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| <b>Course Code</b><br>ECE-360                   | <b>Course Title</b><br>Electric Machines | <b>ECTS Credits</b><br>6                     |
| <b>Department</b><br>Engineering                | <b>Semester</b><br>Fall, Spring          | <b>Prerequisites</b><br>ECE-102              |
| <b>Type of Course</b><br>Required               | <b>Field</b><br>Engineering              | <b>Language of Instruction</b><br>English    |
| <b>Level of Course</b><br>1 <sup>st</sup> Cycle | <b>Year of Study</b><br>3 <sup>rd</sup>  | <b>Lecturer(s)</b><br>Dr Andreas Michaelides |
| <b>Mode of Delivery</b><br>Face-to-face         | <b>Work Placement</b><br>N/A             | <b>Co-requisites</b><br>None                 |

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

The course will initially engage in a thorough analysis of major electromechanical principles adapted by various types of electric machines as transformers, motors and generators. Studying the functional properties of the different types of electric machines will provide the understanding for their specific applications and the knowledge for their operation. The later will be supported by experimental presentations of the machines during and after the lecture. The course will focus on widely known types of machines, dc motors/generators, the ac motor, the synchronous motor/generator and transformers up to some basic motor control techniques.

### **Learning Outcomes:**

After completion of the course students are expected to:

1. Comprehend the significance of electrical energy, its creation up to its utilization.
2. Assess the elementary machine principle.(change between different energy forms)
3. Analyze different electromechanical processes resulting from the magnetic circuit.
4. To perform extensive calculations on usual DC machines.
5. Differentiate among common armature winding modes of industrial DC machines.
6. Assess the functional principle of the Three-Phase and Induction machines.
7. State the operational transition from motor to generator and vice versa.
8. Classify most frequent types of motors and generators used for domestic and industrial purposes, to asses their functioning and operate them.

### **Course Contents:**

1. Magnetic circuits and magnetic materials
2. Transformers
3. Electromechanical-energy-conversion principles
4. Introduction to rotating machines
5. Synchronous machines
6. Polyphase induction machines
7. DC machines

8. Variable-reluctance machines
9. Stepping motors
10. Single-and two-phase motors
11. Introduction to power electronics
12. Speed and torque control

**Learning Activities and Teaching Methods:**

Lectures, Presentation of functioning machines in class

**Assessment Methods:**

Homework, projects, mid-term exam, final exam

**Required Textbooks/Reading:**

| Authors                                       | Title              | Publisher      | Year | ISBN          |
|---|--------------------|----------------|------|---------------|
| A.E.Fitzgerald<br>C.Kingsley Jr.<br>S.D.Umans | Electric Machinery | McGraw<br>Hill | 2003 | 9780073660097 |

**Recommended Textbooks/Reading:**

| Authors     | Title   | Publisher        | Year | ISBN          |
|-------------|---|------------------|------|---------------|
| S.J.Chapman | Electric Machinery<br>Fundamentals                                | McGraw<br>Hill   | 2005 | 9788120325036 |
| C.I.Hubert  | Electric Machines:<br>Theory, Operating<br>Applications & Control | Prentice<br>Hall | 2001 | 9780130612106 |