SYLLABUS

Discipline name	Fundamental Electronic Circuits
Profile	Electronics and Telecommunications Engineering
Specialization	Telecommunications Technologies and Systems
Code	51322209
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				
3	**Engineering**	**2**	**-**	**2**	**-**	**28**	**-**	**28**	**-**	**94**	**150**	**5**	**Exam**

Acquired competences :

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

After completing the discipline, the students will be able to:
- analyze the frequency behavior of basic amplifiers with one transistor
- recognize the topology and determine the type of the feedback
- analyze feedback circuits
- analyze, determine the performances and redesign electronic circuits: voltage regulators, sinusoidal and non – sinusoidal oscillators, power amplifiers, other circuits with OA
- use dedicated integrated circuits for the development of different applications

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 computer for collecting experimental data
- save and analyze the numerical data obtained through exploration
- experimentally determine the parameters and performances of electronic circuits (BJT amplifiers, integrated voltage regulators, dc – dc converters, sinusoidal and non – sinusoidal oscillators, power amplifiers)

Prerequisites (if necessary)

Relations and theorems for electric circuits; frequency response representation; operating principles for electronic devices: diode, operational amplifier, MOSFET and BJT transistors; use of electronic devices in electronic circuits.

A. Course/Lecture (course/lecture titles)	
1	Course description. Frequency response of basic amplifiers with one transistor. CS and CE connections. Current sources and current mirrors with MOSFET and BJT.
2	Feedback circuits. Positive feedback and negative feedback. Equations of the ideal feedback. Feedback topologies. Analysis of the negative feedback amplifier. Negative feedback effects on amplifiers.
3	DC voltage regulators. Parametric regulators. Linear voltage regulators with op amp. Increasing the output current. Over - current and short - circuit protection.
4	Integrated voltage regulators. The 723 voltage regulator. Three – terminal fixed regulator. Switching voltage regulators. Step – down and step –down/step – up converters.
5	Sinusoidal oscillators. Oscillation criterion. RC oscillators. Op – amp and Wien bridge oscillators. Automatic control of the amplitude. Op amp and RC ladder network oscillator.
6	LC oscillators. Three points oscillators. Quartz - crystal oscillators.
7	Nonsinusoidal oscillators. Astable multivibrators. Astable multivibrator with one op – amp. Astable multivibrator with an integrator and a comparator. Quartz – crystal clock generator. LM555 timer.
8	Power amplifiers. Amplifier classes. Class A amplifiers. Operating principle, VTC, waveforms, powers, efficiency.
9	Class B amplifiers. Operating principle, VTC, crossover distortions, waveforms, powers, efficiency.
10	Class AB amplifiers. Biasing using diodes. Biasing using V_{BE} multiplier. Overcurrent protection. Use of compound transistors with higher current gain.
11	Class D amplifiers. Operating principle. PWM generator. Power stage. Low – pass filter.
12	Op – amp applications: integrator and differentiator – active filters; precision rectifier; op-amp amplifiers operated from a single power supply; op – amp current sources and current sources using op - amp and T.
13	Op – amp applications: logarithmic and exponential amplifiers, multiplication and division circuits, voltage domain conversion circuits.

14	Recapitulation. Preparation for final exam.

B1. Applications – Laboratory (list of laboratories)	
1	Introduction. Labor protection
2	Collecting experimental data using the computer
3	Frequency response of CE amplifier
4	Negative feedback effects on amplifiers
5	LM7805 voltage regulator
6	DC – DC converter
7	Sinusoidal oscillator
8	Function generator
9	Multivibrator circuits using the 555 timer
10	Class B amplifier
11	Class D amplifier
12	Rail – to – rail op – amp amplifier
12	Laboratory test
14	Lab recovery and finalization of laboratory activity

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

2 synthesis reports
11 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	12	24	3	27	94

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

1. Oltean, G., Circuite electronice, UT Pres, Cluj-Napoca, 2007, ISBN 978-973-662-300-4, 203 pag
2. Oltean, G., Electronic Devices, Editura U.T. Pres, Cluj-Napoca, ISBN 973-662-220-7 , 2006; 317 pag.
3. Sedra, A. S., Smith, K. C., Microelectronic Circuits, Fifth Edition, ISBN: 978-0-19-522136-7,
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., Gordan, Mihaela, Hoțoleanu, M., Dispozitive si circuite electronice. Îndrumător de laborator, partea II-a, Universitatea Tehnica din Cluj-Napoca, 1999, 115 pag.

On – line references

1. Oltean, G., Fundamental electronic circuits, PowerPoint slides,
http://www.bel.utcluj.ro/rom/dce/goltean/fec/fec.htm
2. Oltean, G, ș.a., Fundamental electronic circuits. Laboratory manual,
http://www.bel.utcluj.ro/rom/dce/goltean/fec/fec.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.