COURSE SYLLABUS AND COURSE REQUIREMENTS - SEMESTER 2

Course Title	*Measurement Technology 2*
Course Code	*IVB267AN*
Hours/Week: le/pr/lab	*2/0/2*
Credits	*4*
Degree Programme	*Electrical Engineering BSc 4. s.*
Study Mode	*-*
Requirements	*Signature with semester-grade*
Teaching Period	*4*
Prerequisites	*Measurement Technology 1*
Department(s)	*Dept. Of Automation*
Teaching Staff	*Dr. Viktor Bagdán, Tibor Malkó, Tibor Gábor Abai*

COURSE DESCRIPTION

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.

SYLLABUS

1. GOALS AND OBJECTIVES

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.

2. COURSE CONTENT

LECTURE

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

SENSOR THEORY

Sensors theory (classification from energy point of view, two-port equivalence, static and dynamic sensor models, sensor characteristics, classification based on Miller-index)

MEASUREMENT SIGNAL PROCESSING

Analogue signal processing, digital signal processing, computer measuring systems

BASIC SENSOR NETWORKS

Measurement network architectures (network architectures, source - device interconnections, noise handling, groundings and earths)

Sensor signal transmissions (base band and carrier band transmissions, chopper, fiber and wireless transmissions, remote sensing, smart sensors, SCADA and DCS systems, embedded technologies)

MEASUREMENT APPLICATIONS WITH SENSORS

- Temperature measurements (RTD, NTC, PTC, pn-junction sensors, thermocouples, pyrometers)
- Radiation measurements (characteristics of electromagnetic spectrum, photo-conductive and photo-electric measurements, color measurement, imaging systems, RF and IR measurements, quantum detectors, GM indicators, scintillation detectors, direct radiation measurements)
- Mechanical measurements (force torque, pressure measurement, strain gauges, position detection, tachometers, acceleration detectors, acoustic measurements)
- Non-destructive moisture diagnostic (fundamental methods, practical applications)

LABORATORY PRACTICE

1. Measurement of magnetic characteristics (#07)
2. Measurement of frequency, period and RPM (#08)
3. Measurement of ‘switch-on’ transients (#12)
4. Measurements of force, torque, and acceleration (#16)
5. Measurements with inductive displacement sensors (#17)
6. Temperature dependency of Zener diode (#18)

DETAILED SYLLABUS AND COURSE SCHEDULE

Week	Topic	Communications	Sources (Teams Docs)	Additional materials
1	Introduction Course description Requirements	Personal attendance on lecture		
2				
3	Sensor theory	Personal attendance on lecture	(2) 5.10-SEN.pdf	(1) Chapter 4
4				
5	Sensor networks	Personal attendance on lecture	(2) 7.10-MNET.pdf	(1) Chapter 5
6				
7	Temperature tests	Personal attendance on lecture	(2) 8.10-TMP.pdf	(1) Chapter 6.1
8				
9	Spring break			
10				
11	Radiation tests Mechanical tests	Personal attendance on lecture	(2) 8.20-RAD.pdf (2) 8.30-MCH.pdf	(1) Chapter 6.2 (1) Chapter 6.3
12				
13	Mid-term test	-	-	-
14				

3. ASSESSMENT AND EVALUATION

Method for monitoring attendance

Attending is required all classes according to the possibility of online education 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.

Signature / Mid-term grade requirement:

Mid-term requirement is the processing of the measurement results of the laboratory measurements. Submission of the measurement reports at the post-measurement exercise. One measurement per measurement group, one report per measurement, must be prepared by the student assigned by the supervisor. Successful completion of the midterm test from the lectures during the term.

Grading Scale:

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

Mid-term grade calculation

The semester grade is calculated as an average of lab small-tests, lab reports, and lecture midterm test.

4. SPECIFIED LITERATURE

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

[2] Teams group documents related to the course

[3] Jacob Fraden: Handbook of Modern Sensors, Springer NY. 2010
ISBN 978-1-4419-6465-6

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