General Information

Name of Course	Measurement Technology 1
Course Code	IVB266ANVM
Semester	2018/2019 1. (Autumn)
Number of Credits	5
Allotment of Hours per Week	2 lectures and 2 lab exercises per week
Evaluation	Signature with grade
Prerequisites	-
Instructors	Dr. István Gyurcsek, Email: gyurcsek.istvan@mik.pte.hu Office: 7624 Pécs Boszorkány u. 2. Room: B232, Office phone extension: 23852

Introduction and learning outcomes

The measurement (and especially electrical measurement) is one of the most important part of all sort of engineering. This course is the short collection of the fundamental principles is given helping to understand the basics of measurement technology i.e. the basics of testing theories, instruments, methods and practical solutions.

General Course Description and Main Content

This subject covers the fundamental principles of the electrical measurement technology that is required to the study of students attending the B.Sc. program. It aims to increase students' knowledge and expertise and determine whether they satisfy the requirements of the course.

The aim of the subject is to convey fundamental knowledge on the measurement theory as well as principles of operation of different sort of testing instruments, measurement methods. The aim of the subject is also to convey knowledge on theories and methods of sensor technology. Measurement methods for mechanical parameters, temperature and different kind of radiations are also included.

Methodology

The course is based on the lectures and practices giving examples and calculation exercises to help understanding the subject of the study.

Schedule

The semester is divided into three principle periods and attendant exercises. The rough outline of the schedule is as the followings:

Week 1 COURSE INTRODUCTION

- Introduction to Measurement Technology (measuring architectures, practical examples)

Week 2-4 FUNDAMENTALS OF ELECTRICAL MEASUREMENTS

- Main Terms and Definitions (measurement technique, main methods)
- Uncertainty of Measurements (errors, uncertainty, reliability, evaluation of the uncertainty in measurements)
- Standards of Electrical Quantities (standards, etalons, calibration and validation, standards of electrical quantities referred to the physical phenomena and laws, material standards of electrical quantities)

Week 5-10 CLASSIC ELECTRICAL MEASUREMENTS

- Indicating Measuring Instruments (electromechanical instruments versus digital measuring systems, moving coil meters, moving iron meters, electrodynamic meters, wattmeters, induction type watt-hour meters)
- Recording and Displaying Measuring Instruments (oscilloscopes, recorders and data storage devices)
- Bridge Circuits (balanced and unbalanced bridge circuits, null-type DC bridge circuits, AC bridge circuits, transformer bridge circuits, unbalanced bridge circuits, Anderson loop)
- Potentiometers and Comparators (DC and AC comparators, practical applications)

Week 11-15 MEASUREMENT APPLICATIONS AND SOLUTIONS

- DC and AC measurement applications (measurement transformers, single-phase and three-phase power measurements, power quality analysis, impedance measurements, three-voltmeter-method, bridge methods, inductance and capacitance measurements)
- Smart electrical loads... (or really, we pollute the electrical network? – case study)
- Loop impedance measurement (…in case of sensitive electronics – case study)

ATTENDANCE

Attending is required all classes and will impact the grade. Unexcused absences will adversely affect the grade and in case of absence from more than 30% of the total number of lessons will be grounds for failing the class. To be in the class at the beginning time and stay until the scheduled end of the lesson is required. Tardiness of more than 20 minutes will be counted as an absence. In the case of an illness or family emergency the student must present a valid excuse, such as a doctor's note.

The highest possible grade on the late performance (in two weeks) is '2'.

REQUIRED PERFORMANCE, EVALUATING, GRADING

The requirement is two approved classroom studies, scheduled during the semester and the accepted performance in lab exercises scheduled for the semester terminus. The *semester grade* of the mid-term performance will be based on the following guidelines:

5. Outstanding work. Execution of work is thoroughly complete and demonstrates a superior level of achievement overall with a clear attention to details. The student is able to synthesize the course material with new concepts and ideas in a thoughtful manner and is able to express those ideas in clear way.

4. High quality work. Student work demonstrates a high level of knowledge with consistency. The student demonstrates a level of thoughtfulness in addressing concepts and ideas. Work demonstrates excellence but less consistency than a '5' student.

3. Satisfactory work. Student work addresses all of the task and assignment objectives with few minor or major problems.

2. Less than satisfactory work. Work is incomplete in significant ways and lacks attention to details.

1. Unsatisfactory work. Work exhibits several major and minor problems with basic conceptual premise, lacking both intention and resolution. Results are severely lacking and are weak in clarity and completeness.

Grading Scale:

Numeric Grade	5	4	3	2	1
Evaluation interval	90-100%	76-89%	63-75 %	51-62 %	0-50 %

STUDENTS WITH SPECIAL NEEDS

Students with disability and needs to request special accommodations, please notify the Deans Office. Proper documentation of disability will be required. All attempts to provide an equal learning environment for all will be made.

RECOMMENDED READING AND REFERENCE MATERIALS

- Dr. Gyurcsek: Fundamentals of Electrical Measurements, PTE MIK, 2018 (manuscript)
- S. Tumanski: Principles of electrical measurement, CRC Press 2006. ISBN 0-7503-1038-3
- Jacob Fraden: Handbook of Modern Sensors (ISBN 978-1-4419-6465-6) Springer NY. 2010
- http://gyurcsekportal.hu/mik.html