

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 **both** 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>	<i>Grade Point Equivalent</i>
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:

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.

It is the departmental policy that once the classroom door has been closed, the learning process has begun. Late arrivers will not be granted admission to the room.

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.

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).

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 include a title page with the following information:

Course number

Lab title and number

Due date

Date submitted

Names of group members (2 per group)

Instructor's name

VII. COURSE OUTLINE ADDENDUM:

The provisions contained in the addendum located on the portal form part of this course outline.