

University of Macau
Faculty of Science and Technology
Department of Electrical and Computer Engineering

Part A: Course Outline

Course Title:	Measuring and Instrumentation II		
Course Code:	ELEC352	Year of Study:	3
Course Mode:	Theoretical with substantial laboratory/practice content		
Compulsory/Elective:	Compulsory		
Course Prerequisites:	ELEC251 Measuring and Instrumentation I		
Prerequisite Knowledge	Circuit Analysis, fundamental electronics circuits, measurement and instrumentation		
Class/Laboratory Schedule:	2-hours lecturer and 2-hours laboratory per week		
Duration	1 semester	Credit Units	3.5
Text Books and References:	<p>[1] Larry D. Jones / A. Foster Chin, "Electronic Instruments and Measurements", Second Edition, Prentice Hall.</p> <p>[2] David A. Bell, "Electronic Instrumentation and Measurements", Prentice-Hall.</p> <p>[3] Labview 6i, Student Edition, National Instruments, Prentice Hall</p>		
Course Description:	<p>This course introduces the operations of measuring instruments, transducers, signal conditioning and automatic measuring equipment. The topics discussed include power meters, Q-meters, recording instruments, signal generators, transducers, noise, filters, digital instruments, signal analyzers, etc. After taking this course, the students should be able to use and understand the various equipments in electrical and electronic measuring, and to clarify the problem in measuring with consideration of signal conditions and data acquisition techniques, and to have ability to set up automatic measuring equipment.</p>		
Topics Covered	<p>Part I: Measurement with Q meters, Power meters, Recording instruments, Signal Generators and Signal Analyzers.</p> <p>Part II: Transducers</p> <p>Part III: Signal Conditioning and Data Acquisition</p> <p>Part IV: Virtual Measurement Unit (Labview)</p>		
Course Objectives:	<ol style="list-style-type: none"> 1. To introduce to students the theory and applications of measurement and instrumentation systems for electrical and electronics engineering, [a, e, k] 2. To prepare students to know the characteristics of different instrumentation systems, [a, b, c, d, e] 3. To design signal conditioning circuits corresponding to the measurement purposes.[a, b, c, d, e, k] 		
Course Assessment:	<p>Simulation and Experiments: 25%, Group Project and Virtual Instruments: 25%, Mid-term Exam. : 20%, Final Exam. : 30%</p>		

<p>Relationship to Program Objectives and Outcomes</p>	<p>This course primarily contributes to ECE program outcomes that develop students abilities to:</p> <ul style="list-style-type: none"> a. Ability to apply knowledge of mathematics, science and engineering. b. Ability to design and conduct experiments. c. Ability to design a system, component or process to meet desired needs. e. Ability to identify, formulate and solve engineering problems. k. Ability to use the techniques, skills and modern engineering tools necessary for engineering practice. <p>This course secondarily contributes to ECE program outcomes that develop students abilities to:</p> <ul style="list-style-type: none"> d. Ability to function on multidisciplinary teams. g. Ability to communicate effectively. l. Ability to use computer/IT tools. 																								
<p>Course Contents and Relationship to Program Criteria:</p>	<table border="1"> <thead> <tr> <th data-bbox="469 864 564 936">Week no.</th> <th data-bbox="564 864 1323 936">Topics</th> <th data-bbox="1323 864 1482 936">Program Criteria</th> </tr> </thead> <tbody> <tr> <td data-bbox="469 936 564 1037">0.5</td> <td data-bbox="564 936 1323 1037"> Introduction A brief look on signal condition circuits for electrical and electronics measurement and </td> <td data-bbox="1323 936 1482 1037">ES</td> </tr> <tr> <td data-bbox="469 1037 564 1137">0.5</td> <td data-bbox="564 1037 1323 1137"> Q meter Basic principle and operations of Q meter </td> <td data-bbox="1323 1037 1482 1137">ES, DIC, CV</td> </tr> <tr> <td data-bbox="469 1137 564 1294">2</td> <td data-bbox="564 1137 1323 1294"> Power Meter and Project Study To learn the basic operations of power meters in signal-phase and three-phase systems, to discuss the most updated power measurement problems, simulation and project study for power meters </td> <td data-bbox="1323 1137 1482 1294">DIC, ES, CV, CS</td> </tr> <tr> <td data-bbox="469 1294 564 1406">1</td> <td data-bbox="564 1294 1323 1406"> Signal Generators To familiar with different kinds of signal generators for measurement purposes </td> <td data-bbox="1323 1294 1482 1406">DIC, ES</td> </tr> <tr> <td data-bbox="469 1406 564 1518">2</td> <td data-bbox="564 1406 1323 1518"> Recording Instrument, Logic Analyzer, Signal Analyzer To know different instruments in eee </td> <td data-bbox="1323 1406 1482 1518">ES, CV</td> </tr> <tr> <td data-bbox="469 1518 564 1653">4</td> <td data-bbox="564 1518 1323 1653"> Data Acquisition and Signal Conditioning To know the purpose for signal conditioning circuits and to construct a signal conditioning circuit corresponding to eee measurement systems. </td> <td data-bbox="1323 1518 1482 1653">ES, CV</td> </tr> <tr> <td data-bbox="469 1653 564 1727">3</td> <td data-bbox="564 1653 1323 1727"> Virtual Measurement To familiar with virtual measurement by Labview programming </td> <td data-bbox="1323 1653 1482 1727">CS, ES, CV</td> </tr> </tbody> </table>	Week no.	Topics	Program Criteria	0.5	Introduction A brief look on signal condition circuits for electrical and electronics measurement and	ES	0.5	Q meter Basic principle and operations of Q meter	ES, DIC, CV	2	Power Meter and Project Study To learn the basic operations of power meters in signal-phase and three-phase systems, to discuss the most updated power measurement problems, simulation and project study for power meters	DIC, ES, CV, CS	1	Signal Generators To familiar with different kinds of signal generators for measurement purposes	DIC, ES	2	Recording Instrument, Logic Analyzer, Signal Analyzer To know different instruments in eee	ES, CV	4	Data Acquisition and Signal Conditioning To know the purpose for signal conditioning circuits and to construct a signal conditioning circuit corresponding to eee measurement systems.	ES, CV	3	Virtual Measurement To familiar with virtual measurement by Labview programming	CS, ES, CV
Week no.	Topics	Program Criteria																							
0.5	Introduction A brief look on signal condition circuits for electrical and electronics measurement and	ES																							
0.5	Q meter Basic principle and operations of Q meter	ES, DIC, CV																							
2	Power Meter and Project Study To learn the basic operations of power meters in signal-phase and three-phase systems, to discuss the most updated power measurement problems, simulation and project study for power meters	DIC, ES, CV, CS																							
1	Signal Generators To familiar with different kinds of signal generators for measurement purposes	DIC, ES																							
2	Recording Instrument, Logic Analyzer, Signal Analyzer To know different instruments in eee	ES, CV																							
4	Data Acquisition and Signal Conditioning To know the purpose for signal conditioning circuits and to construct a signal conditioning circuit corresponding to eee measurement systems.	ES, CV																							
3	Virtual Measurement To familiar with virtual measurement by Labview programming	CS, ES, CV																							
<p>Contribution of Course to meet the professional component:</p>	<p>This course prepares students to work professionally in the area of EEE instrumentation fields. Students should be able to apply knowledge of mathematics and engineering, and identify formulas to solve eee measurement and instrumentation engineering problems. Finally, students should be able to design a signal conditioning circuit for eee measurement.</p>																								
<p>Course Instructor(s):</p>	<p>Dr. Han Ying- Duo, Dr. Wong Man-Chung</p>																								
<p>Prepared by:</p>	<p>Dr. Man-Chung Wong</p>																								

Program Criteria Policy:

Course VS Program Criteria

Scale: 1 (Highest) to 4 (Lowest)

Course	PS	DIC	BS	CS	ES	DE	LA	CV	DM
Measurement And Instrumentation II		3		4	1			2	

Terms:

Probability and Statistics (PS), Differential and Integral Calculus (DIC), Basic Science (BS), Computer Science (CS), Engineering Science (ES), Differential Equation (DE), Linear Algebra (LA), Complex Variables (CV), Discrete Mathematics (DM)

Program Outcome Policy:

Course VS Course Outcomes

(H= Highly Related, S = Supportive, N = None)

Course	a	b	c	d	e	f	g	h	i	j	k	l
Measurement And Instrumentation II	H	H	H	S	H	N	S	N	N	N	H	S

The electrical and electronics engineering program outcomes are:

- a. Ability to apply knowledge of mathematics, science and engineering.
- b. Ability to design and conduct experiments.
- c. Ability to design a system, component or process to meet desired needs.
- d. Ability to function on multidisciplinary teams.
- e. Ability to identify, formulate and solve engineering problems.
- f. Understanding of professional and ethical responsibility.
- g. Ability to communicate effectively.
- h. Broad education necessary to understand the impact of engineering solutions in global and societal context.
- i. Recognition of the need for and an ability to engage in life-long learning.
- j. Knowledge of contemporary issues.
- k. Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
- l. Ability to use the computer/IT tools relevant to the discipline along with an understanding of their processes and limitations

Curriculum Detail

ELEC 352 Measurement And Instrumentation II

Timetabled work in hours per week			No of teaching weeks	Total hours	No /Duration of exam papers	Max marks available from:	
Lecturer	Tutor	Practice				Exams	Course
2	0	2	14	56	2/5 hours	50	50

Term: 5th

Hours			Percentage content of					
Lecturer	Lab/tut	Other	Maths	Basic Science	Engineering Science	Engineering Design and Synthesis	Complementary Studies	Computer Studies
28	24/4	0	20	0	40	35	0	5

Design Elements

% of Design Content	Design Content in Course Work	Design Project	Design Content in Laboratories
35%	X	X	0

Course Assessment Policy:

- Homework/laboratory assignments are given to students according to the course progress. No late report is accepted. Zero mark should be given when homework /reports are copied.
- All students must attend the experimental sections and group experimental reports need to hand up within one week after the experiment.
- Simulations related to the power measurement will be given for single-phase and three-phase systems.
- A case study on signal conditioning circuits for eee measurement will be given and a hardware signal conditioning circuit needs to be set up and tested. A report should be handed up for signal conditioning circuit design.
- Virtual programming by Labview is studied.
- 2 students form one group and group report should be handed up.
- 1 mid-term exam and 1 final exam will be performed with 2 hours and 3 hours respectively.