

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

Part A: Course Outline

Course Title:	Applied Electronics		
Course Code:	ECEB 310	Year of Study:	2
Course Mode:	Theoretical with substantial laboratory/ practice content		
Compulsory/Elective:	Compulsory		
Course Prerequisites:	ECEB 221		
Prerequisite Knowledge	Fundamental Electronics		
Class/Laboratory Schedule:	2-hours lecture, 2-hour tutorial/lab work per week		
Duration	One semester	Credit Units	3
Text Books and References:	<p>[1] Robert L. Boylestad and Louis Nashashelsky, <i>Electronic Devices and Circuit Theory</i>, 11th Edition, Prentice Hall, 2012.</p> <p>[2] A. S. Sedra and K. C. Smith, <i>Microelectronics Circuits</i>, 5th Edition, Oxford University Press, 2004.</p> <p>[3] N. R. Malik, <i>Electronic Circuit Analysis, Simulation and Design</i>, Prentice-Hall, 1995.</p> <p>[4] S. Franco, <i>Design with Operational Amplifiers and Analog Integrated Circuits</i>, McGraw-Hill, 1988.</p> <p>[5] R. C. Dorf and J. A. Svoboda, <i>Introduction to Electric Circuit</i>, 3rd Edition, John Wiley & Sons, 1996.</p> <p>[6] P. R. Gray and R. G. Meyer, <i>Analysis and Design of Analog Integrated Circuits</i>, 3rd Edition, John Wiley & Sons, 1993.</p> <p>[7] D. A. Johns, K. Martin, <i>Analog Integrated Circuit Design</i>, John Wiley & Sons, Inc., 1997.</p>		
Course Description:	<p>This course discusses the feedback configuration in Part 1; its analysis is first presented after conventional feedback structure overview, and then some simple stability applications follow. Part 2 of this course is devoted to some advanced analog circuits with the special emphasis on oscillator. After, this course goes to the introduction of an important class of circuitry – active filters in Part 4. Finally, the output stages and power amplifiers will be discussed in Part 4. Besides, some experiments are provided to help students to have a thorough grasp of the above discussion.</p>		
Topics Covered	<ol style="list-style-type: none"> 1. Feedback network 2. Signal generators and waveform-shaping circuits 3. Filters and tuned amplifiers 4. Output stages and power amplifiers in communication systems 		

<p>Course Objectives:</p>	<ol style="list-style-type: none"> 1. To introduce to students the different configurations of feedback systems and their analysis in analog circuits. [a, b, c, d, e, k] 2. To study the analog signal generation technique. Requirements for oscillators are discussed and different circuit configurations are also studied. [a, e, k, l] 3. To provide the student insight of fundamental knowledge about active filters and tuned amplifiers. Filter classification and their corresponding specifications are also introduced. [a, b, c, d, e, g, k, l] 4. To study and compare the performance of output stages with different topologies. [a, b, d, e, g, k, l]
<p>Course Assessment:</p>	<p>Quiz: 10%</p> <p>Simulation and Experiments: 30%</p> <p>Mid-term Exam. : 25%</p> <p>Final Exam. : 35%</p>
<p>Relationship to Program Objectives and Outcomes</p>	<p>This course primarily contributes to ECE program outcomes that develop students abilities to:</p> <ol style="list-style-type: none"> a. Ability to apply knowledge of mathematics, science and engineering. 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> <ol style="list-style-type: none"> 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. l. Ability to use the computer/IT tools relevant to the discipline along with an understanding of their processes and limitations.

Course Contents and Relationship to Program Criteria:	Week no.	Topics	Program Criteria
	4	Feedback Network parameters; Feedback classification; A-circuit and β -circuit; Stability.	BS, ES
	4	Signal Generators and Waveform-Shaping Circuits Phase/Magnitude conditions; Wien-Bridge oscillator; LC-tuned oscillator; Derivation of oscillating frequency and condition of oscillation.	BS, ES
	3	Filters and Tuned Amplifiers Filter specification; Frequency response; Butterworth and Chebyshev filters; Magnitude-squared function; Second-order filter function; Inductor replacement; Biquad using Two-Integrator-Loop structure; Single-Amplifier Biquad; Switched-Capacitor Filter.	ES
	3	Output Stages and Power Amplifiers Power Amplifier vs. Signal Amplifier; Power calculation; Class A, Class B and Class AB amplifiers; Power conversion efficiency; Cross over distortion elimination; Compound devices for output stage; Darlington Circuit.	ES
Contribution of Course to meet the professional component:	This course provides fundamental knowledge in electronic aspects. Different types of circuitries/components are introduced as so to complete the theory on analog circuit design.		
Course Instructor(s):	Prof. Tam Kam Weng		
Prepared by:	Prof. Tam Kam Weng		

Part B: General Course Information and Policies

Instructor: Prof. Tam Kam Weng

Office: E11-4042a

Office Hour: By appointment

Ext.: 4373

E-mail: kentam@umac.mo

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 electronics 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	1	3	2	1

Remarks:

- 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 given by this course.
- Objective for “Market Acceptance” can be achieved by the course subject that is related to communication systems.
- Objective for “Technical Competence” can be achieved by using fundamentals of math and science in electrical and electronics engineering and experience in engineering project design and computer simulation.

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			3	2	5				

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)

Relationship of Course to Programme Outcomes:

Course VS Course Outcomes

***T – TEACH; P – PRACTICE; M – MEASURED**

	Program Outcomes											
	a	b	c	d	e	f	g	h	i	j	k	l
ECEB310 Applied Electronics	TPM	PM	PM	PM	TM		P				TM	PM

The outcomes of electrical and computer engineering program 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.

Ability to use the computer/IT tools relevant to the discipline along with an

1. understanding of their processes and limitations

Curriculum Detail

ECEB310 Applied Electronics

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	1.2	0.8	14	56	2/5 hours	55	45

Term: 4th

Hours			Percentage content of			
Lecturer	Lab/tut	Safety and Environmental Knowledge	Maths and Basic Science	Engineering Subjects	Complementary Studies	Computer Studies
40	6/8	2	30	60	0	10

Design Elements

Please use an "X" to indicate the presence of the specific elements in the course/module/subject.

Design Content in Course Work	Design Project(s)	Design Content in Laboratories
X		X

Course Assessment Policy:

Course notes, tutorial notes, tips of weekly study and class news are posted on the course web according to the course progress. Assignments will be given to students according to the course progress, and, selected assignments' answers will be posted onto course web accordingly in addition to the weekly tutorial classes;

- 4 quizzes will be given and only the best 3 are counted;
- 3 experiments will be performed. 2 students form a group and individual reports should be submitted. Commercial software shall be used in simulations.
- A 2-hours mid-term exam and a 3-hours final exam will be required respectively.