COURSE DESCRIPTION

Fundamentals of electromechanical energy conversion. Motors and generators, transformers, single and polyphase power circuits, synchronous and induction machines, power measurements.

PRE-REQUISITES AND ANTI-REQUISITES

Prerequisite(s): PHYSICS 1E03; MATH 2Z03, MATH 2ZZ3; registration in either MATH 2M06 (or 2M03 and 2MM3) or both MATH 2P04 and 2Q04; and registration in the Faculty of Engineering
Antirequisite(s): ENGINEER 3M03

SCHEDULE

Lectures: Tuesday, Thursday 11:30 am – 12:20 pm in BSB-147.
Tutorial: T01 Friday 2:30 pm – 3:20 pm in HH-302; T02 Friday 8:30 am – 9:20 am in T13-127, beginning January 19.
Labs: (none)

INSTRUCTOR OFFICE HOURS AND CONTACT INFORMATION

Dr. Peter M. Smith
ITB-A218
smithpm@mcmaster.ca
ext. 27080

Office Hours:
Thursdays 1:30 pm - 3:00 pm
Other times by appointment

TEACHING ASSISTANT CONTACT INFORMATION

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COURSE WEBSITE/ALTERNATE METHODS OF COMMUNICATION

Course materials will be posted on Avenue to Learn (http://avenue.mcmaster.ca/). Copies of the lecture overheads for each week will be posted on the prior Friday.
COURSE OBJECTIVES

By the end of this course, students should be able to analyze, model, and predict the performance of ac and dc power devices and systems including single-phase and balanced three-phase systems, transformers, generators and motors.

ASSUMED KNOWLEDGE

Students should have a basic knowledge of Newtonian mechanics, electric and magnetic fields, electrical circuit analysis and algebra using complex numbers.

COURSE MATERIALS

Required Texts: None.

Calculator: Only the McMaster Standard Calculator (Casio FX-991 MS or MS Plus) will be permitted in tests and examinations. This is available at the Campus Store.


COURSE OVERVIEW

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>Review</td>
</tr>
<tr>
<td>2</td>
<td>Complex numbers</td>
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<tr>
<td>3</td>
<td>Electric circuit elements</td>
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<td>4</td>
<td>Nodal analysis</td>
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<td>5</td>
<td>Loop analysis</td>
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<td>6</td>
<td>Transient analysis of circuits</td>
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<td>7</td>
<td>Steady-state analysis of ac circuits</td>
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<td>8</td>
<td>Thevenin and Norton equivalent circuits</td>
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<td></td>
<td>MID-TERM TEST (FEBRUARY 1)</td>
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<tr>
<td>9</td>
<td>Electrical power</td>
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<td>10</td>
<td>Three-phase circuits</td>
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<tr>
<td>11</td>
<td>Magnetic fields and circuits</td>
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<td>12</td>
<td>Behaviour of magnetic materials</td>
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<tr>
<td>13</td>
<td>Transformers</td>
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<td>14</td>
<td>Linear machines</td>
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<td>15</td>
<td>Basic rotating machines</td>
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<tr>
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<td>MID-TERM TEST (MARCH 8)</td>
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<tr>
<td>16</td>
<td>Generation of rotating magnetic fields</td>
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<tr>
<td>17</td>
<td>Synchronous motors</td>
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<tr>
<td>18</td>
<td>Synchronous generators</td>
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<tr>
<td>19</td>
<td>Induction motors</td>
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<tr>
<td>20</td>
<td>DC motors and generators</td>
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<tr>
<td>21</td>
<td>Special motors</td>
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<tr>
<td>22-23</td>
<td>SPARE/REVIEW</td>
</tr>
</tbody>
</table>
**ASSESSMENT**

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>4 Assignments</td>
<td>10%</td>
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<tr>
<td>2 Mid-Term Tests (50 mins each, closed book)</td>
<td>40%</td>
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<tr>
<td>Final Examination (2 hrs, closed book)</td>
<td>50%</td>
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<tr>
<td>Total</td>
<td>100%</td>
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</tbody>
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Assignments must be submitted in class on the due date. Sample solutions will be posted shortly thereafter, so late submissions will not be accepted.

Note that a standard formula sheet will be supplied with each mid-term test and with the final examination (available on Avenue to Learn). No other written material may be brought to the tests.

**ACCREDITATION LEARNING OUTCOMES**

Note: The *Learning Outcomes* defined in this section are measured throughout the course and form part of the Department's continuous improvement process. They are a key component of the accreditation process for the program and will not be taken into consideration in determining a student's actual grade in the course. For more information on accreditation, please ask your instructor or visit:

http://www.engineerscanada.ca.

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Indicators</th>
<th>Measurement Methods</th>
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</thead>
<tbody>
<tr>
<td>Can analyze, model and extract parameters in DC and AC electrical circuits</td>
<td>1.1, 1.3</td>
<td>Assignments, tests</td>
</tr>
<tr>
<td>Can describe and apply relationships between magnetic and electric fields</td>
<td>2.2</td>
<td>Assignments, tests</td>
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<tr>
<td>Can recognize and discuss fundamentals of electromechanical energy conversion</td>
<td>3.1</td>
<td>Assignments, tests</td>
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<tr>
<td>Can specify most appropriate solution for magnetic and electrical circuits</td>
<td>4.1</td>
<td>Assignments, tests</td>
</tr>
<tr>
<td>Can compute numerical solutions to engineering problems</td>
<td>5.1</td>
<td>Assignments, tests</td>
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**ACADEMIC INTEGRITY**

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at http://www.mcmaster.ca/academicintegrity
The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.

**ACADEMIC ACCOMMODATIONS**

Students who require academic accommodation must contact Student accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contact by phone at 905.525.9140 ext. 28652 or e-mail at sas@mcmaster.ca. For further information, consult McMaster University’s Policy for Academic Accommodation of Students with Disabilities.

**NOTIFICATION OF STUDENT ABSENCE AND SUBMISSION OF REQUEST FOR RELIEF FOR MISSED ACADEMIC WORK**

In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar - "Requests for Relief for Missed Academic Term Work": http://www.mcmaster.ca/msaf/

**NOTICE REGARDING POSSIBLE COURSE MODIFICATION**

The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.