

SYLLABUS

1. **Course name:** Measurement Engineering Lab

2. **Course code:** PMEN310844

3. **Credits:** 1 (0/6/6)

Duration: 8 weeks (45h main course and 45h self-study)

4. **Instructors:**

- 1- Truong Van Hien, MEng
- 2- Nguyen Thi Ngoc Thao, MEng
- 3- Le Thi Thanh Hoang, MEng
- 4- Pham Xuan Ho, MEng

5. **Course conditions**

Prerequisites: Electrical Measurement and Instruments

Corequisites: N/A

6. **Course Description**

This course instructs students how to use electrical measurement instruments, the ability to operate and test instruments, the principles and techniques used in measurement of electrical parameters including voltage, current, resistance, capacitance, inductance, frequency, phase shift, power, electrical energy, power factor.

7. **Course Goals**

Goals	Goal description (This course provides students:)	ELOs
G1	An ability to apply basic knowledge of science and engineering in the field of the measurements.	01 (H)
G2	An ability to measure, analyze and explain the electrical measurement circuits.	03 (H)
G3	An ability to read materials of instruments in English.	05 (M)
G4	An ability to use measurement methods to solve practical measurement circuits.	07 (L)
G5	An ability to calculate, design and install electrical measurement systems.	11 (M)

* **Note:** High: H; Medium: M; Low: L

8. **Course Learning Outcomes (CLOs)**

CLOs	Description (After completing this course, students can have:)	Outcome
G1 G1.1	the ability to understand the structures and usages of measuring instruments.	01

	G1.2	the ability to analyse and evaluate measurement errors.	01
G2	G2.1	the ability to apply the techniques used in measurement of active electrical parameters including current, voltage, frequency, phase shift, power, energy, power factor.	03
	G2.2	the ability to apply the techniques used in measurement of passive electrical parameters including resistance, capacitance, inductance.	03
	G2.3	the ability to analyze and explain the electrical measurement circuits.	03
G3	G3.1	An ability of using catalogues of instruments.	05
G4	G4.1	the ability to use measurement methods to solve measurement circuits in industrial applications.	07
G5	G5.1	the ability to calculate, design and install the single-phase electrical measurement circuits.	11
	G5.2	the ability to calculate, design and install the power and energy measurement circuits in three-phase AC circuits.	11

9. Study materials

- Textbooks:

[1] *Bo mon CSKTĐ, Tai lieu thuc tap ky thuat đo, 2013*

- References:

[1] Nguyen Ngoc Tan – Ngo Van Ky, *Ky thuat đo*, NXB ĐH Quoc Gia TP.HCM, 2010.

10. Student Assessments

- Grading points: 10

- Planning for students assessment is followed:

Type	Contents	Linetime	Assessment technique	CLOs	Rates (%)
Exams					50
Exam 01	Wave form measurement using oscilloscopes.	Week 2	Report 1	G1.2, G2.1	5
Exam 02	Measurement of R, L, C and phase shift.	Week 3	Report 2	G2.1, G2.2	10
Exam 03	Current and voltage measurement.	Week 4	Report 3	G2.1, G4.1	5
Exam 04	Resistance measurement.	Week 5	Report 4	G1.2, G2.2	10
Exam 05	Measurement of power factor, power and energy in single-phase AC circuits.	Week 6	Report 5	G2.1, G4.1 G5.1	10
Exam 06	Measurement of power factor, power and energy in three-phase AC circuits.	Week 7	Report 6	G2.1, G2.3 G5.2	10

Final exam					50
Final Exam	Assembly circuits on the measurement kits, as required.	Week 8	Measurement kit	G2.1, G2.2 G4.1	

11. Course details:

Weeks	Contents	CLOs
1	Chapter 1: <HOW TO USE MEASURING INSTRUMENTS> (0/6/6)	
	A/ Contents and teaching methods: (6) Contents: 1.1 VOM. 1.2 Voltmeters, ammeters, power factor meters. 1.3 Single-Phase and three-Phase Wattmeters. 1.4 Energy meters. 1.5 Oscilloscopes. Teaching methods: + Theoretical lectures. + PowerPoint presentation.	G1.1 G3.1
	B/ Self-study contents: (6) + Review the structures and operations of measuring instruments.	G1.1
2	Chapter 2: <WAVE FORM INVESTIGATION USING OSCILLOSCOPES> (0/6/6)	
	A/ Contents and teaching methods: (6) Contents: 2.1 Sine wave observation using oscilloscopes. 2.2 Square wave observation using oscilloscopes. 2.3 Amplitude of sine wave measurement using oscilloscopes and AC Voltmeters. 2.4 Frequency of sine wave measurement using oscilloscopes. Teaching methods: + Theoretical lectures. + Tutorials and sample manipulation.	G1.2 G2.1
	B/ Self-study contents: (6) + The measurement methods of AC voltage and frequency.	G2.1
3	Chapter 3: <R-L-C CIRCUITS INVESTIGATION USING OSCILLOSCOPES> (0/6/6)	
	A/ Contents and teaching methods: (6) Contents: 3.1 Resistance measurement using oscilloscopes.	G2.1 G2.2

	<p>3.2 Capacitance measurement using oscilloscopes. 3.3 Inductance measurement using oscilloscopes. 3.4 Phase shift measurement using oscilloscopes. 3.5 Impedance measurement using oscilloscopes.</p> <p>Teaching methods:</p> <ul style="list-style-type: none"> + Theoretical lectures. + Tutorials and sample manipulation. 	
	<p>B/Self-study contents: (6)</p> <ul style="list-style-type: none"> + Review the measurement methods of resistance, capacitance, inductance, phase shift. 	G2.2
4	<p>Chapter 4: <CURRENT AND VOLTAGE MEASUREMENT> (0/6/6)</p>	
	<p>A/ Contents and teaching methods: (6)</p> <p>Contents:</p> <ul style="list-style-type: none"> 4.1 Define the accuracy class of voltmeters. 4.2 Current and voltage measurement in DC circuits. 4.3 Current and voltage measurement in AC circuits. 4.4 High current measurement. <p>Teaching methods:</p> <ul style="list-style-type: none"> + Theoretical lectures. + Tutorials and sample manipulation. 	G2.1 G4.1
	<p>B/Self-study contents: (6)</p> <ul style="list-style-type: none"> + Design of the measurement circuits of high voltage. 	G2.1 G5.1
5	<p>Chapter 5: <RESISTANCE MEASUREMENT> (0/6/6)</p>	
	<p>A/ Contents and teaching methods: (6)</p> <p>Contents:</p> <ul style="list-style-type: none"> 5.1 Resistance measurement using Voltmeter–ammeter methods. 5.2 Resistance measurement using comparison methods. 5.3 Resistance measurement using balance Wheatstone bridges. 5.4 Measurement of earth resistance. <p>Teaching methods:</p> <ul style="list-style-type: none"> + Theoretical lectures. + Tutorials and sample manipulation. 	G1.2 G2.2
	<p>B/Self-study contents: (6)</p> <ul style="list-style-type: none"> + How to use Wheatstone bridges and terometers. 	G2.2
6	<p>Chapter 6: <MEASUREMENT OF POWER FACTOR, POWER AND ENERGY IN SINGLE-PHASE AC CIRCUITS> (0/6/6)</p>	
	<p>A/ Contents and teaching methods: (6)</p> <p>Contents:</p> <ul style="list-style-type: none"> 6.1 Power factor measurement using voltmeter, ammeter and wattmeter. 	G2.1 G4.1 G5.1

	<p>6.2 Power factor measurement using voltmeters. 6.3 Power measurement using voltmeter–ammeter methods. 6.4 Power measurement using wattmeters. 6.5 Energy measurement using single-phase energy meters.</p> <p>Teaching methods: + Theoretical lectures. + Tutorials and sample manipulation.</p>	
	<p>B/Self-study contents: (6) + Review the measurement methods of power, energy in single-phase AC circuits. + How to use energy meters and wattmeters.</p>	<p>G1.1 G2.1</p>
7	<p>Chapter 7: <MEASUREMENT OF POWER FACTOR, POWER AND ENERGY IN THREE-PHASE AC CIRCUITS> (0/6/6)</p>	
	<p>A/ Contents and teaching methods: (6) Contents: 7.1 Power factor measurement using power factor meters. 7.2 Current and voltage measurement in three-phase AC circuits. 7.3 Power measurement using three-phase wattmeters. 7.4 Energy measurement using three-phase energy meters.</p> <p>Teaching methods: + Theoretical lectures. + Tutorials and sample manipulation.</p>	<p>G2.1 G2.3 G5.2</p>
	<p>B/Self-study contents: (6) + Design of the measurement circuits of current, voltage and energy in three-phase circuits.</p>	<p>G2.1 G5.2</p>
8	<p><EXAM> (0/3/3)</p>	
	<p>A/ Contents and teaching methods: (3) Contents: Final exam.</p> <p>Teaching methods: Lab test.</p>	<p>G2.1 G2.2 G4.1</p>
	<p>B/Self-study contents:(3) + Review the electrical measurement methods.</p>	<p>G2.1 G2.2</p>

12. Learning ethics:

Assignments must be done by the students themselves and not copied or plagiarized from any source. Plagiarism found in the assessments will get zero point.

13. First approved date: August 01 2012

14. Approval level:

Dean

Department

Instructor

1. Syllabus updated process

1st time: Updated content dated

Instructors

2st time: Updated content dated

Head of department