University of Macau

Faculty of Science and Technology

Department of Electrical and Electronics Engineering

Part A: Course Outline

Course Title:	**Applied Electronics II**		
Course Code:	ELEC223	Year of Study:	2
Course Mode:	Theoretical with subtantial laboratory/ practice content		
Compulsory/Elective:	Compulsory		
Course Prerequisites:	Applied Electronics I		
Prerequisite Knowledge	Strong in **Circuits Analysis + basic electronic cicuit**		
Class/Laboratory Schedule:	3 lecture hours, 1.5 hours tutorial/lab work per week		
Duration	One semester	Credit Units	3.5
Text Books and References:	Text: Sedra & Smith, "*Microelectronic Circuits*," 5th/6th Ed. Oxford U. P. Ref.: [1] D. Neamen, "*Electronic Circuits Analysis and Design*", McGraw-Hill [2] R. Jaeger & T. Blalock, "*Microelectronic Circuit Design*" McGraw-Hill [3] B. Razavi, "*Design of Analog CMOS Integrated Circuits*" McGraw-Hill [4] **Sedra & Smith workgroup** web-page: at http://www.sedrasmith.org/		
Course Description:	Because of its tiny size and low consumption power, FETs (hence CMOS) have become more and more popular in nowadays electronic circuits. This course introduce from FET device structure to sample applications and various building blocks in typical IC (both analog and digital circuits).		
Topics Covered	1. Guided tour of Electronics & its Fabrication 2. FET device and its various operation modes + equivalent circuits 3. Various bias techniques with Sensitivity, Worst-case and Monte Carlo Analyses 4. Basic Building blocks for ICs 4a. Current Mirrors & their improved versions 4b. Digital Inverter: analysis & design 4c. Single-stage core amplifier configurations 4d. Differential Amplifier & Multistage Amplifier 5. Frequency response Analysis 6. Brief Introduction to Feedback Techniques		
Course Objectives:	1. To provide students with the elementary knowledge to **analyze FET circuits and their various basic building blocks in ICs** [a, c, e] 2. To provide hands-on simulation and experimental practices [b, d, e] 3. To give important electronic circuit concepts/techniques such frequency response & Sensitivity + Monte Carlo Circuit Analyses [a, e, k]		

<table>
<tr><td>Course Assessment:</td><td>Pop Quizzes : 6%
HW Assignments: 16%
Simulation Projects and Experiments: 18%
Mid-term Exam. : 16%
Final Exam. : 44%</td></tr>
<tr><td>Relationship to Program Objectives and Outcomes</td><td>This course primarily contributes to EEE program outcomes that develop students abilities to:
a. Ability to apply knowledge of mathematics, science and engineering.
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.

This course secondarily contributes to EEE program outcomes that develop students abilities to:
b. Ability to design and conduct experiments.
d. Ability to function on multidisciplinary teams.
l. Ability to use the computer/IT tools relevant to the discipline along with an understanding of their processes and limitations</td></tr>
<tr><td>Course Contents and Relationship to Program Criteria:</td><td>
<table>
<tr><th>Week no.</th><th>Topics</th><th>Program Criteria</th></tr>
<tr><td>1.5</td><td>Overview of Electronics and its Fabrication</td><td>BS, ES,</td></tr>
<tr><td>2</td><td>FETs device & circuit operations</td><td>DIC, CS,</td></tr>
<tr><td>2</td><td>Bias and Current Source with improvements and sensitivity & Monte Carlo analysis</td><td>ES, CS,</td></tr>
<tr><td>2.5</td><td>Differential and Multistage Amplifiers</td><td>ES, DE, BS</td></tr>
<tr><td>2</td><td>Digital CMOS Logic Inverter: analysis & design</td><td>CS, ES, BS,</td></tr>
<tr><td>2.5</td><td>Basic Frequency Response of Electronic Circuits</td><td>ES</td></tr>
<tr><td>1</td><td>Intro. Feedback & Stabilization Structure, Techniques</td><td>DIC, ES, CS,</td></tr>
</table>
</td></tr>
<tr><td>Contribution of Course to meet the professional component:</td><td>This course is continuation of basic electronic circuit course (use of OP-Amp & Bipolar circuits). Students should be able to apply knowledge of mathematics and engineering, and identify formulas to solve practical microelectronic (analysis and design) engineering problems from the instructed techniques.</td></tr>
<tr><td>Course Instructor(s):</td><td>Dr. Mak, Peng Un, and/or et al.</td></tr>
<tr><td>Prepared by:</td><td>Dr. Mak, Peng Un</td></tr>
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Part B: General Course Information and Policies

(2010 Spring) Instructor: Dr. Mak, Peng Un Phone: 4393 Office: N313
Office Hour: TBA or by appointment
E-mail: fstpum@umac.mo Assignment E-turn-in email: maksirhandin@gmail.com
Our course supplementary page is http://eecl1.cl.eee.umac.mo/~fstpum/ (intranet only)
TA: TBA E-mail: TBA
Office: TBA Phone: TBA

Programme Educational Objectives

1. **Problem Solving:** Graduates have the ability to think in a critical and evaluative manner and to consider a broad perspective, in order to solve technical and nontechnical problems.
2. **Leadership and Communication:** Graduates will provide effective leadership, act in an ethical manner and skills will include the ability to communicate well and to work successfully within diverse groups.
3. **Market Acceptance:** Graduates will have successful careers in the academic environment, industrial and government organizations.
4. **Technical Competence:** Graduates will be technically competent and have a thorough grounding in the fundamentals of math and science in electrical and computer engineering and experience in engineering design. They will be able to use modern engineering techniques, skills, and tools to fulfill societal needs.

Scale: 1 (Highest) to 4 (Lowest)

	Problem Solving	**Leadership and Communication**	**Market Acceptance**	**Technical Competence**
Applied Electronics II	2	3	2	1

Remark:

- Objective for “Problem Solving” can be achieved by assignments, quizzes, mid-term exam, final exam and projects.
- Objective for “Leadership and Communication” can be achieved by report writing and presentation. However, leadership training is not formally given by this course.
- Objective for “Market Acceptance” can be achieved by the course subject that is related to electronic circuit design careers.

- Objective for “Technical Competence” can be achieved by using fundamentals of math and electrical and computer engineering and experience in engineering HW, computer simulation and assignments.

Program Criteria Policy:

Course VS Program Criteria

Scale: 1 (Highest) to 4 (Lowest)

Course	PS	DIC	BS	CS	ES	DE	LA	CV	DM
Applied Electronics II	3	2	2	3	1	3			

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
Applied Electronics II	H	S	S	S	H	N	S	S	N	S	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 223 Applied Electronics II

Timetabled work in hours per week (on average)			**No of teaching weeks**	**Total hours**	**No /Duration of exam papers**	**Max marks available from:**	
Lecturer	**Tutor**	**Practice**				**Exams**	**Course**
3	0.5	1.0	14	63	2/4-4.5 hours	66	34

Term: 5th

Hours			**Percentage content of**					
Lecturer	Lab/tut	Other	Maths	Basic Science	Engineering Science	Engineering Design and Synthesis	Complementary Studies	Computer Studies
42	14/7	0	15	15	45	15	0	10

Design Elements

% of Design Content	**Design Content in Course Work**	**Design Project**	**Design Content in Laboratories**
20%	X	x	X

X: has some

Course Assessment Policy:

- Homework assignments will be given to students according to the course progress, no late homework is accepted. Zero mark will be given when homework is copied.
- A number of pop quizzes will be held during the semester randomly.
- Some experiments will be performed during the semester. 2 students form one group and group report should be handed in.
- Commercial circuit simulation tools shall be used to perform engineering calculation with visualization
- 1 mid-term exam and 1 final exam will be performed with 1.5 hours and 3 hours respectively.
- If time is permitted, on-site visit to nearby company or facilities shall be arranged!