COURSE SYLLABUS AND COURSE REQUIREMENTS
ACADEMIC YEAR 2023/2024 SEMESTER 1

Course title	***Measurement Technology 1***
Course Code	*IVB266ANVM*
Hours/Week: le/pr/lab	2/0/2
Credits	4
Degree Programme	BSc
Study Mode	
Requirements	Mid-term grade
Teaching Period	Autumn
Prerequisites	Electrical Engineering 1
Department(s)	Electrical Network Dept.
Course Director	
Teaching Staff	*Dr. Gyurcsek István, Dr. Bagdán Viktor*

COURSE DESCRIPTION

A short description of the course (max. 10 sentences).
Neptun: Instruction/Subjects/Subject Details/Basic data/Subject description

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.

SYLLABUS

Neptun: Instruction/Subjects/Subject Details/Syllabus

1. GOALS AND OBJECTIVES

Goals, student learning outcome.
Neptun: Instruction/Subjects/Subject Details/Syllabus/Goal of Instruction (ez szerepel a neptunban)

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….

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

2. COURSE CONTENT

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

COURSE INTRODUCTION

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

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)

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)

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)

Detailed timetable of the semester is the following.

Week	Topics	Contact (MS Teams)	Sources (NMS docs)	Additions	Tasks (NMS, UniPoll)
1	Subject, elements, methods	Online PowerPoint Online consultation	(3) 1.10-INT.pdf	(1) Ch. 1.1 (2) Ch. 1	NMS voting
2	Basics, definitions	Online PowerPoint Online consultation	(3) 2.10-MEA.pdf	(1) Ch 1.2 (2) Ch. 2.1	NMS voting
3	Uncertainty	Online PowerPoint Online consultation	(3) 2.20-UNC.pdf	(1) Ch.1.3 (2) Ch. 2.2	NMS voting
4	Standards, etalons	Online PowerPoint Online consultation	(3) 2.30.STD.pdf	(1) Ch. 1.4 (2) Ch. 2.3	NMS voting
5	Indication device 1	Online PowerPoint Online consultation	(3) 3.10-IND.pdf	(1) Ch 2.1 (2) Ch. 3.1	NMS voting
6	Indication device 1	Online PowerPoint Online consultation	(3) 3.10-IND.pdf	(1) Ch 2.1 (2) Ch. 3.1	NMS voting
7	Waveform measurement	Online PowerPoint Online consultation	(3) 3.10-REC.pdf	(1) Ch. 2.2 (2) Ch. 4,7	-
8	Consultation, test 1	MS Teams chat	-	-	NMS, UniPoll
9	Bridges	Online PowerPoint Online consultation	(3) 3.10-BRD.pdf	(1) Ch. 2.3 (2) Ch. 3.3	NMS voting
10	Compensation measurement	Online PowerPoint Online consultation	(3) 3.10-CMP.pdf	(1) Ch. 2.4 (2) Ch. 3.4	NMS voting
11	Measurement solutions 1	Online PowerPoint Online consultation	(3) 3.10-SOL.pdf	1) Ch. 3	NMS voting
12	Measurement solutions 2	Online PowerPoint Online consultation	(3) 3.10-SOL.pdf	(1) Ch. 3	NMS voting
13	Consultation, test 2	MS Teams chat	-	-	NMS, UniPoll

DETAILED SYLLABUS AND COURSE SCHEDULE

ACADEMIC HOLIDAYS INCLUDED

3. ASSESSMENT AND EVALUATION

(Neptun: Instruction/Subjects/Subject Details/Syllabus/Examination and Evaluation System) így szerepel a neptunban

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'.

Method for monitoring attendance *(e.g.: attendance sheet / online test/ register, etc.)*

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.

Grade calculation as a percentage

based on the aggregate performance according to the following table

Numeric Grade	5	4	3	2	1
Evaluation interval	85-100%	70-84%	55-69 %	40-54 %	0-39%

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.

4. SPECIFIED LITERATURE

In order of relevance. (In Neptun ES: Instruction/Subject/Subject details/Syllabus/Literature)

COMPULSORY READING AND AVAILABILITY

[1.] Gyurcsek: Fundamentals of Electrical Measurements, PTE MIK 2019 ISBN 978-963-429-384-2

[2.] Tumanski: Principles of electrical measurement, CRC Press 2006. ISBN 0-7503-1038-3

[3.] Neptun Meet Street presentation materials