

I. COURSE DESCRIPTION:

This course introduces the student to AC and DC solid state motor drives and associated equipment. Theory will be supported by lab exercises that will provide the students with hands-on experience with typical commercial AC and DC motor drives.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

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

1. *Connect, test and analyze single and polyphase diode rectifier circuits.***Potential Elements of the Performance:**

- Successfully describe and demonstrate the operation of single-phase half wave and full wave rectifiers.
- Successfully describe and demonstrate the operation of three-phase star (half wave) and full wave rectifiers.
- Successfully describe and demonstrate transformer connections for, and operation of, six-phase star (half wave) rectifiers.

2. *Connect, program and test DC motor drive systems.***Potential Elements of the Performance:**

- Properly identify the major components of a DC drive system.
- Properly describe the relationship between firing angle, load voltage, CEMF, and motor speed.
- Understand and describe four-quadrant control of a DC motor.
- Describe open and closed loop DC speed control systems and describe their characteristics.
- Describe the operation and Application of encoders, resolvers, and tachogenerators as feedback devices.
- Explain the operation of a DC chopper drive controller.
- Properly connect a commercially available SCR speed controller to a DC motor, properly calibrate the controller for the motor and confirm its operation.
- Understand and describe and demonstrate the procedure for testing the output SCR's of a DC motor control system for proper operation.

3. Connect, program and test AC motor drive systems.**Potential Elements of the Performance:**

- Successfully identify the major components on a commercially available AC Variable Speed Drive including rectifiers, power supply components, and inverter components.
- Properly describe the operation of a three-phase AC Variable Speed Drive Controller.
- Connect, calibrate and confirm the operation of a commercially available AC Variable Speed Drive Controller.
- Successfully explain the procedure to test, remove, and replace if necessary, the output transistors in a variable speed drive.
- Define and understand harmonics and describe their causes and effects on AC Systems.
- Understanding the operation of reactors and their application to AC Variable Speed and DC Motor Drive Systems as a method used to control harmonics on AC Power Systems.
- Understanding the principle operation of serial communication.
- Properly identify common serial communication hardware and protocols.

III. TOPICS:

1. Diode Rectifiers.
2. DC Motor Drives.
3. AC Motor Drives.

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

- Notes supplied by instructor
- Hand tools
- Safety Glasses

V. EVALUATION PROCESS/GRADING SYSTEM:***THEORY***

3 or 4 Tests all equally weighted: 60%

LAB

Shop activities / associated lab reports: 40%

Notes:

You must obtain a minimum of 50% individually in testing and shop activities in order to pass. Obtaining an individual mark less than 50% in either Theory

(tests) or Lab (shop activities) marks will result in an overall "F" grade.

Surprise quizzes, all equally weighted, may be given for a maximum of 5% of the final grade which will be attributed towards the overall theory percentage.

See Special Notes for additional grading policies

The following semester grades will be assigned to students:

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

Tests / Attendance:

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 and actively participating** resulting in a

grade of 0. All lab reports are to be submitted by the assigned deadline or will receive a grade of 0 with no option of re-write or submission.

Communication:

The student must actively maintain and check a valid Sault College email account on a daily basis as a primary channel of communication for this course. Regularly checking up to date emails 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 daily email updates.

Course Outline Amendments:

The professor reserves the right to change the information contained in this course outline with written notification/documentation during scheduled class time.

Instructor Assistance:

Instructor is committed to providing time outside regular scheduled classes** for student mentoring / tutoring and assistance in understanding all course material. Students wishing to meet with the instructor are encouraged to speak to the instructor before or after regular class to schedule a mutually beneficial time for material review.

** between the hours of 8:30am–4:30pm, Monday through Friday, at Sault College

Class/Lab Conduct:

Attendance to scheduled lab activities is compulsory, unless permission has been granted by the instructor. Lab attendance and final grade are directly related. **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 (safety glasses will definitely be required).** Unsafe conduct in the lab will not be tolerated. If a student is absent, 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. Use of cell phones/PDAs/laptops for any form of communication (voice, text...) during class or lab time is strictly prohibited unless instructor permission is granted. Disruption to others and failure to comply will result in the individual being asked to leave the class. Cell phones/PDAs/laptops must be silenced during regular class and lab times and *must only be present when used for appropriate in class material. (ie, typing notes with laptop)*

ALL PERSONAL ELECTRONIC DEVICES 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). Any request to deviate from the aforementioned course outline requirements must be made to the instructor in writing or via Sault College email. If permission is granted it must also be granted in writing or via Sault College email. Verbal requests/permissions are not acceptable. It is the student's responsibility to maintain a copy of all such requests and associated permissions.

Lab report requirements:

All labs are to be submitted in duo tang only (no binders) with student name, class name and class code clearly and neatly printed on the cover. Labs that are loose and not submitted in duo tang folders will not be accepted and will receive a grade of zero with no rewrite or resubmit option.

All labs must also be submitted with the following title page.
In sequence the title page should include.

Lab title and number:

Due date:

Date submitted:

Course number:

Name:

Names of group members:

Instructors name:

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. Announcements, news, the academic calendar of events, class cancellations, your learning management system (LMS), and much more are also accessible through the student portal. 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.