Course Syllabus

Course Title: Small Electrical Machines and Micro Machines

Course code: 610488 + 610383 + 610384

Course Level: Fourth Year

Course prerequisite: Electrical machines (1) - 610381, Electromagnetic –(650241)

Credit hours: 3 hours / week

Academic Staff

<table>
<thead>
<tr>
<th>Name</th>
<th>Rank</th>
<th>Office Number and Location</th>
<th>Office Hours</th>
<th>E-mail Address</th>
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</thead>
<tbody>
<tr>
<td>Dr. yanal faour</td>
<td>Assistance Professor</td>
<td></td>
<td>9.00-10.00</td>
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Course module description:
To introduce concepts of construction, operation, and control of small electrical machines by studying the following main topics.
1. Servomotors, DC and AC Servomotors.
2. Permanent Magnet DC Machines, Brushless DC Machines, and Stepper Motors
3. Synchronous Machines.
4. Reluctance Motors, Synchros, and Linear Motors

Course module objectives:
At completing this course the student should be able to:
1. Understand the principle of construction and operation of small Electrical Machines.
2. Understand the principles of controlling the Small Electrical Machines.
3. Understand the applications of the Small Electrical Machines in the control...
Course/ module components

- **Text Book:**

- **Support material (s) (vcs, acs, etc).**

- **Study guide (s) (if applicable)**

- **Homework and laboratory guide (s) if (applicable).**

**Teaching methods:**

- Lectures (3 per week) are used to describe and develop the concepts listed above.
- Supervisions are used to solve problems set(tutorials) by various exercises.

**Learning outcomes:**

- **Knowledge and understanding**

  Having successfully completed the course, the student will be able to demonstrate knowledge and understanding of:

  - The various types of small and micro electrical machines.
  - The types of transducers, sensors and actuators.
  - Performance and design calculations of the small machines such as the PMDC motors, BLDC motors, stepper motors, reluctance motors, etc.
  - Small machines internal and external characteristics.
  - Machine control methods.
  - Fields of Applications of small and micro machines.

- **Cognitive skills (thinking and analysis).**
  Students are allowed to make seminars on various subjects in small and micro machines with comprehensive discussions.

- **Communication skills (personal and academic).**

  Having successfully completed the module, student will be able to:

  - Appreciate the importance of small and micro machines in industry.
  - Compare and contrast the operation of different types of small machines.
  - Derive equations related to the machine performance and design.
  - Formulate relevant equivalent circuits of the machines to calculate their efficiencies.
  - Identify different types of machines and their applications.
  - Analyze simple problems related to small electrical machines.
Practical and subject specific skills (Transferable Skills).

Having successfully completed the module, the student will be able to:

- Choose among the different types of small machines to suit a given application task.
- Explain the operation and performance of different types of machines.
- Apply engineering studies for different types of small and micro machines.
- Interpret results and correlate them with theoretical predictions.
- Write a technical reports.

Assessment instruments

- Short reports and/or presentations, and/or Short research projects
- Quizzes.
- Home works
- Final examination: 40 marks

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<tr>
<th>Allocation of Marks</th>
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<tbody>
<tr>
<td>Assessment Instruments</td>
<td>Mark</td>
</tr>
<tr>
<td>First examination</td>
<td>20 Marks</td>
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<tr>
<td>Second Examination</td>
<td>20 Marks</td>
</tr>
<tr>
<td>Final examination</td>
<td>40 Marks</td>
</tr>
<tr>
<td>Reports, research projects, Quizzes, Home works, Projects</td>
<td>20 Marks</td>
</tr>
<tr>
<td>Total</td>
<td>100 Marks</td>
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Documentation and academic honesty
• Documentation style (with illustrative examples)
  • Hand written and typed lecture notes including solved examples and tutorial problems are prepared from various references related to the topics. The student shall try to solve these tutorial problems by himself while answers are given individually. The solution of these problems are given to the student before the final examination.

• Protection by copyright
• Avoiding plagiarism.

Course/module academic calendar

<table>
<thead>
<tr>
<th>week</th>
<th>Basic and support material to be covered</th>
<th>Homework/reports and their due dates</th>
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<tbody>
<tr>
<td>(1)</td>
<td>Introduction. Microsystems Components, Transducers (Sensors and Micro actuators).</td>
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<tr>
<td>(2)</td>
<td>DC Machines: Construction, Principle of Operation, dc motors and their control.</td>
<td>Homework No.1</td>
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<tr>
<td>(3)</td>
<td>DC Machines: Construction, Principle of Operation, dc motors and their control.</td>
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<tr>
<td>(4)</td>
<td>Permanent Magnet DC Machines, Construction, Operation and Control</td>
<td>Homework No.2</td>
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<tr>
<td>(5)</td>
<td>Permanent Magnet DC Machines, Construction, Operation and Control</td>
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<tr>
<td>(6)</td>
<td>Synchronous Machines: Construction, Operation and Control.</td>
<td>Homework No.3</td>
</tr>
<tr>
<td>(7)</td>
<td>Synchronous Machines: Construction, Operation and Control.</td>
<td>Report No.1</td>
</tr>
<tr>
<td>(8)</td>
<td>Servomechanism: Servomotors, DC and AC Servomotors, Operation and Control.</td>
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</tr>
<tr>
<td>(9)</td>
<td>Servomechanism: Servomotors, DC and AC Servomotors, Operation and Control.</td>
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<tr>
<td>(10)</td>
<td>Stepping Motors: Construction, Operation and Control.</td>
<td>Homework No.4</td>
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<tr>
<td>(11)</td>
<td>Stepping Motors: Construction, Operation and Control.</td>
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<td>(12)</td>
<td>Reluctance Motors, Construction, Operation and Control.</td>
<td>Homework No.5</td>
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<td>(13)</td>
<td>Synchros, Construction, Operation and Control.</td>
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<td>(14)</td>
<td>Synchros, Construction, Operation and Control.</td>
<td>Homework No.6</td>
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<tr>
<td>(15)</td>
<td>Linear Motors: Construction.</td>
<td>Report No.2</td>
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Expected workload:

On average students need to spend 2 hours of study and preparation for each 50-minute lecture/tutorial.

Attendance policy:

Absence from lectures and/or tutorials shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse acceptable to and approved by the Dean of the relevant college/faculty shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.

Module references

Books

ReferenceBooks


Journals

IEEE Transactions on Power Apparatus and Systems

Websites

www.wikipedia.org