SYLLABUS

Discipline name	Electronic Devices
Profile	Electronics and Telecommunications Engineering
Specialization	Telecommunications Technologies and Systems
Code	51321309
Course leader	Prof. Gabriel Oltean, Ph.D – Gabriel.Oltean@bel.utcluj.ro
Collaborators	Assistant Emilia Şipoş – Emilia.Sipos@bel.utcluj.ro Assistant Laura Ivanciu – Laura.Ivanciu@bel.utcluj.ro
Department	Basis of Electronics
Faculty	Electronics, Telecommunications and Information Technology

Sem.	Type of discipline	Course	Applications			Course	Applications			Ind. study	TOTAL	Credits	Form of assessment
		[hours/week]				[hours/sem.]							
			S	L	P		S	L	P				
2	**Engineering**	**2**	**-**	**2**	**-**	**28**	**-**	**28**	**-**	**64**	**120**	**4**	**Exam**

Acquired competences :

Acquired skills (what the student is able to do):

After completing the discipline, the students will be able to:
- use electronic devices in different operating regimes: switching regime, permanent conduction regime (or as amplifier);
- determine the operating regime of electronic devices;
- characterize the behavior of an electronic device in its quiescent point;
- determine the performances of simple electronic circuits;
- use the basic applications of electronic devices;

Acquired abilities: (what type of equipment/instruments/software the student is able to handle)

After completing the discipline, the students will be able to:
- use the lab instrumentation (power supply, oscilloscope, function generator, multimeter) for the experimental study of simple electronic circuits
- gather and analyze the numerical data obtained through the explorations
- experimentally determine the diode characteristic
- experimentally determine the voltage transfer characteristic of several circuits (DR, op-amp comparators, op-amp amplifiers)
- experimentally determine the parameters of several circuits (gain, input resistance, pass band)
- experimentally determine the parameters of some circuits

Prerequisites (if necessary)

Knowledge about electrical signals, series/parallel connection of passive components, relations and theorems for electric circuits (Ohm's law, Kirchhoff's theorems, voltage divider, superposition method, Thevenin's theorem), time and frequency behavior of capacitors and inductors, frequency response representation.

A. Course/Lecture (course/lecture titles)	
1	Presentation of course structure. Review: electrical signals, relations and theorems for electric circuits, RC circuits, frequency response representation
2	Diodes. Models for switching diode. Switching DR circuits.
3	Switching DC circuits. Single-phase rectifiers with capacitive filter.
4	Diode in permanent conduction. Exponential model. DR circuit analysis. Small-signal parameters. Zener diode. Use of Zener diode
5	Operational amplifier (op amp). Op-amp terminals. Op-amp operation. Ideal op amp. Modes of use.
6	Simple op-amp comparators. Inverting and noninverting comparators. Voltage transfer characteristic. Waveforms
7	Positive feedback op-amp comparators. Inverting and noninverting comparators. Voltage transfer characteristic. Waveforms
8	Negative feedback op-amp amplifiers. Inverting, noninverting, differential and summing amplifiers: voltage transfer characteristic, waveforms, gain, input and output resistances.
9	MOS transistors: symbol, internal structure, operating principle and equations, transistor characteristics, operating regions. Switching MOS transistor: analog switch, CMOS inverter.
10	Bipolar junction transistors: symbol, internal structure, operating principle and equations, transistor characteristics, operating regions. Bipolar junction transistor saturation. Switching bipolar transistor: RTL logic circuits, standard TTL gate.
11	Transistor biasing. Biasing circuits. Quiescent point.

12	Small-signal transistor operation: small-signal parameters, small-signal equivalent models
13	Basic amplifier with one transistor. CS, CE; CG, CB; CD, CC amplifiers. Small-signal equivalent circuit, gain, input and output resistances, waveforms.
14	Recapitulation. Preparation for final exam.

B1. Applications – **Laboratory** (list of laboratories)	
1	Introduction. Labour protection
2	Lab instrumentation
3	DR switching circuits, two-port and multi-port networks
4	DC switching two-port network
5	Single phase rectifiers with capacitive filter
6	Semiconductor diodes
7	Voltage comparator with op-amp - simple comparators
8	Voltage comparator with op-amp - hysteresis comparators
9	Basic amplifiers with op amp
10	CMOS transmission gate circuits
11	Logic circuits with BJT
12	Single stage BJT amplifiers
13	Laboratory test
14	Lab recovery and finalization of laboratory activity

C. Individual study (reference study contents, synthesis materials, projects, applications etc.)

2 synthesis reports
12 sets of problems (the preparation part in every laboratory)
3 sets of problems (course homework)

Individual study structure	Course study	Problem solving, laboratory, project	Applications preparation	Examination time	Additional reference study	Total no. of individual study hours
Hours	28	4	20	3	9	64

References (Textbooks, courses, laboratory manual, exercise book)

1. Oltean, G., Electronic Devices, Editura U.T. Pres, Cluj-Napoca, ISBN 973-662-220-7, 2006; 317 pag.
2. Sedra, A. S., Smith, K. C., Microelectronic Circuits, Fifth Edition, ISBN: 978-0-19-522136-7,
3. Oltean, G., Dispozitive si circuite electronice. Dispozitive electronice, Editura Risoprint, Cluj-Napoca, ISBN 973-656-433-9, 2004.
4. Miron,C., Oltean, G., Gordan, Mihaela, Dispozitive si circuite electronice, Culegere de probleme, Editura Casa Cărții de Știință, Cluj-Napoca, 1999
5. Oltean, G., Miron, C., Dispozitive si circuite electronice. Îndrumător de laborator, partea I, Casa Cartii de Stiinta, Cluj-Napoca, 1997

On – line references

1. Oltean, G., Electronic Devices, PowerPoint slides, http://www.bel.utcluj.ro/rom/dce/goltean/ed/ed.htm
2. Oltean, G, ș.a., Electronic Devices. Laboratory manual, http://www.bel.utcluj.ro/rom/dce/goltean/ed/ed.htm

Final evaluation	
Evaluation method	Written exam (E): problem solving (70%) and theoretical subjects (30%).
Mark components	Exam (E: 0…10 points); Laboratory (L: 0…10 points); Homework (H: 0…10 points);
Mark computation	M = 0.6E + 0.2L + 0.2H. Pass if: E≥4 and L≥4 and M≥4.5

Course leader,

Prof. Gabriel OLTEAN, Ph.D.