

## Electrical Measuring Techniques (E741047)

Due to Covid 19, the education and assessment methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

<b>Course size</b>	<i>(nominal values; actual values may depend on programme)</i>			
<b>Credits 4.0</b>	<b>Study time 120 h</b>	<b>Contact hrs</b>	48.0h	
<b>Course offerings and teaching methods in academic year 2021-2022</b>				
A (semester 1)	Dutch	Gent	lecture	24.0h
			practicum	24.0h
<b>Lecturers in academic year 2021-2022</b>				
Foubert, Guy		TW11	staff member	
Kerseman, Mathias		TW11	lecturer-in-charge	
De Kooning, Jeroen		TW08	co-lecturer	
<b>Offered in the following programmes in 2021-2022</b>			<b>crdts</b>	<b>offering</b>
<a href="#">Bachelor of Science in Engineering Technology(main subject Electromechanical Engineering Technology)</a>			4	A

### Teaching languages

Dutch

### Keywords

Measurement instruments, measurement methods, measurement errors, analogue and digital meters, surface roughness, strain, external and internal defects

### Position of the course

The goal of the course is to get insight in methods for correct measuring electrical and mechanical quantities.

In the part **Electrical Measurement Techniques**, the distinction is made between analog, digital and electronic measurements devices, with all their characteristics and limitations. Several methods are discussed to measure classical electrical quantities, i.e., voltage, current, impedance, power and energy. The measurement of rotational speed, position and torque of rotating shafts is discussed as well. Focus is put on the sensitivity and accuracy of the measurements, signal conditioning, choosing and using the correct measurement protocol for a given problem, and the processing and analysis of the measurement data.

In the part **Mechanical Measurement Techniques**, the student will gain insight in the monitoring and measurement techniques found in the mechanical industry. These techniques are required to assure the quality of a certain product. The quality requirement or the finishing degree of a part is indicated on the technical drawing. The measurement of mechanical quantities can happen before, during or after the manufacturing (additive and/or subtractive) process.

### Contents

#### Electrical Measuring Techniques

##### Theory:

- Introduction to electric power concepts
- Basics of electrical measurements: Accuracy, precision, range, resolution, dynamics, measurement errors, error-propagation, signal conditioning, digital data-acquisition
- Voltage measurement: Analog meters, digital meters, oscilloscope, electronic measurement, capacitive instrumentation-transformer
- Current measurement: Analog meters, shunt measurement, Hall effect sensor, current transformer, current clamps, Rogowski coil

- Impedance measurement: Volt-Ampère method, 3 Volt/Ampère measurement, bridge measurements, LCR meters, earth resistance, isolation resistance
- Power measurement: Single and three phase power, two watt-meter method, power quality
- Energy measurement: Ferraris meter, digital meter
- Measuring position, speed and torque of rotating shafts: Incremental & absolute encoders, Hall position sensor, resolver, torque sensor

Due to the Corona-measures, it is possible that the theory will be given online. This will be communicated through Ufora.

**Lab:**

- Volt-Ampère method
- 3 Volt-meter method
- 2 watt-meter method
- LCR meter
- Earth resistance
- Power analyser

*Due to the Corona-measures it is possible that these lab's are (partially) replaced by assignments which can be performed at home.*

**Mechanical Measuring Techniques**

**Theory:**

- Basics of measuring techniques
- Size tolerances and fits, form and fit tolerances
- Surface roughness, measuring devices (indicant devices, calibres, tools);
- Strain: measuring techniques, local-global, surface-volumetric
- External and internal damage: measuring techniques, local-global, surface-volumetric
- High end mechanical measurement equipment as used in industry

**Lab:**

- Measurement deviation and uncertainty, suitability and of devices, surveillance of devices (calibration), measuring area.
- Inspection of form and fit tolerances, surface roughness.
- Execute measurements with analogue and digital measuring devices.
- Processing of measurements.
- Report writing.

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**Initial competences**

**Final competences**

- 1 Knowledge of measurement methods and instruments.
- 2 Use of measurement instruments and application of measurement methods.
- 3 Be able to choose measurement methods and instruments for a given measurement problem in electrical engineering, and to correctly process measurement results.
- 4 Report and communicate measurement problems, solutions and results in an adequate way.
- 5 Basic and practical understanding of the most important inspection and measuring techniques as used in modern mechanical industry.
- 6 Gathering and processing in an adequate way of relevant multilingual (English, German) scientific and technical information concerning measuring techniques.

**Conditions for credit contract**

Access to this course unit via a credit contract is determined after successful competences assessment

**Conditions for exam contract**

This course unit cannot be taken via an exam contract

**Teaching methods**

Practicum, Lecture

**Extra information on the teaching methods**

Lecture, practicum, group work

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### **Learning materials and price**

- Capita selecta, slides and exercises in lab.
- Slides "Mechanische meettechnieken"
- Course notes and slides "Elektrische meettechnieken"
- Additional material (Online supplements) handed via lecturer(s).

### **References**

R.B. Northrop, "Introduction to Instrumentation and Measurements," 2005.  
B.E. Jones and W.B. Spillman, "Principles of Electrical Measurement," 2006.

### **Course content-related study coaching**

The lecturer is available during or in between lectures; there is assistance during the lab-sessions. Individual assistance is possible by making an appointment. Individual coaching, evaluation and correction of student. Apart of the foreseen contact hours, students can make appointments with lecturer(s) for additional information.

### **Assessment moments**

end-of-term and continuous assessment

### **Examination methods in case of periodic assessment during the first examination period**

Written examination

### **Examination methods in case of periodic assessment during the second examination period**

Written examination

### **Examination methods in case of permanent assessment**

Report

### **Possibilities of retake in case of permanent assessment**

examination during the second examination period is not possible

### **Extra information on the examination methods**

Exam will be on campus

### **Calculation of the examination mark**

- Electrical Measuring Techniques: Written exam (30%)
- Electrical Measuring Techniques: Lab (20%)
- Mechanical Measuring Techniques: Written exam (30%)
- Mechanical Measuring Techniques: Lab (20%)

In case the student does not participate to the evaluation of one or more components or the student scores less than 8/20 for one of the components, he/she can no longer pass the entire course unit. If the total score is a mark of ten or more out of twenty, then this is reduced to the highest failing mark, being 9/20.

In case the student scores in total (theory + lab) less than 10/20 on the part electrical measuring technique or the part mechanical measuring technique, he/she can no longer pass the entire course unit. If the total score is a mark of ten or more out of twenty, then this is reduced to the highest failing mark, being 9/20.