

I. COURSE DESCRIPTION:

This lab-based course runs concurrently with and supports theory covered in Electrical Theory, Level II. Students will connect and test direct current (DC) motors and generators, single phase and three phase squirrel cage induction motors and associated control circuitry. Alternating current RLC circuits will also be tested in the lab.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

Upon successful completion of this course, the student will demonstrate the ability to:

1. *Connect and test various DC machine configurations.***Potential Elements of the Performance**

- Identify the mechanical parts, windings and wiring connections of DC machines.
- Draw schematics and demonstrate wiring, starting, and control methods of series, shunt and compound DC motors.
- Demonstrate methods for forward-reverse control of DC motors.
- Explain and demonstrate reduced voltage starting techniques for DC motors.
- Demonstrate dynamic braking to illustrate principles of Counter Electromotive Force
- Use voltmeters and ammeters to determine torque and load characteristics of DC machines.

2. *Connect and test single phase and three phase squirrel cage induction motors.***Potential Elements of the Performance:**

- Identify the mechanical parts, windings, and wiring connections for single- and three-phase squirrel cage induction motors (SCIM).
- Draw schematics and demonstrate manual and magnetic across-the-line starting techniques for single- and three-phase squirrel cage induction motors.

- Draw schematics and demonstrate methods of jogging and plugging control of three-phase squirrel cage induction motors.
- Demonstrate methods for forward and reverse control of single- and three-phase squirrel cage induction motors using push buttons, selector switches, limit switches, pilot lamps, and related devices.
- Draw schematic circuit diagrams and demonstrate the control of a Single Phase Capacitor Start Dual Voltage Motor with a reversing drum switch and manual starter.
- Draw schematic circuit diagrams and demonstrate push-button control of a Single Phase Capacitor Start Dual Voltage Motor with a reversing magnetic starter.
- Connect, test, and describe the characteristics of RCL circuits.
- State the procedures for installing and aligning belt driven motors.

3. *Use test equipment to analyze alternating current RLC circuits.*
Potential Elements of the Performance:

- Connect RLC circuits and measure current and voltages using multimeters and oscilloscopes.
- Perform calculations to confirm lab measurements.

III. TOPICS:

1. Direct Current Machines
2. Single Phase and Three Phase Squirrel Cage Induction Motor
3. Motor Control
4. RLC Circuits

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

Canadian Electrical Code, Part 1 2009 (it is recommended the students purchase the Ontario Electrical Safety Code 2009 since it contains the Canadian Electrical Code as well as supplements relevant to working in Ontario).

REFERENCES:

Industrial Motor Control (Lab Manual) by Herman
ISBN 0-8273-8642-7

Industrial Motor Control (Text) by Herman & Alerich
ISBN 0-8273-8640-0

Electric Motor Control by Herman & Alerich
ISBN 0-7668-6164-3

Safety glasses, rubber insulating gloves with leather protectors and hand tools are required.

V. EVALUATION PROCESS/GRADING SYSTEM:

Course grade will be based primarily on lab reports. Students must attend and actively participate in their scheduled lab classes in order to submit associated reports. Late arrival or leaving early without the instructor's permission will be considered as missing the class. Students must bring hand tools and safety glasses to all classes.

Lab Reports:	80%
Tests (1 or 2 practical or theory tests as time permits)	20%

See Special Notes.

The following semester grades will be assigned to students:

Grade	<u>Definition</u>	<i>Grade Point Equivalent</i>
A+	90 – 100%	
A	80 – 89%	4.00
B	70 - 79%	3.00
C	60 - 69%	2.00
D	50 – 59%	1.00
F (Fail)	49% and below	0.00

CR (Credit) Credit for diploma requirements has been

	awarded.
S	Satisfactory achievement in field /clinical placement or non-graded subject area.
U	Unsatisfactory achievement in field/clinical placement or non-graded subject area.
X	A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.
NR	Grade not reported to Registrar's office.
W	Student has withdrawn from the course without academic penalty.

VI. SPECIAL NOTES:

Course Outline Amendments:

The professor reserves the right to change the information contained in this course outline depending on the needs of the learner and the availability of resources.

Retention of Course Outlines:

It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other postsecondary institutions.

Prior Learning Assessment:

Students who wish to apply for advance credit transfer (advanced standing) should obtain an Application for Advance Credit from the program coordinator (or the course coordinator regarding a general education transfer request) or academic assistant. Students will be required to provide an unofficial transcript and course outline related to the course in question. Please refer to the Student Academic Calendar of Events for the deadline date by which application must be made for advance standing.

Credit for prior learning will also be given upon successful completion of a challenge exam or portfolio.

Substitute course information is available in the Registrar's office.

Disability Services:

If you are a student with a disability (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with your professor and/or the Disability Services office. Visit Room E1101 or call Extension 2703 so that support services can be arranged for you.

Communication:

The College considers **WebCT/LMS** as the primary channel of communication for each course. Regularly checking this software platform is critical as it will keep you directly connected with faculty and current course information. Success in this course may be directly related to your willingness to take advantage of the **Learning Management System** communication tool.

Plagiarism:

Students should refer to the definition of “academic dishonesty” in *Student Code of Conduct*. A professor/instructor may assign a sanction as defined below, or make recommendations to the Academic Chair for disposition of the matter. The professor/instructor may (i) issue a verbal reprimand, (ii) make an assignment of a lower grade with explanation, (iii) require additional academic assignments and issue a lower grade upon completion to the maximum grade “C”, (iv) make an automatic assignment of a failing grade, (v) recommend to the Chair dismissal from the course with the assignment of a failing grade. In order to protect students from inadvertent plagiarism, to protect the copyright of the material referenced, and to credit the author of the material, it is the policy of the department to employ a documentation format for referencing source material.

Student Portal:

The Sault College portal allows you to view all your student information in one place. **mysaultcollege** gives you personalized access to online resources seven days a week from your home or school computer. Single log-in access allows you to see your personal and financial information, timetable, grades, records of achievement, unofficial transcript, and outstanding obligations, in addition to announcements, news, academic calendar of events, class cancellations, your learning management system (LMS), and much more. Go to <https://my.saultcollege.ca>.

Electronic Devices in the Classroom:

Students who wish to use electronic devices in the classroom will seek permission of the faculty member before proceeding to record instruction. With the exception of issues related to accommodations of disability, the decision to approve or refuse the request is the responsibility of the faculty member. Recorded classroom instruction will be used only for personal use and will not be used for any other purpose. Recorded classroom instruction will be destroyed at the end of the course. To ensure this, the student is required to return all copies of recorded material to the faculty member by the last day of class in the semester. Where the use of an electronic device has been approved, the student agrees that materials recorded are for his/her use only, are not for distribution, and are the sole property of the College.

Attendance:

Sault College is committed to student success. There is a direct correlation between academic performance and class attendance; therefore, for the benefit of all its constituents, all students are encouraged to attend all of their scheduled learning and evaluation sessions. This implies arriving on time and remaining for the duration of the scheduled session.

Other:

Attendance to scheduled lab activities is compulsory, unless permission has been granted by the instructor. Lab attendance and final grade are directly related. If a student arrives late for, or is not continuously present and actively participating at (scheduled breaks excepted), a scheduled lab class he/she will be considered absent for the entire class and will not be permitted to submit the associated lab report.

Students must continuously wear all Sault College required personal protective equipment (PPE) during lab activities. Failure to do this will result in expulsion from the lab activity and a grade of zero being assigned. Students are expected to be wearing their required PPE prior to entering the lab. The instructor will advise what specific PPE is required. If a student repeatedly neglects to wear PPE as required he/she will be considered to be in violation of the Sault College Academic Code of Conduct and may be sanctioned accordingly (see Student Code of Conduct & Appeal Guidelines). For instance, first violation – verbal warning, second violation written warning, third violation suspension from lab activities. Students must complete a lab safety orientation prior to participating in lab activities. Successful completion of this orientation will be demonstrated by the student completing a quiz with a minimum grade of 100%.

If a student misses a test/lab he/she must have a valid reason (i.e. medical or family emergency – documentation may be required). In addition, the instructor **must** be notified **prior** to the test or lab sitting. If this procedure is not followed the student will receive a mark of zero on the test/lab with no make-up option. Students may not submit lab reports for labs in which they were not in continuous attendance. Lab reports not submitted by the assigned deadline will receive a grade of 0.

Use of cell phones/PDAs for any form of communication (voice, text...) during class or lab time is strictly prohibited. Cell phones/PDAs must be silenced during regular class and lab times and must be turned off and kept out of sight during test sittings. Failure to follow the latter requirement during a test sitting will result in a grade of 0 being assigned.

Students may not wear earphones of any kind (i.e. for play back of recorded music/voice) during lab activities or test sittings. This does not include hearing aids required for hearing impaired.

Students are expected to maintain an active Sault College email account. They are required to check this email account daily. The instructor may announce details of lab and test requirements and scheduling through the Sault College email system (as well as sharing other important information).

VII LAB REQUIREMENTS:

1. All lab reports should be computer generated. Hand written reports will only be accepted if deemed neatly done. Circuit diagrams must be neatly hand drawn using a straight edge and component template or done using some drawing package.
2. All lab reports are to include a title page with the following information:
 - Lab title and number
 - Due date
 - Course number
 - Names of group members
 - Instructor's name
3. Lab reports are to include all procedures and observations listed **in the order** they were performed/taken and **numbered to match the lab handout**.
4. One lab report submission per group. Maximum 2 members per group.
5. Lab reports submitted with grammatical and/or spelling errors will receive a lesser grade. If a word processor is used, spell checking is expected.
6. Lab reports are due at the beginning of class, 1 week after the scheduled period in which it was done (unless otherwise specified by the Instructor). Late submissions will receive a grade of 0 (BUT ARE STILL REQUIRED TO BE SUBMITTED).
7. Students are not permitted to work on live equipment outside of regular class time and may not work in the lab without faculty permission. This permission will not be considered outside of the regular 8:30am to 4:30pm, Monday – Friday time period. If a student misses all or part of a lab class he/she will not be permitted to submit the corresponding lab report.
8. Students must supply their own personal protective equipment (PPE). Students will not be permitted in the lab if not wearing required PPE. Students must never work alone in the lab. Unsafe work habits will not be tolerated.
9. Students are expected to maintain a clean and organized work area. Failure to put away equipment (in assigned location) and to clean up after a lab activity will result in a grade of 0 being assigned for that activity.