



<b>Course Code</b> MENG-100	<b>Course Title</b> Electrical Networks and Machines	<b>ECTS Credits</b> 6
<b>Department</b> Engineering	<b>Semester</b> Fall, Spring	<b>Prerequisites</b> None
<b>Type of Course</b> Required	<b>Field</b> Engineering	<b>Language of Instruction</b> English
<b>Level of Course</b> 1 <sup>st</sup> Cycle	<b>Year of Study</b> 3 <sup>rd</sup>	<b>Lecturer(s)</b> Dr Andreas Michaelides
<b>Mode of Delivery</b> Face-to-face	<b>Work Placement</b> N/A	<b>Co-requisites</b> MATH-190

### **Objectives of the Course:**

The main objectives of the course are to:

- Introduce students to the basic electrical principles of electric circuit analysis and operation of electric motors
- Provide the tools for the analysis of DC circuits using simple techniques (e.g. Ohms Law, Kirchhoff's Laws, mesh analysis)
- Provide techniques for the analysis of AC circuits that incorporate resistors, inductors and capacitors
- Familiarize students with the three-phase current systems and its triangle-star connection mode
- Introduce students to basic electrical energy transformation and transmission
- Teach students the electromechanical principles and electromagnetic induction
- Provide the fundamentals for the construction and operation of the DC motor
- Provide the basic principles and operation of the single-phase AC induction motor
- Provide understanding of the operation and performance evaluation of three-phase asynchronous and synchronous motors
- Train students on how to connect, start and operate all basic DC/AC motors through laboratory experiments and hands-on experience

### **Learning Outcomes:**

After completion of the course students are expected to:

- Differentiate among different type of motors based on fabrication, performance and application
- Know the operation and use of important laboratory equipment including oscilloscopes, power supplies, signal generators and digital multimeters
- Use specific techniques to analyze basic electrical networks through calculations

- Perform laboratory measurements for electrical networks and motors
- Construct simple circuits and measure voltage, current, power dissipation and phase-shift
- Explain briefly the major electric supply management scheme
- Explain the main types of motors and their specific applications
- Operate reliably any low wattage DC/AC motor used in the domestic electrical grid

**Course Contents:**

- Basic DC electric circuits; Ohms Law and electric power
- Electric circuit analysis methods; Series/Parallel connection
- AC Circuits with resistors, inductors, capacitors; Phase shift
- Three-phase voltage sources, star delta load connection
- Laboratory experiments with DC circuits and AC single/three phase circuits
- Electromechanical principles, induction law, force on current-carrying conductor
- DC motor, constructional and functional parameters, stator’s lap/wave winding
- Universal motor and transmission lines
- One phase AC induction motors with auxiliary winding and starting capacitor
- Three-phase asynchronous motors; stepper motor
- Synchronous motors; synchronization of rotor with stator’s field
- A series of laboratory experiments with motors

**Learning Activities and Teaching Methods:**

Lectures, Presentation of operating machines and their control in laboratory sessions.

**Assessment Methods:**

Homework, projects, mid-term exam, final exam

**Required Textbooks/Reading:**

Authors	Title	Publisher	Year	ISBN
James W. Nilson, Susan A. Riedel	Electric Circuits	Prentice Hall	2008	0131989251
S.J.Chapman	Electric Machinery Fundamentals 4 <sup>th</sup> edition pdf	McGraw Hill	2014	9780072465239

**Recommended Textbooks/Reading:**

Authors	Title	Publisher	Year	ISBN
Robert L. Boylestad	Introductory Circuit Analysis	Prentice Hall	2007	0131988263
David J. Irwin, Mark R. Nelms	Basic Engineering Circuits Analysis	Wiley	2008	9780470128695
A.E.Fitzgerald C.Kingsley Jr.	Electric Machinery	McGraw Hill	2003	9780073660097

S.D.Umans				
C.I.Hubert	Electric Machines: Theory, Operating Applications & Control	Prentice Hall	2001	9780130612106