COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF ELECTRONICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	2602003	**SEMESTER**	2
COURSE TITLE	Analog Electronics I		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS (ECTS)**
Lectures	4	7
Laboratory	2	
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special Background Course
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	http://www.electronics.teipir.gr/personalpages/papageorgas/download/1/

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Upon successful completion of this course module students possess advanced knowledge, skills and competences in the subject of Analog Electronics that enable them to:

- Analyse simple electronic circuits based on diodes and transistors with special focus on designing amplifiers with discrete components;
- Design simple linear power supplies according to the required specifications; Design and analyse bias circuits for BJTs and Amplifiers for the basic categories (CE, CC, CB and those for FETs);
- Perform Analysis at AC of Amplifiers based on BJTs and FETs using weak signal models;
- Demonstrate basic skills on using electronic devices simulation programs and on applying them in homework and laboratory exercises.

- Cooperate with fellow students as a team for the successful implementation of the laboratory exercises with the appropriate preparation of the procedures that must be followed, as well as the study of the relevant material for homework

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Working independently
- Team work

(3) COURSE CONTENT

Lectures

Unit 1 Introduction to Analog Electronics
1.1 Signals
1.2 The Frequency Spectrum
1.3 Analog and Digital Signals
1.4 Introduction to Amplifiers
1.5 Circuit Models for Amplifiers

Unit 2 Diodes
2.1 The ideal diode
2.2 I-V characteristic of a diode
2.3 Analysis of diode circuits
2.4 The small-signal diode model and its applications
2.5 Zener diodes
2.6 Rectifier circuits and Power Supplies
2.7 Limiters and clippers
2.8 Simulation of diodes with SPICE models

Unit 3 BJTs (Bipolar junction transistors)
3.1 Basic principles and operation in the active area
3.2 Operation of BJTs in the DC
3.3 Biasing topologies
3.4 Building an amplifier with BJTs
3.5 BJT small signal model
3.6 Graphical analysis for the BJT operation as an Amplifier
3.7 Basic amplifier topologies with BJTs
3.8 Analysis and design examples of single and multiple stages amplifiers based on BJTs

3.9 Simulation examples of single and multiple stages amplifiers based on BJTs using SPICE models

Unit 4 FETs (Field-effect transistors)
4.1 Basic principles and operation in the saturation area
4.2 Operation of FETs in the DC
4.3 Biasing topologies
4.4 Building an amplifier with FETs
4.5 FETs small signal model
4.6 Graphical analysis for the FETs operation as an Amplifier
4.7 Basic amplifier topologies with FETs
4.8 Analysis and design examples of single and multiple stages amplifiers based on FETs
4.9 Simulation examples of single and multiple stages amplifiers based on FETs using SPICE models

Laboratory Experiments
1. Diodes and LEDs
2. Study the common emitter (CE) Amplifier as a two-door network
3. Study the characteristics of the Common Emitter Amplifier (CE)
4. Study characteristics of Common Collector Amplifier (CC)
5. Study the characteristics of the Common Base (CB) Amplifier
6. BJT biasing methods and voltage stabilization
7. DC Amplifier
8. Phase Inverter
9. FET Common Source Amplifier (CS)

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face lectures
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of electronic presentation with multimedia content in class, • Student support through the course webpage and the departmental e-learning platform, • Electronic communication of instructors and students, through the course webpage and by e-mail. • Use of special circuit simulation software.
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	Lectures, Laboratory experiments, study.

Activity	***Semester workload (hours)***
Lectures	52
Study for lectures	52
Laboratory experiments	52
Report on lab experiments	26
Study and preparation for exams	28
Course Total	**210**

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Final course grade = Lectures part grade x 60% + Laboratory part grade x 40%, Lectures part grade results from: Final exam (80%) and Homework (20%) Laboratory part grade results from: - The students attending the lab, must be familiar with the theory of the specific exercise. During the lab experiment they implement the specific circuits, they complete their measurements and try to get answers for their questions. The next time they visit the lab they must deliver a report for the particular experiment. Their presence at the lab is obligatory. - Each exercise is evaluated with a grade that results from the evaluation of the report and his oral presence. The oral results are announced during the exercise duration. - The final examination includes oral and practical exams. The final Laboratory grade is calculated by a formula announced to the students at the start of each semester. Normally the final examination has a weighting factor of 0.7 and the oral examination with the homework has a weighting factor of 0.3.

(5) ATTACHED BIBLIOGRAPHY

Essential reading

1. SEDRA, A.S. and K. C. SMITH, Microelectronic Circuits, Papasotiriou Editions (translated in greek).
2. J. HARITANTIS, Electronics I- Introduction to Electronics, Arakynthos Editions ISBN: 978-960-91034-6-6 (In Greek)
3. Analog Electronics I Laboratory manual (In Greek)

Recommended Books

1. MILLMAN J. and C. HALKIAS, Electronic Devices and Circuits
2. MALVINO, A.P., Electronic Principles, McGraw-Hill (translated in greek).
3. Introduction to Electronics G. Tobras (In Greek)