# MECH3630 Electrical Technology

<table>
<thead>
<tr>
<th><strong>Course Code:</strong></th>
<th>MECH3630</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course Title:</strong></td>
<td>Electrical Technology</td>
</tr>
<tr>
<td><strong>Terms Offered (Credits):</strong></td>
<td>Spring (3 credits)</td>
</tr>
<tr>
<td><strong>Pre/Co-Requisites:</strong></td>
<td>NA</td>
</tr>
</tbody>
</table>

| **Course Structure:** | Lecture: 2 days per week, 3 hours; Lab: 1 day per week, 1 hour; Tutorial: 1 day per week, 1 hour |

**Textbook/Required Material:**


**Course Description:**
Theoretical and practical treatment of key elements in electrical technology with industrial applications. Main topics include magnetic circuits, transformers, electrical machines, and applications for industrial automation.

**Course Topics:**
1. Magnetic Circuits (1.5 weeks)
2. Hysteresis
3. Sinusoidal excitation
4. Permanent magnet
5. Transformers (2 weeks)
6. Construction and working principle
7. Equivalent circuit analysis
8. Autotransformers and three-phase transformers
9. Electromechanical Energy Conversion (0.5 week)
10. Energy conversion process
11. Field energy
12. Mechanical force in the electromagnetic system
13. Rotating machines
14. DC Machines (3 weeks)
15. Motor and generator principles
16. Speed-torque characteristics of series, shunt, and compound wound motors
17. Induction (asynchronous) Machines (3.5 weeks)
18. Construction and principle of action of squirrel cage motors
19. Speed control and starting method
20. Equivalent circuit analysis
21. Speed-torque characteristics
22. Synchronous Machines (0.5 week)
23. Construction and principle of action
24. Equivalent circuit analysis
25. Speed-torque characteristics
26. Single-Phase Motors (0.5 week)
27. Double revolving field theory
28. Equivalent circuit analysis  
29. Speed-torque characteristics

30. Special Machines (0.5weeks)  
31. Servomotors  
32. Synchros  
33. Stepper motors

34. Transients and Dynamics (0.5weeks)  
35. DC machines  
36. Synchronous machines  
37. Induction machines  
38. Transformer

39. Power Semiconductor Converters (0.5 week)  
40. Power semiconductor devices  
41. Controlled rectifiers  
42. AC voltage controllers  
43. Choppers  
44. Inverters and cycloconverters

| Course Objectives: | 1. To equip students with fundamental theories and technologies in electromechanical energy conversion.  
2. To introduce students structures, working principle, and load characteristics of key devices such as transformer, DC machine, and induction machine.  
3. To provide students extensive training in development and use of equivalent circuit for magnetic circuit and device analysis for engineering design.  
4. To introduce students practical issues that affect safety and energy efficiency. |
| --- | --- |
| Course Outcomes: | A. Ability to use basic knowledge in physics and mathematical tool to develop new analysis tools, concepts, and models.  
B. Ability to use electromechanical devices, such as transformers, DC machines, induction machines, and power devices for mechanical system design and development.  
C. Ability to conduct design analysis for products that involve electromechanical energy conversion.  
D. Awareness of safety issues in use of electromechanical devices and power devices. |
| Assessment Method: | ● Homework  
● Lab  
● Mid Term and Final Exams |