Reedley College

CREDIT COURSE OUTLINE

I. COVER PAGE

(1) MFGT 93 | (2) Programmable Logic Controllers (PLC's) | (3) 2
Number | Title | Units

(4) Lecture / Lab Hours:				(8)Classification:			
	Course Hours						
		Weekly Lec hours:	1.50			Degree applicable:	X
		Weekly Lab hours:	1.50			Non-degree applicable:	
		Total Contact hours:	54.00			Basic skills:	

Lec will generate __ hour(s) outside work.
Lab will generate __ hour(s) outside work.

(5) Grading Basis:	Grading Scale Only	
	Pass/No Pass option	X
	Pass/No Pass only	

(6) Advisories:

(7) Pre-requisites (requires C grade or better):
   • Mfgt 92
Corequisites:
   •

(9)RC	Fulfills AS/AA degree requirement: (area)	
	General education category:	
	Major:	
	Certificate of:	
	Certificate in:	

(10)CSU	Baccalaureate:	X

(11)Repeatable: (A course may be repeated three times) | 0

(12)C-ID:

Proposed Start Date: | Fall 2012

(12) Catalog Description:
Study of basic Programmable Logic Controllers (PLC's). Methods of installing, configuring, programming, wiring, operating, and troubleshooting basic PLC's.

II. COURSE OUTCOMES:

(Specify the learning skills the student demonstrates through completing the course and link critical thinking skills to specific course content and objectives.)

Upon completion of this course, students will be able to:
   I. Identify PLC components for use within a manufacturing environment.
   II. Design control logic for use on a PLC.
   III. Program, download, and operate a PLC.

III. COURSE OBJECTIVES:

(Specify major objectives in terms of the observable knowledge and/or skills to be attained.)

In the process of completing this course, students will:
   I. Identify components of a typical PLC such as power supplies, CPU, IO, and communication modules.
   II. Design motor control and process control circuits.
   III. Program, operate, and troubleshoot motor control and process control logic.

IV. COURSE OUTLINE:

Lecture Content:

1. Introduction to Programmable Logic Controllers
   a. Defined
   b. Typical uses
   c. Anatomy
   d. Components
      i. Power supply
      ii. CPU
      iii. I/O
      iv. Communication
   e. Modes of operation

2. Programming Software
   a. IEC Languages

i. Ladder Logic
                ii. Function Block Diagram
                iii. Sequential Function Chart
                iv. Structured Text
                v. Instruction List
        b. Ladder Logic
                i. Control Logic
                ii. Discrete functions
                iii. Numeric functions
        c. Process of Programming
                i. Program
                ii. Download
                iii. Run
                iv. Troubleshoot
        d. Data Types
                i. bits and bytes
                ii. Boolean
                iii. Integer
                iv. Real

3. Ladder Logic Control
        a. Various control circuits
        b. Relay replacement
        c. Motor start/stop
        d. VFD Control

Lab Content:

1. Identification of PLC components
2. Communication with PLC
3. Download simple PLC program
4. PLC Operational modes
5. Motor start/stop
6. VFD Control
7. Programming data types

V. APPROPRIATE READINGS

Reading assignments may include but are not limited to the following:

    I. Sample Text Title:
        1. Recommended - Rockis, G.J., Mazur, G.A. *Electrical Motor Controls for Integrated Systems,* ed. 5th American Technical Publishers, 2012,

    II. Other Readings

    ___ Global or international materials or concepts are appropriately included in this course
    ___ Multicultural materials and concepts are appropriately included in this course

If either line is checked, write a paragraph indicating specifically how global/international and/or multicultural materials and concepts relate to content outline and/or readings.

VI. METHODS TO MEASURE STUDENT ACHIEVEMENT AND DETERMINE GRADES:

Students in this course will be graded in at least one of the following four categories. Please check those appropriate. A degree applicable course must have a minimum of one response in category A, B, or C.

A. Writing		
Check either 1 or 2 below		
	1. Substantial writing assignments are required. Check the appropriate boxes below and provide a written description in the space provided.	
X	*2. Substantial writing assignments are NOT required. If this box is checked leave this section blank. For degree applicable courses you must complete category B and/or C.*	
	a) essay exam(s)	d) written homework
	b) term or other paper(s)	e) reading reports
	c) laboratory report(s)	f) other (specify)

Required assignments may include but are not limited to the following:

B. Problem Solving
Computational or non-computational problem-solving demonstrations, including:

X	a) exam(s)	X	d) laboratory reports
X	b) quizzes		e) field work
X	c) homework problems		f) other (specify):

Required assignments may include but are not limited to the following:
Troubleshoot: The PLC is in "Run" mode, you have verified inputs are correct, but the expected output is not on. What is your next step in order to troubleshoot this problem.
Answer: Verify logic is correct, verify output is wired correctly.

C. Skill demonstrations, including:			
X	a) class performance(s)	X	c) performance exams(s)
	b) field work		d) other (specify)

Required assignments may include but are not limited to the following:
Demonstrate how to establilsh communication between the PLC and PC, then download the sample program.

D. Objective examinations including:			
X	a) multiple choice	X	d) completion
X	b) true/false		e) other (specify):
X	c) matching items		

COURSE GRADE DETERMINATION:
Description/explanation: Based on the categories checked in A-D, it is the recommendation of the department that the instructor's grading methods fall within the following departmental guidelines; however, the final method of grading is still at the discretion of the individual instructor. The instructor's syllabus must reflect the criteria by which the student's grade has been determined. (A minimum of five (5) grades must be recorded on the final roster.)

If several methods to measure student achievement are used, indicate here the approximate weight or percentage each has in determining student final grades.
Home Work 25% Lab work 25% Quizzes 25% Final 25%
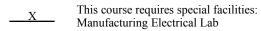
VII. EDUCATIONAL MATERIALS

For degree applicable courses, the adopted texts, as listed in the college bookstore, or instructor-prepared materials have been certified to contain college-level materials.

Validation Language Level (check where applicable):

College-Level Criteria Met

	YES	NO
Textbook	X	
Reference materials	X	
Instructor-prepared materials	X	
Audio-visual materials	X	

Indicate Method of evaluation:

Used readability formulae (grade level 10 or higher)	
Text is used in a college-level course	X
Used grading provided by publisher	
Other: (please explain; relate to Skills Levels)	

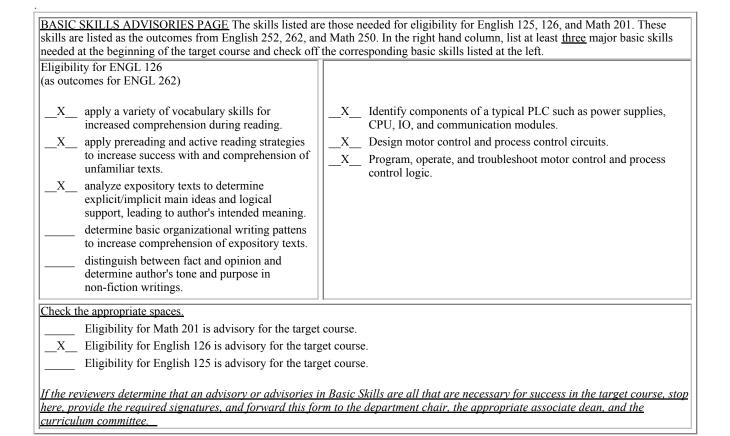|	YES	NO
Computation Level (Eligible for MATH 101 level or higher where applicable)	X	
Content		
Breadth of ideas covered clearly meets college-level learning objectives of this course	X	
Presentation of content and/or exercises/projects:		
Requires a variety of problem-solving strategies including inductive and deductive reasoning.	X	
Requires independent thought and study	X	
Applies transferring knowledge and skills appropriately and efficiently to new situations or problems.	X	

List of Reading/Educational Materials
Recommended - Rockis, G.J., Mazur, G.A. *Electrical Motor Controls for Integrated Systems,* ed. 5th American Technical Publishers, 2012,

Comments:

_____ This course requires special or additional library materials (list attached).

___X___   This course requires special facilities:
Manufacturing Electrical Lab

Attached Files:
[MFGT 93 Prereq Justification](#)
[MFGT 93 Objectives Corrections](#)
[Manufacturing Pathways](#)

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BASIC SKILLS ADVISORIES PAGE The skills listed are those needed for eligibility for English 125, 126, and Math 201. These skills are listed as the outcomes from English 252, 262, and Math 250. In the right hand column, list at least <u>three</u> major basic skills needed at the beginning of the target course and check off the corresponding basic skills listed at the left.

Eligibility for ENGL 126 (as outcomes for ENGL 262)	
__X__ apply a variety of vocabulary skills for increased comprehension during reading.	__X__ Identify components of a typical PLC such as power supplies, CPU, IO, and communication modules.
__X__ apply prereading and active reading strategies to increase success with and comprehension of unfamiliar texts.	__X__ Design motor control and process control circuits.
__X__ analyze expository texts to determine explicit/implicit main ideas and logical support, leading to author's intended meaning.	__X__ Program, operate, and troubleshoot motor control and process control logic.
_____ determine basic organizational writing pattens to increase comprehension of expository texts.	
_____ distinguish between fact and opinion and determine author's tone and purpose in non-fiction writings.	

Check the appropriate spaces.

_____ Eligibility for Math 201 is advisory for the target course.

__X__ Eligibility for English 126 is advisory for the target course.

_____ Eligibility for English 125 is advisory for the target course.

If the reviewers determine that an advisory or advisories in Basic Skills are all that are necessary for success in the target course, stop here, provide the required signatures, and forward this form to the department chair, the appropriate associate dean, and the curriculum committee.

REQUISITES

Corequisite -- MFGT 92 Motor Controls 2

• Identify intermediate and advanced motor and control systems within a manufacturing environment. • Design and diagram the integration of motor and control system components. • Organize and assemble motor and control system components into working control systems.	• Identify components of a typical PLC such as power supplies, CPU, IO, and communication modules. • Design motor control and process control circuits. • Program, operate, and troubleshoot motor control and process control logic.

ESTABLISHING PREREQUISITES OR COREQUISITES

Every prerequisite or corequisite requires content review plus justification of at least one of the seven kinds below. Prerequisite courses in communication and math outside of their disciplines require justification through statistical evidence. Kinds of justification that may establish a prerequisite are listed below.

Check one of the following that apply. Documentation may be attached.

_____Significant statistical evidence indicates that the absence of the prerequisite course is related to unsatisfactory performance in the target course.
Justification: Indicate how this is so.
_____The health or safety of the students in this course requires the prerequisite.
Justification: Indicate how this is so.
__X__The prerequisite course is part of a sequence of courses within or across a discipline.
_____The prerequisite is required in order for the course to be accepted for transfer to the UC or CSU systems.
Justification: Indicate how this is so.
_____The prerequisite/corequisite is required by law or government regulations.
Explain or cite regulation numbers:
_____The safety or equipment operation skills learned in the prerequisite course are required for the successful or safe completion of this course.

Justification: Indicate how this is so.
_____The safety or equipment operation skills learned in the prerequisite course are required for the successful or safe completion of this course.
Justification: Indicate how this is so.
_____Three CSU/UC campuses require an equivalent prerequisite or corequisite for a course equivalent to the target course:

Justification:

JUSTIFICATION OF LIMITATION ON ENROLLMENT

Enrollment in courses or blocks of courses may be limited based on performance, honors, or other performance based criteria. Be mindful of the disproportionate impact the limitation will have on specific groups of students. It is important to determine if the limitation will disproportionately keep under-represented students from enrolling in the course or block of courses.

Describe the reasons for limiting the enrollment.

Course Designator: MFGT 93

Course Title(s): Programmable Logic Controllers (PLC's)

Rationale for Limiting Enrollment:
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