Heartland Community College
Master Course Syllabus

Division Name: **CTE**
Course Prefix and Number: **MAIN 222**
Course Title: **Programmable Controllers**

DATE PREPARED: **August 24, 1994**
DATE REVIEWED: **November 2019**
DATE REVISED: **November 2019**

PCS/CIP/ID NO: **12-470303**
IAI NO. (if available):
EFFECTIVE DATE OF FIRST CLASS: **Spring 2020**

CREDIT HOURS: **3**
      CONTACT HOURS: **4**
      LECTURE HOURS: **2**
      LABORATORY HOURS: **2**

PREREQUISITE:
Completion of MAIN 101

CATALOG DESCRIPTION:
Programmable Controllers covers the application and programming of programmable logic controllers (PLCs), programmable automated controllers (PACs), and/or building control systems. You will learn about theory and operation of controllers, along with logic program development and implementation.

TEXTBOOK:
Instructors for this class should use the following textbooks/online resources or comparable text/online resource that addresses at a minimum the topics listed in the Course Outline and that provides students with the opportunity to achieve the learning outcomes for this course:

Amatrol Learning Content (available via activation codes)

Dunning, Gary. (2006). *Introduction to Programmable Logic Controllers, 3rd Ed*. Clifton Park, New York: Delmar.

RELATIONSHIP TO ACADEMIC DEVELOPMENT PROGRAMS AND TRANSFERABILITY:
MAIN 222 was designed to meet the specific needs of an Associate of Applied Science degree and not necessarily as a transfer course, particularly in relation to the Illinois Articulation Initiative. This course may transfer to various institutions in a variety of ways. Please see an academic advisor for an explanation concerning transfer options.

LEARNING OUTCOMES:

Course Outcomes	Essential Competencies	Range of Assessment Methods
1. Identify basic ladder logic components	PS/CT	Exams/Quizzes Assignments
2. Physically demonstrate proper safety while operating industrial and building controllers	T	Labs
3. Describe the operation of a non-retentive contact	C	Assignments/Exams
4. Identify sinking and sourcing inputs and outputs wired to a controller	PS/CT	Assignments Labs
5. Construct a ladder diagram and correctly predict order of operation	PS/CT	Assignments Labs
6. Program a programmable logic controller, programmable automated controller, and/or a building controller to complete a process by reading schematics and technical documentation	T	Labs
7. Research and apply, along with reflect and share, in written form, information about industrial technology as it relates to the student's field of study	C	Assignments Final Project

ESSENTIAL COMPETENCIES:
Communication (C) - Students communicate effectively.
Problem Solving/Critical Thinking (PS/CT) - Students think critically to solve problems or explore issues.
Technology (T) - Students appropriately utilize technology..

PROGRAM OUTCOME(S):
- Apply knowledge of controllers and control systems for effective system management. (MAIN 222)
- Develop specialized technical skills in one or more areas (Design & Fabrication, Construction, Electronics, Renewable Energy, Facilities Maintenance, Industrial Maintenance, and/or Welding).

COURSE/LAB OUTLINE:
1. Control system theories
2. Input and output devices
3. Ladder logic programs
4. Sequential control problems
5. Time driven control problems
6. Event driven control problems
7. Control relay functions
8. Understand controller selection considerations

METHOD OF EVALUATION (Tests/Exams, Grading System):

Assessment Method	% of Final Grade
Exams/Quizzes	20-40%
Labs	20-40%
Assignments (may include a Final Project)	20-40%
TOTAL	100%

Course grades will be determined by the use of the following grading scale:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	Below 60%

REQUIRED WRITING AND READING:
Documentation is an important part of this course. All labs are to include descriptive comments within the write-up/answer section relating to each lab. Students will be expected to read assigned selections from the textbook and or labs, articles or other course related materials, at a minimum of 25 pages per week. Estimate is based on a 16-week course schedule. Please note if your class is not a 16-week class your weekly reading assignment will be increased. There is no formal research or writing assignments in this course. However, discipline specific writing and documentation is an important part of these courses, therefore discipline appropriate writing/reading methods will be taught and used in this course.

SAMPLE COURSE CALENDAR:
This sample course calendar is provided to guide instructors; each instructor will modify to suit.

Module #	Module Topic(s)
MODULE #00	Course Orientation
MODULE #01	Introduction to Programmable Controllers
MODULE #02	Basic PanelView Plus Terminal Operation PLC Program Operations
MODULE #03	PLC Programming PLC Motor Control
MODULE #04	PLC Timer and Counter Instructions Event Sequencing
MODULE #05	Program Control Instructions Math and Data Move Instructions
MODULE #06	Exam #1
MODULE #07	PanelView Plus Application Editing PanelView Plus Application Editing 2
MODULE #08	Analog Inputs Analog Outputs
MODULE #09	Variable Output Applications
MODULE #10	Exam #2
MODULE #11	Introduction to PLC Troubleshooting
MODULE #12	PLC Systems Troubleshooting
MODULE #13	Analog Input/Output Troubleshooting
MODULE #14	Analog Application Troubleshooting
MODULE #15	Course Wrap Up Exam #3