COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
DEPARTMENT	Electrical and Computer Engineering		
LEVEL OF STUDY	Undergraduate		
COURSE UNIT CODE	9.001	**SEMESTER**	9th
COURSE TITLE	Industrial Electrical Installations		
COURSEWORK BREAKDOWN		**TEACHING WEEKLY HOURS**	**ECTS Credits**
	Theory (Lectures)	2	2
	Tutorial/Exercises	1	1
	Laboratory	1	1
	TOTAL	**4**	**4**
COURSE UNIT TYPE	Specialized knowledge/Skills development		
PREREQUISITES			
LANGUAGE OF INSTRUCTION/EXAMS	Greek		
COURSE DELIVERED TO ERASMUS STUDENTS	No		
WEB PAGE (URL)	https://eclass.hmu.gr/courses/ECE180/		

(2) LEARNING OUTCOMES

Learning Outcomes

Upon successful completion of the course, the student will:

- be able to evaluate the hazards in an electrical installation and the required means protection (operation, selection, and use),
- know the basic principles of the EL HD384 standard, its scope and the principles of design of corresponding electrical installations,
- know the basic principles of earthing systems in building and industrial installations
  The basic principles of earthing in industrial and industrial installations, how to select - calculate and methods of measurement - evaluation,
- be familiar with the operation and selection of equipment used in low and medium voltage consumer installations
- be able to design a low-voltage industrial building installation
- be able to certify a low-voltage industrial building installation in accordance with EL HD384
- be able to design a medium voltage substation installation

The **skills**, which the students will obtain upon successful completion of the course are:

- understanding of the fundamental principles of electrical installations design and operation,
- understanding of hazards experienced in electrical installations for users and installations
- understanding of the concept of design an electrical installation applying appropriate standards
- project development and organization
- utilization of a computer in project development and design.

The **abilities**, which the students will get upon the successful completion of the course are:

a) understanding fundamental concepts of electrical installation design, operation, maintenance and failure.
b) design an electrical system according to operation requirements and standards
c) cooperation with other people, as part of a team, in writing project.

General Skills

The course aims at the acquisition by the graduate of the following general competences:

- Searching, analyzing and synthesizing data and information, using both analysis and synthesis of data and information using the necessary technologies
- Autonomous work
- Decision-making
- Project planning and management
- Promotion of free, creative and deductive thinking
- Exercise of criticism and self-criticism
- Respect for the natural environment

(3) SYLLABUS

The aim of the course is to understand the principles of electrical installation design building and industrial, low and medium voltage, according to the EL HD384 standard, where or corresponding IEC standards. to achieve this objective the student will be able to understand the structure is as follows:

1. Effect of electric current on human, mechanism of electric shock, protection. Dangers in electrical installations, effect of AC and DC electricity on the Electrical behaviour of the human body, electrocution, voltages contact effects of frequency and shock currents. Protection against electric shock, networks, and Characterization of installations and protection.
2. ELOT HD 384 Standard
   Scope, structure and scope, application to the case of protection against protection against electric shock, characterization of electrical installations.
3. Basic principles of earthing systems
   Earthing systems in buildings and industrial installations, typical arrangements electrode types, foundation earthing, equipotential connections, measurement of resistance grounding - certification.
4. Calculation of short-circuit currents
   Types of faults (3F, 2F, 2F with earth and 1F), basic characteristics of currents. Short-circuit current characteristics, short-circuit current, calculation in networks, IEC60609 standard.
5. Conductor and cable technology - calculations
   Conductors and cables, standard signs and regulations. Selection of cables and calculations in permanent and transient conditions. Effect of mode of operation and installation, selection and adjustment of cable protection systems.
6. Low and medium voltage switches and coupling devices
   Switching phenomena in coupling and decoupling, influence of load, decouplers load and power circuit breakers, relays, X fuses, microautomatic, switches voltage escape, special-purpose components, basic principles of selective protection.
7. Electrical installations in buildings
   Basic distribution circuits, load estimation, utilization factors, lighting installations, standard load installations, special area installations, distribution panels, panel supply line, panel supply line, EDP supplies, compensation, certification electrical installations - EL HD 384 standard
8. Electrical drive installations
   Types and use of electric motors, torque curves, motor selection, basic operating circuits and automation, electrical protection and coupling devices motors, connection to the mains, Y motors.
9. Medium voltage consumer substations
   Basic elements of M.V. networks and M.V. supplies, power supply, substation structure, switchgear, switchgear, switchgear, switchgear and control gear M.V. equipment (cables, fuses, fuses, metering transformers, arresters selection of cables and calculations, types and selection of transformers power, sizing of M.V. buses and earthing of M.V. substations.

(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 ICTs in lecturing
▪ Use of ICTs for the 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>45</td></tr>
<tr><td>Problem solving</td><td>15</td></tr>
<tr><td>Project (journal/paper reading and theoretical study)</td><td>40</td></tr>
<tr><td>Laboratory work</td><td>30</td></tr>
<tr><td>Non-guided personal study</td><td>50</td></tr>
<tr><td>Total Contact Hours</td><td>180</td></tr>
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<tr><td>ASSESSMENT METHODS</td><td>All announcements for the course regulations and complementary reading material are permanently posted in the course web page. The course grade incorporates the following evaluation procedures:

(A) Final Written examination (60 %)
• Problem solving.
• Targeted multiple-choice questions
(B) Written individual work (30%)
(C) Laboratory practice (10%)</td></tr>
</table>

(5) RECOMMENDED BIBLIOGRAPHY

-Recommended Bibliography:

1. *Consumer Electrical Installations, Petros Dokopoulos, Ziti Publications, 2005 (In Greek)*
2. *ELOT HD384 (In Greek)*
3. *Electrical installations, Seip g., JIola publications, 2004 (In Greek)*
4. *Industrial electrical installations, Vassilios D. Bitzionis, Publications Jiola Publications, 2014 (In Greek)*
5. *Electrical Installations of Conventional Building Systems (according to ELOT HD standard). (In Greek)*
6. *EIB Technical - instabus, Stefanos Touloglou, Ion Publications, 2004, (In Greek)*
7. *Electric Industrial Drive Installations and Medium Voltage Substations, Stefanos Touloglou, Ion Publications, 2010, (In Greek)*
8. *Planning guide for power distribution plants, Hartmut Kiank, Wolfgang Fruth, SIEMENS (In Greek)*
9. *Electrical Installation guide according to IEC international standards, Schneider Electric 2016, (In Greek)*
10. *Introduction to the protection of electrical installations, Konstantinos N. Kritsotakis, Tziola Publications, 2012 (In Greek)*

Relevant Scientific Journals:

1. *IEEE Transactions on Power Delivery*
2. *IEEE Transactions on Industry Applications*
3. *IET Electric Power Applications*
4. *IET Generation, Transmission & Distribution 5. International Journal of Electrical Power & Energy Systems*
5. *Electric Power Systems Research*
6. *IET Science, Measurement & Technology*
7. *Electric Power Components and Systems*

<u>Standards and Technical Guides:</u>

1. *IEC Standards*
2. *IEEE Standards*
3. *Cigre*
4. *ANSI*
5. *EPRI*