



MASTER COURSE OUTLINE

A. ARET 2101 Advanced Automation Controls

B. COURSE DESCRIPTION:

This course is designed for those students in the fields of Mechatronics and Packaging. Students will work with modern automation control devices to explore how various motors are used to control position and timing on industrial machinery. Students will work on multiple labs designed to develop their knowledge of these devices and components. Industrial networking, Programmable Logic Controllers, Process Control and PID (Proportional-Integral-Derivative) Controls will also be examined. An examination of various motor drives will occur during this course. Alternating current (AC) and direct current (DC) electric motors are commonly applied in multiple industrial operations including packaging equipment, machine tools, and processing equipment. The control of speed, torque and other parameters is growing in use, resulting in more complex motor drive systems. Technicians need to be proficient in the use of these technologies when they enter the workforce. Prerequisite: ARET 1155
(3 Cr – 2 lect, 1 lab)

C. Core Theme: Critical Thinking

D. RIVERLAND INSTITUTIONAL LEARNING OUTCOMES:

This course addresses the following Riverland Institutional Learning Outcome(s):

- ILO 1: critical thinking (*Core Theme Goal 2*)
- ILO 2: awareness of the larger global community (*Core Theme Goal 7 or 8*)
- ILO 3: ethical, engaged citizenship (*Core Theme Goal 9 or Goal 10*)
- ILO 4: communication and collaboration (*Discipline Goal 1 and by any learning outcome(s) involving communication or collaboration*)

E. MAJOR CONTENT AREAS:

- Construct variable frequency drive (VFD) circuits
- Construct servo motor circuits
- Construct stepper motor circuits
- Analyze electric linear actuators
- Integrate motor controls with a programmable logic controller (PLC)
- Explain proportional-integral-derivative (PID) control
- Differentiate AC and DC motor drives
- Compare how various motors are used for position control
- Appraise motion control components

F. GOAL TYPE, OBJECTIVES, AND OUTCOMES:

<u>GOAL TYPE</u>	<u>OBJECTIVES</u> Students will be able to	<u>OUTCOMES</u> The student will successfully
<u>**Critical Thinking</u>	gather factual information and apply it to a given problem in a manner that is relevant, clear, comprehensive, and conscious of possible bias in the information selected.	<ol style="list-style-type: none"> critique differences between AC and DC motor drives. critique how various motors are used for position control.
<u>CS</u>	define motion control components.	<ol style="list-style-type: none"> integrate motor controls with programmable logic controller (PLC).
<u>CS</u>	examine various motor drives.	<ol style="list-style-type: none"> analyze electric linear actuators.
<u>CS</u>	recognize various motor circuits.	<ol style="list-style-type: none"> articulate the difference between variable frequency drive, servo motor, and stepper motor circuits.

G. SPECIAL INFORMATION:

This course may require use of the Internet, the submission of electronically prepared documents and the use of a course management software program. Students who have a disability and need accommodations should contact Accessibility Services at the beginning of the semester. This information will be made available in alternative format, such as Braille, large print, or current media, upon request.

H. COURSE CODING INFORMATION: Course Code S/Class Maximum 24; Letter Grade

Revision date:

AASC Approval date: 02/15/22

*Riverland Community College Disciplines	MnTC Goal Number
Communication (CM)	1
Natural Sciences (NS)	3
Mathematics/Logical Reasoning (MA)	4
History and the Social & Behavioral Sciences (SS)	5
Humanities and Fine Arts (HU)	6

**Riverland Community College Core Themes	MnTC Goal Number
Critical Thinking (CT)	2
Human Diversity (HD)	7
Global Perspective (GP)	8
Ethical and Civic Responsibility (EC)	9
People and the Environment (PE)	10

*These five MnTC Goals have been identified as Riverland Community College Disciplines.

** These five MnTC Goals have been identified as Riverland Community College Core Themes.

NOTE: The Minnesota Transfer Curriculum “10 Goal Areas of Emphasis” are reflected in the five required discipline areas and five core themes noted in the Riverland Community College program of study guide and/or college catalog.

Riverland