



SYLLABUS FOR EE 252 – MICROELECTRONIC DEVICES AND CIRCUITS

TED UNIVERSITY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Academic Year & Semester

2025 Spring

Page 1 of 5

Course Code	EE 252	Course Title	Microelectronic Devices and Circuits	
Type of Course	<input checked="" type="checkbox"/> Compulsory <input type="checkbox"/> Elective	Semester	<input type="checkbox"/> Fall <input checked="" type="checkbox"/> Spring <input type="checkbox"/> Summer	
Credit Hours / ECTS credits	(3+0+0) 3 Credits / 5 ECTS	Pre-requisite	EE 201	
		Co-requisite	NONE	
Mode of Delivery	<input checked="" type="checkbox"/> Face-to-face <input type="checkbox"/> Distance learning	Language of Instruction	<input checked="" type="checkbox"/> English <input type="checkbox"/> Turkish	
Course Level	<input checked="" type="checkbox"/> Undergraduate <input type="checkbox"/> Graduate (MS) <input type="checkbox"/> Graduate (PhD)	Year of Study	<input type="checkbox"/> First Year <input checked="" type="checkbox"/> Sophomore <input type="checkbox"/> Junior <input type="checkbox"/> Senior	<input type="checkbox"/> Masters <input type="checkbox"/> Doctorate

Course Coordinator	Asst. Prof. Çiçek Boztuğ Yerci E-mail: cicek.boztug@tedu.edu.tr Room: A319 Phone: +90 (312) 585 01 68
Office Hours	By appointment only
Course Schedule	Tuesday (13:00–13:50), Wednesday (13:00–14:50) @F410

Catalog Description	Basic semiconductor fundamentals. The current mechanisms in semiconductors: drift and diffusion currents. The formation and operation principle of the p-n junction diode. Breakdown mechanism in p-n junction diode. Half-wave rectifier and peak detector circuits. The operation principle of bipolar junction transistor (BJT) and metal-oxide-semiconductor field-effect transistor (MOSFET) at direct current (DC). MOSFET as an amplifier.
Course Objectives	This course equips students with the operational knowledge of semiconductor components like p-n junction diodes, bipolar junction transistors (BJTs), and metal oxide semiconductor field effect transistors (MOSFETs). The course also enables students to grasp circuit operations involving diodes and transistors, like rectifiers, detectors, and amplifiers, alongside DC analysis for BJTs and MOSFETs.
Required Reading	Jaeger, R. C., & Blalock, T. N. (2011). <i>Microelectronic Circuit Design</i> . 4 th Ed., McGraw Hill.
Suggested / Recommended Reading	<ul style="list-style-type: none"> Sedra, S., & Smith, K. C. (2011). <i>Microelectronic Circuit Design</i>. 6th Edition, Oxford University Press. Pierret, R. F. (1996). <i>Semiconductor Device Fundamentals</i>. Addison-Wesley.
Software Usage	MATLAB and SPICE assignments
Course Learning Outcomes (LOs)	Upon successful completion of the course, students will be able to: <ol style="list-style-type: none"> Recognize the basic semiconductor fundamentals, including free carrier generation and doping, Classify diffusion and drift currents, comprehending their principles and behaviors, Apply knowledge to evaluate p-n junction diode formation, understanding operational principles and breakdown mechanism, Analyze BJT and MOSFET operation principles, functionalities, and characteristics,



SYLLABUS FOR EE 252 – MICROELECTRONIC DEVICES AND CIRCUITS

TED UNIVERSITY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Academic Year & Semester

2025 Spring

Page 2 of 5

	<p>5. Evaluate BJT- and MOSFET-based circuits at DC for performance and behavior,</p> <p>6. Create new ways to modify MOSFET usage as an amplifier.</p>
Course Evaluation	Course feedback survey will be conducted in the last two weeks of the semester.
Course Web Page	The class has already been enrolled in Moodle (https://lms.tedu.edu.tr/). All announcements and course-related materials will be posted on the Moodle course page.
Some Useful Website References	N/A

Learning Activities & Teaching Methods¹	<input checked="" type="checkbox"/> Brainstorming <input type="checkbox"/> Case Study/Scenario Analysis <input checked="" type="checkbox"/> Collaborating <input type="checkbox"/> Concept Mapping <input type="checkbox"/> Demonstrating <input type="checkbox"/> Discussions / Debates <input type="checkbox"/> Drama / Role Playing <input type="checkbox"/> Experiments <input type="checkbox"/> Field Trips <input type="checkbox"/> Guest Speakers	<input type="checkbox"/> Hands-on Activities <input type="checkbox"/> Inquiry <input type="checkbox"/> Microteaching <input type="checkbox"/> Oral Presentations / Reports <input type="checkbox"/> Peer Teaching <input type="checkbox"/> Predict-Observe-Explain <input checked="" type="checkbox"/> Problem Solving <input checked="" type="checkbox"/> Questioning <input checked="" type="checkbox"/> Reading	<input type="checkbox"/> Scaffolding / Coaching <input type="checkbox"/> Seminars <input type="checkbox"/> Service Learning <input type="checkbox"/> Simulations & Games <input checked="" type="checkbox"/> Telling / Explaining <input checked="" type="checkbox"/> Think-Pair-Share <input type="checkbox"/> Video Presentations <input checked="" type="checkbox"/> Web Searching <input type="checkbox"/> Other(s):.....
---	---	---	--

Assessment Methods & Criteria²	<input type="checkbox"/> Case Studies / Homework	(...%)	<input type="checkbox"/> Presentation (Oral, Poster)	(...%)
	<input type="checkbox"/> Lab Assignment	(...%)	<input type="checkbox"/> Project	(...%)
	<input type="checkbox"/> Observation	(...%)	<input checked="" type="checkbox"/> Quiz	(10%)
	<input type="checkbox"/> Oral Questioning	(...%)	<input type="checkbox"/> Self-evaluation	(...%)
	<input type="checkbox"/> Peer Evaluation	(...%)	<input checked="" type="checkbox"/> Test/Exam	(75%)
	<input type="checkbox"/> Performance Project (Written, Oral)	(...%)	<input checked="" type="checkbox"/> Other(s): Active Learning Exercises	(15%)
	<input type="checkbox"/> Portfolio	(...%)		

Student Workload³	<input type="checkbox"/> Case Study Analysis	(... hrs)	<input type="checkbox"/> Online Discussion	(... hrs)
	<input checked="" type="checkbox"/> Course Readings	(45 hrs)	<input type="checkbox"/> Oral Presentation	(... hrs)
	<input type="checkbox"/> Debate	(... hrs)	<input type="checkbox"/> Poster Presentation	(... hrs)
	<input type="checkbox"/> Demonstration	(... hrs)	<input type="checkbox"/> Report on a Topic	(... hrs)
	<input checked="" type="checkbox"/> Exams/Quizzes	(47 hrs)	<input type="checkbox"/> Research Review	(... hrs)
	<input type="checkbox"/> Field Trips/Visits	(... hrs)	<input type="checkbox"/> Resource Review	(... hrs)
	<input type="checkbox"/> Hands-on Work	(... hrs)	<input type="checkbox"/> Team Meetings	(... hrs)
	<input type="checkbox"/> Lab Applications	(... hrs)	<input type="checkbox"/> Web Designs	(... hrs)
	<input checked="" type="checkbox"/> Lectures	(42 hrs)	<input type="checkbox"/> Work Placement	(... hrs)
	<input type="checkbox"/> Mock Designs	(... hrs)	<input type="checkbox"/> Workshop	(... hrs)
<input type="checkbox"/> Observation	(... hrs)	<input checked="" type="checkbox"/> Other(s): Active Learning Exercises	(16 hrs)	

¹ Multiple options possible.

² Multiple options possible. A percentage must be stated for the selected assessment method & criteria.

³ Multiple options possible. The student workload is found by multiplying the number and duration (hour) of the activity involved.



**SYLLABUS FOR
EE 252 – MICROELECTRONIC DEVICES AND CIRCUITS**

TED UNIVERSITY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Academic Year & Semester

2025 Spring

Page 3 of 5

Total Workload⁴ | 150 hrs

TENTATIVE OUTLINE

Any changes and updates will be announced on the course web page.

Week	Topics	LOs	Textbook Reading	Assignments
1	Introduction	1	Ch. 1	
2	Solid State Electronic Materials, Energy Band Model	1	Ch. 2	
3	Drift and Diffusion Currents in Semiconductors, Mobility and Resistivity	2, 8	Ch. 2	
4	Impurities (and doping) in Semiconductors Generation/Recombination of Electrons-Hole Pairs	2	Ch. 2	Quiz 1 ALE 1
5	The p-n Junction Diode, Overview of Diode (and Integrated Circuit) Fabrication, Qualitative Description of Current Flow in Diode	3	Ch. 3	
6	Diode Equation (A Mathematical Model for the Diode), I-V Characteristics, Diode Breakdown	4, 8	Ch. 3	Midterm 1 March 23rd, Sunday 12:00-14:00
7	Diode Circuits, Photodiodes, Solar Cells, LEDs, Schottky Diodes	4	Ch. 3	
8	No Lecture (Ramadan Feast Holiday & Spring Break)			
9	Basic Concepts About Transistors; Applications (Amplifier, Switch, etc.), Introduction to the Bipolar Junction Transistor (BJT)	4, 5, 8	Ch. 5	
10	Transport Models for npn and pnp BJTs	5	Ch. 5	
11	BJT I-V Characteristics (No Lecture on Wed, April 23rd)	5, 8	Ch. 5	
12	BJT I-V Characteristics, Early Effect in BJT	5	Ch. 5	
13	Characteristics of the MOS Capacitor, NMOS Transistor I-V Characteristics, MOSFET Types and Characteristics	5	Ch. 4	
14	MOSFET Types and Characteristics, The Transistor as an Amplifier	6, 7	Ch. 4, 13	Midterm 2 May 14th, Wed 13:00-15:00
15	The Transistor as an Amplifier	6, 7, 8	Ch. 13	
16	The Transistor as an Amplifier	6, 7, 8	Ch. 13	Quiz 2 ALE 2
FINAL EXAMS WEEK (date and time to be announced later).				

⁴Computing the ECTS credits of a course: Total workload / 25 or 30 hours = ECTS credit and 1 ECTS credit = 25-30 hours



SYLLABUS FOR EE 252 – MICROELECTRONIC DEVICES AND CIRCUITS

TED UNIVERSITY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Academic Year & Semester

2025 Spring

Page 4 of 5

COURSE ASSIGNMENTS & GRADING

A. Midterm Exams [40%]

There will be two midterm exams (20% each).

B. Final Exam [35%]

There will be a cumulative final exam covering all topics. Date and time of the final will be announced at the end of the semester.

C. Active Learning Exercises (ALEs) [15%]

There will be a total of 2 active learning exercises (7.5% each)

D. Quizzes [10%]

There will be a total of 2 individual quizzes (5% each)

COURSE ASSESSMENTS & LEARNING OUTCOMES MATRIX

Assessment Methods	Course Learning Outcomes
Test/Exam	LO # 1–8
Active Learning Exercises	LO # 1–8
Quiz	LO # 1–8

COURSE POLICIES

I. Attendance

- Regular class attendance is expected for all students at the University. You are not required but advised to attend all lectures.
- Your absence will not reduce your attendance rate *if and only if* you have a legitimate reason for missing a class (such as illness, death in the family, a traffic accident, *etc.*). In case of a disease or emergency, you must supply formal documentation that supports your claim.
- Classes start at the hour. Please be respectful of your classmates by being on time.

II. Make-up Policy

To be eligible to take a make-up for the term exams, you should report your acceptable excuse to the course instructor and receive formal permission no later than one week after the exam date. A single make-up exam will be given at or after the end of the semester in the form of a final exam, where all of the topics are included. No make-ups will be given for active learning exercises. **Additional (or bonus) assignment will not be given, please do not ask for it!**

III. Late Submission Policy

Late submissions will not be graded. Missed assignments will result in a grade of zero (0).

IV. Cheating & Plagiarism

Collaboration is strongly encouraged; however, the work you hand in must be solely your own. Cheating and plagiarism are severe offenses and will be penalized accordingly by the university disciplinary committee. Cheating has a comprehensive description which can be summarized as "acting dishonestly." Some of the things that can be considered cheating are the following:

- Copying answers on exams, home works and lab works,
- Using prohibited material on exams,
- Lying to gain any advantage in class,
- Providing false, modified, or forged data in a report,
- Plagiarizing (see below),
- Modifying graded material to be re-graded,
- Causing harm to colleagues by distributing false information about an exam, homework, or lab.



SYLLABUS FOR EE 252 – MICROELECTRONIC DEVICES AND CIRCUITS

TED UNIVERSITY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Academic Year & Semester

2025 Spring

Page 5 of 5

All of the following are considered plagiarism (www.plagiarism.org):

- Turning in someone else's work as your own,
- Copying words or ideas from someone else without giving credit,
- Failing to put a quotation in quotation marks,
- Giving incorrect information about the source of a quotation,
- Changing words but copying the sentence structure of a source without giving credit,
- Copying so many words or ideas from a source that it makes up the majority of your work, whether you give credit or not.

V. TEDU Without Barriers Unit

Please inform the TEDU Without Barriers Unit and the instructor of the course about the specific issues in case you have a physical or mental disability and are having trouble with anything related to this course such as accessing the material, participating in the class, taking notes, preparing for, attending or managing to complete the exams. Your situation will be reviewed by commission, in accordance with the principle of confidentiality, and if deemed appropriate, facilitating measures will be taken so that you can take the course more efficiently. For further information and/or questions: engelsiz@tedu.edu.tr
<https://www.tedu.edu.tr/engelsiz-tedu>

VI. Student Services Information

• Student Development and Psychological Counseling Center:

The Center is a service mandated with providing crisis intervention and supportive listening services to the campus community. A major part of fulfilling that mandate is raising awareness of our service so students know they are never alone in dealing with problems. You may contact the SDPCC at: ogrencidanismamerkezi@tedu.edu.tr, 0312 585 0316, Office A122, Or visit their website at <http://csc.tedu.edu.tr/>

• TEDU COPeS - Psycho-Social Support

TED University Psychosocial Support Team was initially established in order to facilitate coping with the psychological, social, familial, academic, and professional difficulties that may arise due to adverse conditions associated with COVID-19 pandemic for TEDU students and employees.

In time we have expanded our services to provide psychosocial support in diverse disasters. In this line, TEDU COPeS offers psychosocial support for TED University students and employees in the aftermath of Kahramanmaraş earthquakes.

For further information and/or questions, visit their website at <https://copes.tedu.edu.tr/>

• Specialized Support and Students with Disabilities

Students who may require specialized support due to a disability affecting mobility, vision, hearing, learning, mental or physical health should consult with Specialized Support and Disability Coordinator, Asst. Prof. Emrah Keser E-mail: emrah.keser@tedu.edu.tr, or visit the website at <https://www.tedu.edu.tr/tr/main/engelsiz-tedu>