UNIVERSITY of NICOSIA

Course Syllabus

Course Code	Course Title	ECTS Credits
MENG-314	Mechanical Measurements and Instrumentation	6
Prerequisites	**Department**	**Semester**
None	Engineering	Fall, spring
Type of Course	**Field**	**Language of Instruction**
Required	Engineering	English
Level of Course	**Lecturer(s)**	**Year of Study**
1st Cycle	Dr Marios Constantinou	3rd
Mode of Delivery	**Work Placement**	**Corequisites**
Face-to-face	N/A	None

Course Objectives:

The main objectives of the course are to:

- Introduce students to experimental mechanics through theoretical description of mechanical experimental measurement techniques.
- Familiarize students with experimental measurement techniques as well as with instruments utilized in experiments for measuring different mechanical properties.
- Provide students with knowledge on different methods on how to collect, analyze, and report various forms of data taken from mechanical measurements.
- Familiarize students with experimental design and analytical methods in order to extract valuable information about the performance of an experimental apparatus and take decision-actions where necessary.

Learning Outcomes:

After completion of the course students are expected to be able to:

- Perform, read and understand fundamental measurements on stress/strain, displacement, velocity, acceleration, force, pressure, heat flux, thermophysical properties of materials, fluid mechanics, etc.
- Be familiar with the use of basic instruments that take mechanical measurements on mechanical properties such as stress/strain, displacement, velocity, acceleration, force, pressure, heat flux, thermophysical properties of materials, fluid mechanics, etc.
- Evaluate measurements and experimental setups based on mathematical concepts such as probability and statistics, discrete and continuous probability distributions, test statistics,

classified and robust test of significance, measurement uncertainty, experimental design, regression analysis, etc.
- Be able to design experimental procedures with adequate technical instruments for evaluating certain mechanical properties through the appropriate analytical tools.

Course Content:

- Measurements Overview.
- Design of Experiments.
- Probability Analysis.
- Data Correlation.
- Uncertainty, Errors, Propagation of Errors, and Tolerance.
- Electrical Signal Conditioning.
- Electrical Signal Measurement and Transmission.
- Digital Data Acquisition.
- Temperature Measurements (Thermometry, Thermoelectric Thermometry, Resistance Thermometry, Pyrometry).
- Pressure Measurements (Pressure transducers, manometers, vacuum, etc.).
- Velocity and Acceleration Measurements (Laser Doppler Velocimetry, Ultrasonic Methods, Hot Wire Anemometry).
- Force Measurements (accelerometer, torque, power measurements, etc.).
- Stress/Strain Measurements.
- Displacement Measurements.
- Vibration and acceleration measurements.
- Fluid Mechanics Measurements (Flow Measuring Devices, Measurement of Volume and Mass Flow Rate of Fluid).
- Measurements of Gas Composition, Emissivity, and Smoke.
- Measurement of Viscosity.
- Measurement of Heat Flux (Steady and Transient Heat Flux Measurement, ThemoPhysical. Properties, Thermal Conductivity, Heat Capacity and Heating Value).

Learning Activities and Teaching Methods:

Lectures, In-class examples and exercises, Laboratory work, In-class Activities, Videos.

Assessment Methods:

In-class Activities, Homework & Lab reports, Midterm Exams, Final Exam.

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Measurement and Instrumentation: Theory and Application 2nd Edition	Alan S. Morris & Reza Langari	Elsevier	2016	9780128008843

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Fundamentals of Test Measurement Instrumentation	Keith R. Cheatle	The Intern Society of Automation (www.isa.org)	2006	9781556179143
Measurement, Instrumentation, and Sensors Handbook, 2nd ed.: Spatial, Mechanical, Thermal, and Radiation Measurement	John G. Webster, Halit Eren	CRC Press Taylor & Francis Group	2014	9781439848883