Politehnica University of Bucharest
Faculty of Electronics, Telecommunications and Information Technology

COURSE DESCRIPTION

1. Program identification information

1.1 Higher education institution	Politehnica University of Bucharest
1.2 Faculty	Faculty of Electronics, Telecommunications and Information Technology
1.3 Department	Dept. of Electronic Devices, Circuits and Electronic Architectures
1.4 Domain of studies	Electronic Engineering, Telecommunications and Informational Technologies
1.5 Cycle of studies	License
1.6 Program of studies/Qualification	Technologies and Systems of Telecommunications (TSTeng)

2. Course identification information

2.1 Name of the course				Electronic Devices and Circuits (Project 1)			
2.2 Lecturer				Teaching Assistant Ph.D Eng. Laurențiu Teodorescu,.			
2.3 Instructor for practical activities				Lect. Ph.D Eng. Mihaela Pantazică			
2.4 Year of studies	III	2.5 Semester	5	2.6 Evaluation type	Final examination	2.7 Course choice type	Mandatory

3. Total estimated time (hours per semester for academic activities)

3.1 Number of hours per week, out of which	1	3.2 course	-	3.3 practical activities	1
3.4 Total hours in the curricula, out of which	14	3.5 course	-	3.6 practical activities	14

Distribution of time	hours
Study according to the manual, course support, bibliography and hand notes	20
Supplemental documentation (library, electronic access resources, in the field, etc)	11
Preparation for practical activities, homeworks, essays, portfolios, etc.	5
Tutoring	0
Examinations	2
Other activities	0

3.7 Total hours of individual study	38
3.9 Total hours per semester	52
3. 10 Number of ECTS credit points	2

4. Prerequisites (if applicable)

4.1 curricular	Electro-technical Fundamentals, Electronic Devices, Fundamental Electronic Circuits, Electronic Devices and Materials – laboratory, Electronic Circuits – laboratory, Passive Components and Circuits, CAD Techniques, Spice Models
4.2 competence-based	General principles of electro-technical fundamentals, electronic devices, electronic circuit analysis and simulation, passive components and

	circuits.

5. Requisites (if applicable)

5.1 for running the course	Not applicable.
5.2 for running of the applications	Not applicable.

6. Specific competences

Professional competences	C1. Using the fundamental elements regarding devices, circuits and electronic instrumentation. C2. The application, in typical situations, of the basic methods of acquisition and signal processing. C3 - Making practical use of knowledge, concepts and methods about computational systems' architecture, microprocessors, microcontrollers, and computer programming languages and techniques.
Transversal competences	-

7. Course objectives (as implied by the grid of specific competences)

7.1 General objective of the course	Familiarizing the students with specific analogue circuit design techniques. Capitalizing on accumulated knowledge from *Electronic Devices, Fundamental Electronic Circuits, Passive Components and Circuits, Spice Models and CAD Techniques* regarding: diodes and transistors (models and parameters), gain stages, negative feedback, multi-stage amplifiers, regulators, oscillators. Proposed project assignments consist of medium complexity circuit topologies used in engineering: amplifiers, voltage regulators, oscillators, etc.
7.2 Specific objectives	• Practical implementation of amplifiers, voltage regulators, oscillators, etc. based on given design parameters. • MOS and bipolar transistor models for circuit use. • Analogue circuit design techniques • Selection and use of data sheets for active and passive devices (discrete components). • Circuit and design parameters evaluation (by computations/simulations). • Design and implementation of circuit layout (in a given technology). • Circuit assembling and testing.

8. Content

8.1 Lectures	Teaching techniques	Remarks
-		
8.2 Practical applications	Teaching techniques	Remarks
8.2.1 • Project presentation. • Project assignment. • Design parameters.	Oral, projector-aided exposition. The teaching method used is problem-solving. The main materials are: lecture notes,	2 Hrs

• Rationalization of knowledge referring to electronic devices and circuits	problem books, datasheets, most of which are available through the project's website.	
8.2.2 • Selection criteria for circuit schematics based on circuit topologies used in engineering. • Circuit block diagram.		2 Hrs
8.2.3 • Typical schematics and design algorithms for: bias circuits (voltage/current references, etc.), input/output stages, etc. • Device selection. Datasheet usage. DC and AC analyses: static and dynamic parameters determination for the circuit.		2 Hrs
8.2.4 • Editing the electric schematic (OrCAD Capture CIS). • Simulations (CAD - PSpice). Model selection for circuit components. • Final component and footprint selection (datasheet usage).	ORCAD circuit simulator usage.	2 Hrs
8.2.5 • Layout design (OrCAD PCB Editor). Estimation of the density of tracks and components. Track width sizing. Area and interconnection structure length minimization. • Overcoming heat dissipation issues. • Layout verification. • Bill of materials (BOM).		2 Hrs
8.2.6 • Component placement. • Testing/repair and rework.	Use of CETTI laboratory facilities	2 Hrs
8.2.7 • Electrical measurements on assembled circuit. • Comparison between measurements, simulations and computations. • Validation of circuit operation within specifications. • Cost evaluation. • Datasheet elaboration (for potential users)	Use of laboratory facilities	2 Hrs
8.2.8 • Presentation of the	Use of laboratory facilities. Projector aided exposition for final evaluation.	2 Hrs

design/implementation activities. • Assignment evaluation.		

Bibliography:

1. P. R. Gray, P. J Hurst, S. H. Lewis, R. G. Meyer, *Analysis and Design of Analog Integrated Circuits*, J. Wiley & Sons, 2001.
2. A. Rusu, G. Ştefan, G. Brezeanu, *Dispozitive şi circuite electronice - culegere de probleme de proiectare*, Institutul Politehnic Bucureşti, 1991.
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11. D. Self , *Audio Power Amplifier Design Handbook,* Fourth edition, Newnes, 2006.
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19. **L. Teodorescu**, http://wiki.dcae.pub.ro/images/d/df/Oscilatoare_simulari.pdf
20. **L. Teodorescu**, http://wiki.dcae.pub.ro/index.php/Fi%C8%99ier:Stabilizatoare_simulari.pdf
21. **L. Teodorescu**, Project 1 - Electronic Devices and Circuits, http://wiki.dcae.pub.ro/index.php/Project_1_-_Electronic_Devices_and_Circuits_(proiect)

9. Bridging the course content with the expectations of the epistemic community representatives, professional associations and employers representatives for the domain of the program

Analogue, digital and mixed-signal circuit design represents an essential skill in electrical engineering. Current performances of companies in the field of electronics are based on design activities which, together with emerging technologies, lead to an ever expanding market of low-size and cost, high reliability/autonomy/versatility electronic devices and systems.
The electronic devices and circuits project represents a test of initiation for the future engineer regarding his activities in a design company. The project assignment corroborates specialized knowledge accumulated across the first two academic years, such as electro-technical

fundamentals, electronic devices and circuits, passive components and computer-aided-design (CAD). The future engineer will have an understanding of the technological flow for design and manufacturing of electronic circuits (here implemented with discrete components), meeting current market demands. After graduation, the engineer has more employment opportunities within an electronics company due to the market-imposed competences obtained through this course. Thus, the course subscribes to the "Politehnica" University of Bucharest policy regarding structure, content and international opportunities offered to its students.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in the final mark
10.4 Lectures	-	-	-
10.5 Project	Ability to design, simulate, implement and test a fundamental electronic circuit and its layout.	Grading students after each project stage depending on the degree of completion.	70%
	Final project presentation and defence	Final project evaluation	30%
10.6 Minimal performance standard			
- the design of a low/medium complexity fundamental electronic circuit; -the electrical simulations for the designed circuit.			

Date 20.09.2017

Instructor for circuit design activities,
As. Ph.D Eng. Laurențiu Teodorescu, Ph. D.

Instructor for layout design activities,
Lect. Ph.D Eng. Mihaela Pantazică

Date of department approval
25.09.2017

Director of Department,
Prof. Ph.D Eng. Claudius Dan