

COURSE INFORMATION

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Course Description:

In the Analog Design course, you have learned how to design and analyze analog circuits. Although analog electronics is a major part of electronics, many of today's electronic systems are based on digital circuits, from hand-held calculators to the most sophisticated computers. There has been a tremendous development in digital circuits over the past 3 decades, and there are a number of approaches for implementation of digital circuits. This course intends to give you a background on digital electronics.

The course will cover various circuit families, including diode-transistor logic (DTL), transistor-transistor logic (TTL), NMOS, and CMOS logic. In addition, various other circuits used in digital world will be covered. These include regenerative circuits, Schmitt-triggers, multivibrators, the 555 integrated circuit timer, RAMs, ROMs, and digital-to-analog and analog-to-digital converters.

There will be three lectures per week. The lectures will be supplemented by reading assignments, take-home exams, two midterm exams, and a final exam. The exams, take-home exams, and the grading will be in coordination for all sections. Students are free to change their sections.

Lectures:

- Instructors will announce their methods for each section in more detail at the first lecture.
- All lecture notes (synchronous and asynchronous) will be uploaded to ODTU-CLASS (or any other convenient web link), and they will be available for all students.

Exams:

Exams will be common to all sections. There will be four Midterm Exams and a Final Exam. Each midterm exam will have two questions and will be online through ODTU-CLASS. Exam regulations and details of the Final Exam will be announced timely.

Take-home exams:

Take-home exams are essential part of this course, and due to the nature of these exams, you are expected to work on them by yourself. **Observation of any unethical conduct on your submitted work will naturally result in getting zero from the overall Take-Home Exam gradings, and a disciplinary action will be started.** Your work will be collected on the due date. Late submissions will not be accepted.

Attendance:

Good attendance rate is %100, and all students are advised to attend lectures regularly. Please also make sure that you cover the topics presented in this lecture before you attend the next one.

Grading Policy:

Course grades will be assigned according to the following grading formula.

Take-Home Exams:	8%
Midterm Exam 1:	14%
Midterm Exam 2:	14%

Midterm Exam 3:	14%
Midterm Exam 4:	14%
Final Exam:	36%

Course Webpage: METU-CLASS

DETAILED COURSE SYLLABUS

The following comprises the syllabus describing the material to be covered in the course for Spring 2015-2016. The material is indicated along with the corresponding sections of the textbook (A. S. Sedra & K. C. Smith, Microelectronic Circuits, 6th Ed., Oxford University Press, 2011) and the reference books (DeMassa and Ciccone, Digital Integrated Circuits, Wiley, 1996).

Note that some of the sections are going to be reading assignments and noted as RA.

Chapter	TOPIC	Hours
SS, LN	Overview of Digital Circuit Design (14.1)	2 hr
SS, DC+WEB	Diodes (2.1-4s), Diode Resistor Logic (2.5) TH, (SS 3.1-3.3)	RA
SS	Bipolar Junction Transistors, The Ebers-Moll Model (4.1-4.2)	2 hr
SS	Resistor-Transistor Logic (RTL) (4.4.1, 4.4.2)	1 hr
SS	BJT Circuits DC Analysis (4.3)	1 hr
DC	Diode-Transistor Logic (DTL) Spice	1 hr
DC	Transistor-Transistor Logic (TTL) (Examples 7.3&7.4) (7.9, 7.10 R.A.) Spice	3 hr
DC	Schottky Transistor and STTL (8)	RA
SS	MOS Field Effect Transistors (5.1-5.3)	2 hr
SS+LN	CMOS Inverter (14.2, 14.3), Tri-State Buffer	2 hrs
SS	CMOS Combinational Logic Gates (14.4)	1 hr
SS	Pseudo NMOS Logic (15.1)	2 hr
SS	Pass Transistor Logic (15.2)	1 hr
SS	Dynamic Logic Circuits and Domino CMOS Logic (15.3)	1 hr
DC	Comparison and Interfacing of Logic Families	2 hr
SS	Regenerative Circuits, Schmitt-Trigger (12.4)	2 hr
SS	Latches and Flip Flops (16.1) Schmitt-Trigger (12.4)	1 hr
SS	Multivibrator Circuits (Monostable, Astable, Ring Oscillator) (12.5)	2 hr
SS	The 555 Integrated Circuit Timer (12.7)	3 hr
SS	Random Access Memories (RAM), Read-Only Memories (ROM) (16.2-5)	4 hr
SS	Data Converters, Digital-to-Analog (D/A) and (SS 5 th Ed. 9.7, 9.8), LN	3 hr
SS	Analog-to-Digital (A/D) Converters, (SS 5 th Ed. 9.9), LN	3 hr
	Total	40 hr

LN: Lecture Notes, **RA:** Reading Assignment