (individual or group work)</td>
<td>13</td>
</tr>
<tr>
<td>Laboratory experiments and exercises in individual and group levels</td>
<td>26</td>
</tr>
<tr>
<td>Work Support for the writing of experimental technical reports and memoranda</td>
<td>13</td>
</tr>
<tr>
<td>Work for completing individual and team projects and exercises</td>
<td>12</td>
</tr>
<tr>
<td>Individual Study</td>
<td>61</td>
</tr>
<tr>
<td><strong>Total course Load</strong></td>
<td><strong>125</strong></td>
</tr>
</tbody>
</table>

Student evaluation language: Greek  (English for Erasmus students)

**THEORY (60%)**: I. Written Final Exam (60%) that consists of:
- Problems that lead to numerical results, however the emphasis is placed in the solution procedure
- Comparative evaluation of theoretical concepts

II. Midterm exams and (40%)

**LAB (40%)**: Written and oral exams (60%)
Individual and group exercises and technical reports and memoranda on experiments (40%)

- Specialized software for data acquisition and analysis and problem solving (LabVIEW, MATLAB/OCTAVE/SCILAB)
- Open access software for aerodynamic applications and problems involving transport phenomena
- Electronic platforms and appropriate software for course support (e-class)