Course: Actuators Laboratory 0908324 (1 Cr–Core Course)

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Course Website: e-learning website
https://elearning.ju.edu.jo/course/view.php?id=15079

Catalog Data: Single Phase Transformers; DC Motors (shunt, series, differentially compound, cumulatively compound); Three phase induction motors; Synchronous generators.

Prerequisites by Course:
0908323 – Electrical Actuators (pre-requisite)

Prerequisites by Topic:
Students should have assumed to have sufficient knowledge in:

• Magnetic circuits and single-phase transformers.
• Three-phase transformers: construction, connections and groups.
• DC Generators and Motors.
• Concept of 3-phase rotating field.
• 3-phase synchronous generators.

Textbook: Experiment Sheets on the e-learning website
https://elearning.ju.edu.jo/course/view.php?id=15079

References:

Schedule & Duration:
16 Weeks, 6 Labs (3 hours each) plus exams.

Minimum Student Material: Experiments Manual, class handouts, and scientific calculator.

Minimum College Facilities: Lab with proper equipment and measuring instrumentation facilities.

Course Objectives:
This is a practical course of Electrical Machines that is provided by the Department of Electrical Engineering for the Electrical Engineering students. It is designed to achieve the following objectives:

• Provide the student with the basic skills and proficiency of implementing the wiring diagrams required to conduct the testing procedures of transformers, AC and DC generators and motors.
• Provide the student with the basic skills of conducting different testing procedures of the different types of electrical machines.
• Allow the student to benefit from the testing results of the testing procedures to calculate the parameters of the tested machine equivalent circuit.
• Provide the student with the proficiency of constructing the experimental performance characteristics of the different types of machines and correlate practical and theoretical results.
Mapping to Student Outcomes

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<tr>
<th>ABET SO</th>
<th>b</th>
<th>d</th>
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<td>Will be measured</td>
<td>Yes</td>
<td>Yes</td>
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Course Learning Outcomes and Relation to ABET Student Outcomes:

Upon successful completion of this course, a student should:

1. Proficiently deal with the measuring instruments usually involved in electrical machines testing [a,b,k] procedures such as voltmeters, ammeters, ohmmeters, wattmeters, power factor meters, torque and speed meters
2. Improve report writing skills and presentation skills [d,g]
3. Understand and construct the wiring diagram of the different testing procedures of power transformers and electric generators and motors [a,b,k]
4. Perform the different test procedures of the different types of electrical machines safely [a,b,k]
5. Use the testing data to calculate the equivalent circuit parameters of the tested machines [a,b,k]
6. Construct and understand the different performance characteristics of electrical machines [a,b,k]
7. Correlate practical and theoretical results of the testing machines [a,b,k]

Course Topics:

<table>
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<tr>
<th>Topic Description</th>
<th>Hrs</th>
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<tr>
<td>1. <strong>Single-Phase Transformers</strong>: DC test, No-load test and Short-circuit test, Equivalent circuit parameters</td>
<td>6</td>
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<td>2. <strong>DC Motors</strong>: Starting of DC Motors, Torque-Speed Characteristics of Separately-excited &amp; Shunt DC Motors, Speed control of DC Motors by Armature Voltage Control</td>
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<tr>
<td>4. <strong>Synchronous Generators</strong>: DC test, Open-circuit test &amp; short-circuit tests, Equivalent circuit parameters evaluation, Load test and load characteristics, Voltage regulation of Synchronous Generators</td>
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Ground Rules: **Attendance is required** and highly encouraged. To that end, attendance will be taken every lecture. All exams (including the final exam) should be considered **cumulative**. Exams are closed book. No scratch paper is allowed. You will be held responsible for all reading material assigned, even if it is not explicitly covered in lecture notes.

Assessments: Exams, Quizzes, Reports, and Assignments.

Grading policy:

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<tr>
<th>Component</th>
<th>Percentage</th>
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<tr>
<td>Lab report</td>
<td>20 %</td>
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<tr>
<td>Midterm Exam</td>
<td>30 %</td>
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<tr>
<td>Quizzes</td>
<td>10 %</td>
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<tr>
<td>Final Exam</td>
<td>40 %</td>
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<tr>
<td><strong>Total</strong></td>
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Last Updated: November 2017