

COURSE SYLLABUS
(Training Level: Undergraduate)

Course Title:

Vietnamese Subject: Kỹ thuật điện tử tương tự

English Subject: Analog Electronic Engineering

Course Code: MAN131

Major: Electronic and telecommunications engineering technology, Computer engineering technology, Biomedical engineering.

Training program: Bachelor; Engineer.

Version: 2017

1. General Information

- Number of credits: 3 (Theory: 3; Practice: 0)

- Types of Knowledge:

General Education		Base core courses		Major core courses		Concentration courses		Others
Required <input type="checkbox"/>	Optional <input type="checkbox"/>	Required <input type="checkbox"/>	Optional <input type="checkbox"/>	Required <input type="checkbox"/>	Optional <input type="checkbox"/>	Required <input checked="" type="checkbox"/>	Optional <input type="checkbox"/>	Alternative subject of Graduation Thesis <input type="checkbox"/>

- Required course: None.

- Pre-requisite: Physic Subject.

- Co-requisite: None.

- Facility Requirements: Classrooms with projectors

- Departments in Charge: Faculty of Electronic and Communication Technology

2. Time Allocated

Total: 54 Periods	Theory: 33 periods
	Discussion/ Group Presentation: 18 periods
	Assignment/ Essay/ Practice: 0.

	Tests: 3 periods + Theory: Number of Tests:03 +Practice: Number of Tests:0	Periods: 03 Periods: 0
Self-study: 90 periods.		

3. Lecturer's Information

No.	Lecturer name	Phone number	Email	Note
1	MSc.Nguyễn Thanh Trung	0987843338	nttrungktmt@ictu.edu.vn	Leader
2	MSc.Nguyen Sy Hiep	0988.999.027	nshiep@ictu.edu.vn	Member
3	MSc.Doan Manh Cuong	0973039940	dmcuong@ictu.edu.vn	Member

4. Objectives

- Knowledge: The Analog Electronics course aims to equip students with knowledge and skills to contribute to achieving the related learning outcomes of the training program, specifically:
Basic knowledge about types of electronic materials, about the structure, symbols, specifications, and applications of passive electronic components, operating principles, and applications of semiconductor diodes biasing, circuit diagrams, and applications of bipolar junction transistors, biasing, circuit diagrams, and applications of field-effect transistors, integrated circuits and semiconductor integrated circuit fabrication technology
- Skills: Students can calculate some practical electronic problems.
- Attitude: The course creates confidence, professionalism in problem solving. Promote the students' sense of self-study and creativity. Consciously apply the knowledge learned to life in general and professional reality in particular.
- Position of course: The course belongs to the major core courses, which is compulsory.
- The course contributes to meeting the L5, L6, L7, L8 learning outcomes of the training program.

5. Describe the content and learning outcomes (according to Bloom's taxonomy)

Learning outcomes of the course (according to Bloom's cognitive taxonomy).

- (1) Remembering ⇒ (2) Understanding ⇒ (3) Applying ⇒ (4) Analyzing ⇒ (5) Evaluating ⇒ (6) Creating

CLO	Course Learning Outcome (CLO)	Degree		TPLOS
		Knowledge	skills	
C1	Knowing the characteristics of different types of electronic materials	2		L8
C2	Understanding the structure, symbols, and applications of passive electronic components.	2		L8
C3	Understanding the structure, symbols, operating principles, and applications of semiconductor diodes	3	3	L8
C4	Understand the structure, symbol, and operating principle of some special types of diodes	2		L8

CLO	Course Learning Outcome (CLO)	Degree		TPLOS
		Knowledge	skills	
C5	Understand the structure, symbol, and operating principle of bipolar transistors.	2		L8
C6	Understand the principle of biasing and static operating point stability of transistors	3	3	L8
C7	Understand the diagrams and characteristics of amplifier stages using transistors	3	3	L8, L5
C8	Understand the diagrams and characteristics of amplifier stages using transistors.	3	3	L8, L5
C9	Understand the diagrams and characteristics of amplifier stages using transistors	2		L8, L5
C10	Understand the diagrams and characteristics of circuits using JFETs	2		L8, L7
C11	Understand the biasing methods for JFETs	2		L8, L7
C12	Understand the parameters and equivalent circuit of JFET in small signal mode.	2		L8, L7
C13	Understand the structure, symbol, and operating principle of depletion-mode and enhancement-mode MOSFETs	2		L8, L7
C14	Understand the ways to connect MOSFETs in amplifier circuit diagrams and the biasing methods for MOSFETs.	2		L8, L7
C15	Understand the applications of field-effect transistors.	2		L8, L6
C16	Understand the structure, symbol, operating principle, and applications of silicon-controlled rectifiers (SCRs)	2		L8, L7
C17	Understand the structure, symbol, operating principle, and applications of Diacs	2		L8, L7
C18	Understand the structure, symbol, operating principle, and applications of Triacs.	2		L8, L7
C19	Understand the structure, symbol, operating principle, and applications of four-layer diodes.	2		L8
C20	Understand the concept and classification of integrated circuits	2		L8
C21	Understand the method of manufacturing semiconductor integrated circuits.	2		L8, L6
C22	Understand the general concept of optoelectronics technology	2		L8
C23	Understand the structure and operating principle of electrical-to-optical conversion components.	2		L8
C24	Understand the structure and operating principle of optical-to-electrical conversion components.	2		L8

6. Reading List

A. Main Syllabus

[1]. Đỗ Xuân Thụ (2009), Electronic engineering, education publisher.

B. References

[2]. Phạm Minh Hà (2009), Electronic circuit technology , Science and Technology Publishing House.

[3]. Nguyễn Viết Nguyên (2009), Electronics Components and Applications Coursebook, education publisher.

[4]. Trần Quang Vinh (2007), Electronic components, College of Post and Telecommunications Technology

[5]. Thomas L.Floyd (2005), Electronic Devices, Prentice Hall Pearson.

[6]. Thomas L.Floyd (2005), Electronic Devices, Prentice Hall Pearson.

7. Score Assessment

- Score Scale: 10.

- Components Assessment:

Evaluation Time	Components Assessment	Course Learning Outcome	Factor	Score	Weight
During the duration of the course	Attendance: (score b_0)		1	$d = (b_0 + b_1 + b_2 + b_3) / 4$	30%
According to the teaching plan in section 9	Test No.1: (b_1)	$C_1 \div C_4$	1		
	Test No.2: (b_2)	$C_5 \div C_{15}$	1		
	Test No.3: (b_3)	$C_{16} \div C_{24}$	1		
The end of the term.	Final exam	$C_1 \div C_{24}$		Final examination: e	70%
Final Score: (f)				$f = d \times 30\% + e \times 70\%$	

- End-term Examination: Write

8. Regulations for students

8.1. Student's duties

- Read the material and prepare for each lesson before attending class.
- Complete assigned assignments.
- Prepare discussion content for the course.

8.2. Regulations on Exams and Academic Studies

- Students must attend classes, ensuring at least 80% of classroom sessions.
- Complete the assigned tasks for the course.
- Participate in the full number of regular tests.

9. Teaching Plan

No.	Period	Contents	Teaching Methodology	CLOs	References
1	3	<p>Chapter 1: Passive Electronic Components and Semiconductor Diodes</p> <p>1.1. General Introduction</p> <p>Definition of electronic components.</p> <p>Classification of electronic components.</p> <p>1.2. Concepts of Electrical Circuits and Electronic Systems</p> <p>1.3. Electronic Materials</p> <p>1.3.1. Insulating Materials (Dielectrics)</p> <p>1.3.2. Conducting Materials</p> <p>1.3.3. Semiconductor Materials</p> <p>-Pure Semiconductor Materials.</p> <p>-Impure Semiconductor Materials:</p> <p>N-type Semiconductor Materials</p> <p>-P-type Semiconductor Materials</p> <p>-Photoconductive Materials</p> <p>1.3.4. Energy Bands in Electronic Materials.</p> <p>1.4. Passive Electronic Components</p> <p>1.4.1. Definition of Passive Electronic Components.</p> <p>1.4.2. Resistors</p> <p>Definition and symbols</p> <p>Classification</p> <p>Methods of determining values.</p>	<p>- Teaching: Lecturing, interacting with students.</p> <p>In-class learning: Listening to lectures, taking notes, and interacting with the instructor.</p> <p>At-home learning: Reviewing course materials covered in class and previewing upcoming materials for the next class</p>	C1 C2	[1]. 18-22 [5]. 22-30 [3]. 30-34 [4]. 10-16
2	3	<p>1.4.3. Capacitors</p> <p>Definition and symbols</p> <p>Classification</p> <p>Determining values</p> <p>Applications</p> <p>1.4.4. Inductors and Transformers</p>	<p>- Teaching: Lecturing, interacting with students.</p> <p>In-class learning: Listening to lectures, taking notes, and interacting with the instructor.</p>	C1 C2	[1]. 22-27 [3]. 34-41 [4]. 27-39 [5]. 32-45 [6]. 31-35

		<p>Definition Classification Applications</p> <p>1.5. Semiconductor Diodes</p> <ul style="list-style-type: none"> -Construction and symbols -Operation of a semiconductor diode -Polarization of a semiconductor diode -Voltage-current characteristic curve of a diode (V-I) 	<p>At-home learning: Reviewing course materials covered in class and previewing upcoming materials for the next class</p>		
3	3	<p>Chapter 1 Discussion</p> <p>Exercises on reading values of passive electronic components and calculating their values when connected in specific electronic circuit diagrams.</p>	<p>- Teaching: Lecturing, interacting with students.</p> <p>In-class learning: Listening to lectures, taking notes, and interacting with the instructor.</p> <p>At-home learning: Reviewing course materials covered in class and previewing upcoming materials for the next class</p>	C1 C2	[4]. 27-49
4	3	<p>1.6. Some applications of semiconductor diodes</p> <p>1.6.1. Half-wave rectifier circuit with center-tapped transformer</p> <p>1.6.2. Full-wave rectifier circuit</p> <p>1.6.3. Clipping circuit</p> <p>1.7. Some special types of diodes</p> <p>1.7.1. Zener diode</p> <p>1.7.2. Varactor diode</p> <p>Periodic Test</p>	<p>- Teaching: Lecturing, interacting with students.</p> <p>In-class learning: Listening to lectures, taking notes, and interacting with the instructor.</p> <p>At-home learning: Reviewing course materials covered in class and previewing upcoming materials for the next class</p>	C1 C3 C4	[1]. 27-32 [3]. 41-64 [4]. 67-70
5	3	<p>Chapter 1 discussion (continued)</p> <p>Discussion on the topic of special types of diodes and exercises on circuits with diodes</p>	<p>The teacher presents discussion topics and the students research the materials and present them to the class.</p>	C1 C3 C4	[1]. 27-32 [3]. 41-56
6	3	<p>CHAPTER 2: BIPOLAR JUNCTION TRANSISTOR</p>	<p>- Teaching: Lecturing, interacting with students.</p>	C1 C5	[4]. 73-88 [5]. 61-66

		(Total: 15; Lecture: 12, Discussion: 03) 2.1. Structure of BJT Bipolar Junction Transistor. Construction, symbols of NPN and PNP Transistors 2.2. Working principle and basic parameters of Bipolar Junction Transistor.	In-class learning: Listening to lectures, taking notes, and interacting with the instructor. At-home learning: Reviewing course materials covered in class and previewing upcoming materials for the next class		
7	3	2.3. Biasing and Static Operating Point Stability of Transistors 2.3.1. Common-Emitter Biasing Principle for Transistors 2.3.2. DC Load Line and Static Operating Point 2.3.3. Static Operating Point Stability with Temperature Variation 2.3.4. Fixed-Biasing of Transistors 2.3.5. Feedback Biasing of Transistors 2.3.6. Emitter-Biasing of Transistors	- Teaching: Lecturing, interacting with students. In-class learning: Listening to lectures, taking notes, and interacting with the instructor. At-home learning: Reviewing course materials covered in class and previewing upcoming materials for the next class	C1 C5 C6	[1]. 43-55 [4]. 88-96
8	3	2.4. Basic Amplifier Circuits Using Transistors 2.4.1. Common-Emitter Amplifier Circuit 2.4.2. Common-Collector Amplifier Circuit 2.4.3. Common-Base Amplifier Circuit	- Teaching: Lecturing, interacting with students. In-class learning: Listening to lectures, taking notes, and interacting with the instructor. At-home learning: Reviewing course materials covered in class and previewing upcoming materials for the next class	C1 C5 C7	[2]. 61-79 [6]. 272-304
9	3	2.5. Connecting Amplifier Stages Connecting Stages with Capacitors -Connecting Stages with Transformers -Direct Coupling -Differential Amplifier Circuit Darlington Pair Circuit	- Teaching: Lecturing, interacting with students. In-class learning: Listening to lectures, taking notes, and interacting with the instructor.	C1 C5 C8	[2]. 94-96

			At-home learning: Reviewing course materials covered in class and previewing upcoming materials for the next class		
10	3	Chapter 2 Discussion Exercises on bipolar transistor amplifier circuits and connecting amplifier stages	The teacher presents discussion topics and the students research the materials and present them to the class.	C5 C6 C7 C8	[2]. 61-79 [6]. 272-304
11	3	Chapter 3: Field-Effect Transistor (FET) 3.7. Introduction to Field-Effect Transistor 3.8. Junction Field-Effect Transistor (JFET) 3.8.1. Structure and Symbol 3.8.2. Operating Principle 3.8.3. Main Parameters of JFET 3.8.4. JFET Circuit Diagrams -Common Source Amplifier -Common Drain Amplifier -Common Gate Amplifier 3.8.5. Biasing JFET 3.8.6. JFET Parameters in Small-Signal Operation 3.8.7. Small-Signal Equivalent Circuit of JFET	- Teaching: Lecturing, interacting with students. In-class learning: Listening to lectures, taking notes, and interacting with the instructor. At-home learning: Reviewing course materials covered in class and previewing upcoming materials for the next class	C9 C10 C11 C12	[1]. 43-55; 70-79
12	3	3.9. Insulated Gate Field Effect Transistor (MOSFET) 3.9.1. Structure, symbol, and operating principle of N-channel MOSFET 3.9.2. Structure, symbol, and operating principle of P-channel MOSFET 3.9.3. Various circuit configurations using MOSFETs for amplification 3.9.4. Biasing of MOSFETs 3.10. Some applications of FETs Periodic Test	- Teaching: Lecturing, interacting with students. In-class learning: Listening to lectures, taking notes, and interacting with the instructor. At-home learning: Reviewing course materials covered in class and previewing upcoming materials for the next class	C13 C14 C15	[6]. 384-479
13	3	Discussion on Chapter 3 (continued) Exercises on amplifier circuits of Field Effect Transistors.	The teacher presents discussion topics and the students research the	C10 C11 C14	[1]. 43-55; 70-79 [6]. 384-479

			materials and present them to the class.		
14	3	<p>Chapter 4: Introduction to Semiconductor Devices with Multiple P-N Junctions and Integrated Circuits</p> <p>4.1. Silicon Controlled Rectifier (SCR)</p> <ul style="list-style-type: none"> -Structure, symbol -Working principle -Applications <p>4.2. Diac</p> <ul style="list-style-type: none"> -Structure, symbol -Working principle -Applications <p>4.3. Triac</p> <ul style="list-style-type: none"> -Structure, symbol -Working principle -Applications 	<p>- Teaching: Lecturing, interacting with students.</p> <p>In-class learning: Listening to lectures, taking notes, and interacting with the instructor.</p> <p>At-home learning: Reviewing course materials covered in class and previewing upcoming materials for the next class</p>	C16 C17 C18	[4]. 129-135
15	3	<p>4.4. Four-layer diode</p> <p>Structure, symbol</p> <p>Working principle</p> <p>Applications.</p> <p>4.5. Introduction to integrated circuits</p> <p>4.5.1. Concepts and classification of integrated circuits.</p> <p>4.5.2. Methods for manufacturing semiconductor integrated circuits.</p>	<p>- Teaching: Lecturing, interacting with students.</p> <p>In-class learning: Listening to lectures, taking notes, and interacting with the instructor.</p> <p>At-home learning: Reviewing course materials covered in class and previewing upcoming materials for the next class</p>	C19 C20 C21	[4].141-148
16	3	<p>Chapter 4 Discussion</p> <p>Discussion on topics related to Unijunction Transistor (UJT)</p>	The teacher presents discussion topics and the students research the materials and present them to the class.	C16 C17 C18 C19	[4].135-141 [6]. 578-583
17	3	<p>4.7. Photonic devices 4.7.1.</p> <p>General concepts of optoelectronics</p> <p>4.7.2. Electrical-optical conversion devices</p> <p>Light emitting diode (LED)</p> <p>Infrared LED</p> <p>Laser diode</p> <p>Liquid crystal display (LCD)</p>	<p>- Teaching: Lecturing, interacting with students.</p> <p>In-class learning: Listening to lectures, taking notes, and interacting with the instructor.</p> <p>At-home learning: Reviewing course</p>	C22 C23 C24	[4].167-208 [5].148-155

		4.7.3. Optical-electrical conversion devices Photoresistor Photodiode Photovoltaic cell and solar cell Dual-gate opto-transistor Periodic Test	materials covered in class and previewing upcoming materials for the next class		
18	3	Chapter 4 discussion Discuss topics related to optoelectronic conversion components	- Teaching: Lecturing, interacting with students. In-class learning: Listening to lectures, taking notes, and interacting with the instructor. At-home learning: Reviewing course materials covered in class and previewing upcoming materials for the next class	C22 C23 C24	[1]. 43-55; 70-79 [6]. 384-479

10. Competent Authority Approval: University of Information and Communication Technology.

August 27th, 2017

Vice Rector



PhD. Do Dinh Cuong

Vice Dean



PhD. Vu Chien Thang

Vice of Department



MSc. Nguyen Thanh Trung

Composer Team



Nguyen Thanh Trung



Nguyen Sy Hiep



Doan Manh Cuong

11. Updated Procedure

1st update: <i>Day/month/year</i>	Updater
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2st update:
Day/month/year

Updater