COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
DEPARTMENT	Electrical and Computer Engineering		
LEVEL OF STUDY	Undergraduate		
COURSE UNIT CODE	2.002	**SEMESTER**	2nd
COURSE TITLE	Electrical circuits I		

COURSEWORK BREAKDOWN	**TEACHING WEEKLY HOURS**	**ECTS Credits**
Theory (Lectures)	4	4
Tutorial/Exercises	1	2
TOTAL	**5**	**6**

COURSE UNIT TYPE	Specialized knowledge/Skills development
PREREQUISITES	
LANGUAGE OF INSTRUCTION/EXAMS	Greek
COURSE DELIVERED TO ERASMUS STUDENTS	No
WEB PAGE (URL)	https://ece.hmu.gr/proptyxiakes/programma-spoydwn/

(2) LEARNING OUTCOMES

Learning Outcomes

The course "Electrical Circuits I" aims to provide students with the necessary knowledge on the analysis of electrical elements and configurations, as well as direct current circuits. The course covers theoretical and practical topics related to the complete solution of complex circuits, the calculation of currents, voltages, and powers, the assessment of the optimal way to address complex problems, the application of simple circuit configuration design, and finally, an introduction to the use of numerical methods for solving circuits.

Particular emphasis is placed on understanding and analyzing the energy parameters of electrical elements and circuits. Upon successful completion of the course, the student will be able to:

- Understand the operation and properties of linear electrical elements as well as the basic instruments and methods for measuring basic electrical quantities.
- Know the tools used for the analysis of direct current (DC) circuits.
- Apply numerical methods for the analysis and solution of direct current circuits.
- Analyze and calculate the basic electrical quantities (voltage, current, electrical power consumption) either in individual elements or in complex circuit connections.
- Propose solutions to basic issues of analysis, design, and energy efficiency of simple circuits and general issues of electrical power and energy.

General Skills

- Search, analyze, and synthesize data and information, using the necessary technologies
- Adaptation to new situations
- Decision making
- Independent work
- Teamwork
- Work in an interdisciplinary environment

- Production of new research ideas

(3) SYLLABUS

Theoretical Lecture Sections

- Basic Electrical Elements and Properties
- Simple element configuration, resistor connections, source connections, voltage and current dividers
- Electrical Power and energy balance
- Direct Current Circuits
- Complex Circuits
- Kirchoff's Equations and application in solving complex circuits
- Superposition Principle in Linear Circuits
- Application of the superposition principle in circuit solving
- Accumulators – technologies – charging techniques
- Current Sources, properties, applications, design, simple connections
- Thevenin's Theorem and Norton's Theorem
- Applications of Thevenin's and Norton's theorems in complex connections – circuit solving
- Maximum Power Transfer Theorem and applications
- Dependent Voltage and Current Sources
- Solving circuits with dependent sources
- Capacitors – properties – energy issues – connections – calculations for solving circuits/connections with capacitors

Laboratory Exercises

1. Resistor connections, use of measuring instruments, voltage sources
2. Voltage dividers, current dividers
3. Complex DC circuits – Kirchoff's equations
4. Superposition principle in electrical circuits
5. Current Sources – measurements/circuits
6. Thevenin's and Norton's Theorems
7. Electrical Power and Energy – Maximum Power Transfer Theorem

(4) TEACHING METHODS - ASSESSMENT

<table>
<tr><td>MODE OF DELIVERY</td><td>In-Class Face-to-Face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>▪ Use of ICT in teaching
▪ Use of ICT in laboratory education
▪ Use of ICT in communication with students via the e-class platform</td></tr>
<tr><td>TEACHING ORGANIZATION</td><td><table><tr><th>Method description/Activity</th><th>Semester Workload</th></tr><tr><td>Lectures</td><td>52</td></tr><tr><td>Laboratory</td><td>33</td></tr><tr><td>Independent study</td><td>95</td></tr><tr><td>Total Contact Hours</td><td>180</td></tr></table></td></tr>
<tr><td>ASSESSMENT METHODS</td><td>• Written final exam (70%)
• Problem-solving
• Multiple-choice questions
• Laboratory participation and tests (15%)
• Laboratory exercise reports (15%)
• The assessment criteria are announced to students at the beginning of the semester and posted on the course website - eClass.</td></tr>
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(5) RECOMMENDED BIBLIOGRAPHY

Recommended Bibliography:

1. Circuits and signal analysis, Volume 1 – Theory and application of Electrical Engineer, G. Rizzoni, Edition Papazisi, ISBN 960-02-1902-8
2. Electrical Circuits – volume A', G. E. Chatzarakis, Edition Tziola, ISBN 960-7219-75-9
3. Electrical Circuits- Theory, Analysis and Simulation, G. Charitandi, Edition Arakanthos, ISBN 978-960-9474-10-8
4. Introduction to Electrical Circuits, N. Kolliopoulos, Edition Ion ISBN 978-960-508-054-9