



AUTOMATED ELECTRICAL SYSTEMS  
COURSE NAME

ELR320 - 6  
CODE NUMBER

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TOTAL CREDIT HOURS: 90

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PREREQUISITE(S): ELN 228

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**PHILOSOPHY/GOALS:**

THE STUDENT WILL DEVELOP THE ABILITY TO USE THE COMPUTER IN A DRAFTING AND DESIGN ROLE IN A WIDE VARIETY OF INDUSTRIAL APPLICATIONS USING A LEADING TOOL FOR COMPUTER AIDED DRAFTING AND DESIGN; AUTOCAD.

THE STUDENT WILL USE ADVANCED PLC TECHNIQUES & SOFTWARE TO DESIGN & DOCUMENT AUTOMATED ELECTRICAL SYSTEMS.

THE STUDENT WILL ALSO INTERFACE PLC CONTROL TO AN INDUSTRIAL ROBOT. THIS COURSE WILL FAMILIARIZE THE STUDENT WITH INDUSTRIAL AUTOMATION OF ELECTRICAL, HYDRAULIC AND PNEUMATIC SYSTEMS.

**STUDENT PERFORMANCE OBJECTIVES:**

UPON SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENT WILL BE ABLE TO:

- 1) DEFINE AND DISCUSS COMPUTER AIDED DRAFTING AND DESIGN TERMINOLOGY AND PRINCIPLES.
- 2) DISTINGUISH THE HARDWARE AND SOFTWARE COMPONENTS OF A COMPUTER AIDED DRAFTING AND DESIGN ENVIRONMENT.
- 3) UTILIZE AUTOCAD MENU STRUCTURES AND DIFFERENT COMMAND ENTRY FORMS.
- 4) PRODUCE DRAWINGS THAT CAN BE USED EFFECTIVELY IN INDUSTRY TO MANUFACTURE, CONSTRUCT AND ASSEMBLE PRODUCTS.
- 5) PROGRAM ADVANCED PLC INSTRUCTIONS USING PLC DEVELOPMENT SOFTWARE.
- 6) PROGRAM AND RUN INDUSTRIAL ROBOTS WITH PLC'S AND AUTOMATION CONTROLLERS.

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TOPICS TO BE COVERED:

- 1) OVERVIEW OF CAD/CADD TERMINOLOGY AND PRINCIPLES.
- 2) OVERVIEW OF CAD/CADD WORKSTATION HARDWARE & SOFTWARE.
- 3) RECAP OF AUTOCAD MENU STRUCTURES UTILIZING DIFFERENT COMMAND ENTRY FORMS.
- 4) INTRODUCTION TO AUTOLISP FUNCTIONS.
- 5) OVERVIEW OF PLC CLASSIFICATIONS & MANUFACTURES.
- 6) RECAP OF AB PLC FAMILY HARDWARE & SOFTWARE.
- 7) INTRODUCTION TO ADVANCED SET OF INSTRUCTIONS FOR THE PLC 5 FAMILY.
- 8) INTRODUCTION TO THE TAYLOR DEVELOPMENT SOFTWARE.
- 9) INTRODUCTION TO FMS STRATEGIES AND IN-PROCESS CONTROL.
- 10) PROGRAMMING THE HERCULES ROBOT WITH A PLC 2/30.
- 11) INTERFACING THE AMERICAN ROBOT WITH A PLC 2/30.

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LEARNING ACTIVITIES

1.0 OVERVIEW OF CAD/CADD  
TERMINOLOGY & PRINCIPLES

- 1.1) DEFINE THE TERMS CAD & CADD.
- 1.2) DISCUSS CAD/CADD AT SAULT COLLEGE.
- 1.3) DISCUSS CAD/CADD APPLICATION.
- 1.4) DISTINGUISH THE ADVANTAGES AND DISADVANTAGES OF USING AUTOCAD.

2.0) OVERVIEW OF CAD/CADD  
WORKSTATION  
HARDWARE & SOFTWARE

- 2.1) DISCUSS THE SELECTION OF A CAD/CADD WORKSTATION.
- 2.2) UTILIZE THE CAD/CADD/CAE SURVEY.
- 2.3) DISCUSS THE CAD/CADD HARDWARE & SOFTWARE CHECKLIST.
- 2.4) DEFINE THE HARDWARE & SOFTWARE COMPONENTS OF CAD/CADD WORKSTATION.

REQUIRED RESOURCES

TEXT: AUTOCAD AND ITS  
APPLICATIONS  
CHAPTER #1

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3.0) INTRODUCTION TO AUTOCAD |  
MAIN MENU & COMMANDS |

UPON SUCCESSFUL COMPLETION OF |  
THIS UNIT, THE STUDENT WILL |  
ABLE TO: |

- 3.1) OUTLINE THE VARIOUS |
- AUTOCAD FEATURES |
- 3.2) DISCUSS THE AUTOCAD |
- COMMAND SUMMARY. |
- 3.3) DESCRIBE THE AUTOCAD |
- MENU STRUCTURE. |
- 3.4) UTILIZE AUTOCAD TO DRAW. |

TEXT:  
THE AUTOCAD TEXTBOOK  
CHAPTERS 16 THRU 35

4.0) INTRODUCTION TO AUTOLISP |

- 4.1) DISCUSS THE NATURE OF |
- LISP AND IT'S HISTORY. |
- 4.2) OUTLINE AUTOLISP INSIDE |
- AUTOCAD. |
- 4.3) DESCRIBE AUTOLISP |
- BUILDING BLOCKS. |
- 4.4) DEFINING AUTOLISP |
- FUNCTIONS. |

NOTES FROM:  
AUTOLISP CONCEPTS  
CHAPTERS 1 THRU 3  
TEXT:  
THE AUTOCAD TEXTBOOK  
CHAPTER 34

BLOCK 2 - ADVANCED PLC DEVELOPMENT

- 5.0) OVERVIEW OF PLC CLASSIFICATIONS & MANUFACTURES.
- 6.0) RECAP OF AB PLC FAMILY HARDWARE & SOFTWARE.

HARDWARE

- 6.1) INTRODUCTION TO PLC CONTROLLERS  
- HISTORY & DEFINITION
- 6.2) CLASSIFICATION OF PLC CONTROLLERS  
- MICROS, SMALL, MEDIUM, LARGE
- 6.3) I/O COMPONENTS
- 6.4) POWER SUPPLIES
- 6.5) PROGRAMMING DEVICES
- 6.6) DATA HIGHWAY & CONFIGURATION
- 6.7) ALLEN BRADLEY PLC-5/25 SYSTEM OVERVIEW

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6.0) RECAP OF AB PLC FAMILY HARDWARE & SOFTWARE.

SOFTWARE

6200 AB DEVELOPMENT SERIES

- 6.8) PROGRAM DESCRIPTION & OVERVIEW
  - 6.9) OFFLINE PROGRAMMING & DOCUMENTATION
  - 6.10) ONLINE PROGRAMMING & DOCUMENTATION
  - 6.11) PROGRAMMING FUNCTIONS
  - 6.12) DOCUMENTATION & REPORT
  - 6.13) UTILITIES - UP/DOWN LOADING PROGRAMS
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**REQUIRED STUDENT RESOURCES**  
( INCLUDING TEXTBOOKS & WORKBOOKS )

- 1) T. SHYMAKER/D.A. MADSEN AUTOCAD AND ITS APPLICATIONS  
GOODHEART-WILCOX 1990

**ADDITIONAL RESOURCE MATERIALS**

- 1) W.& D. KRAMER, AUTOLISP CONCEPTS  
AUSTIN, TEXAS, 78720, U.S.A. ARIEL COMMUNICATIONS 1989
- 2) D.RAKER & H.RICE, INSIDE AUTOCAD FIFTH EDITION  
THOUSAND OAKS, CA91360, U.S.A. NEW RIDERS 1989
- 3) TAYLOR LADDER LOGIC DEVELOPMENT SERIES FOR PLC.
- 4) AMATROL MANUALS - HERCULES ROBOT & WORKCELL
- 5) AMERICAN ROBOT MANUALS

METHOD(S) OF EVALUATION

THE FINAL GRADE OF THIS COURSE WILL BE DIVIDED BETWEEN THE AUTOCAD UNIT (35%), AND THE ADVANCED PLC UNIT (35%). AND THE ROBOT PROGRAMMING UNIT (30%).

THE FINAL GRADE FOR COURSE WILL BE DERIVED FROM THE RESULTS OF TEACHER ASSIGNED TESTS, AND ASSIGNMENTS PLUS PROJECTS:

TESTS	50%
ASSIGNMENTS & PROJECTS	50%
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TOTAL	100%

THE GRADING SYSTEM USED WILL BE AS FOLLOWS:

A+	>= 90%	CONSISTENTLY OUTSTANDING ACHIEVEMENT
A	80-89%	EXCELLENT ACHIEVEMENT
B	70-79%	ABOVE AVERAGE ACHIEVEMENT
C	55-69%	SATISFACTORY ACHIEVEMENT
R		REPEAT
X		INCOMPLETE

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GENERAL INFORMATION

TIMETABLE

<u>DAY</u>	<u>TIME</u>	<u>PLACE</u>	<u>ACTIVITY</u>
TUESDAY	1:30- 3:30	B1040	LAB ( PLC & ROBOTS)
WEDNESDAY	12:30-2:30	B1153	LAB ( AUTOCAD )
THURSDAY	9:30-10:30	P7	LECTURE
FRIDAY	10:30-11:30	J1180	LECTURE

EVALUATION

<u>ACTIVITY</u>	<u>DAY</u>	<u>TIME</u>	<u>PLACE</u>	<u>%</u>
TEST #1 (BLOCK #1 MATERIAL)	OCT. 13/92 (TUESDAY)	1:30- 3:30	B1040	20
ASSIGNMENT #1 (BLOCK #1 MATERIAL)	OCT. 17/92 (FRIDAY)	10:30-11:30	J1180	14
TEST #2 (BLOCK #2 MATERIAL)	NOV. 17/92 (TUESDAY)	1:30- 3:30	B1040	20
ASSIGNMENT #2 (BLOCK #2 MATERIAL)	NOV. 21/92 (FRIDAY)	10:30-11:30	J1180	13
TEST #3 (BLOCK #3 MATERIAL)	DEC. 15/92 (TUESDAY)	1:30- 3:30	B1040	20
ASSIGNMENT #3 (BLOCK #3 MATERIAL)	DEC. 22/92 (TUESDAY)	1:30- 3:30	B1040	13