

**Course Outline**

**COURSE:** WTRM 203 DIVISION: 50                      ALSO LISTED AS: WTRM 103  
**TERM EFFECTIVE:** Fall 2019                      **CURRICULUM APPROVAL DATE:** 11/13/2018

**SHORT TITLE:** ELECTRICAL AND INSTRUMENTATION

**LONG TITLE:** Introduction to Electrical and Instrumentation Processes

Units	Number of Weeks		Contact Hours/Week		Total Contact Hours
3	18	Lecture:	3	Lecture:	54
		Lab:	0	Lab:	0
		Other:	0	Other:	0
		Total:	3	Total:	54

**COURSE DESCRIPTION:**

Introduction to basic electrical theory, applications, common uses and real world examples of control systems and instrumentation used in water distribution, water, and wastewater treatment plants including switches, relays, alarms, motors, instrumentation, valve actuators, computers and communications. This course was previously listed as WTRM 103. **ADVISORY:** WTRM 201 Introduction to Water-Wastewater Technology; WTRM 202 Beginning Water-Wastewater Mathematics.

**PREREQUISITES:**

**COREQUISITES:**

**CREDIT STATUS:** D - Credit - Degree Applicable

**GRADING MODES**

L - Standard Letter Grade

**REPEATABILITY:** N - Course may not be repeated

**SCHEDULE TYPES:**

02 - Lecture and/or discussion

05 - Hybrid

72 - Dist. Ed Internet Delayed

**STUDENT LEARNING OUTCOMES:**

1. Explain basic electrical theory and components.

Measure of assessment: Exams, Homework

Year assessed, or planned year of assessment: 2017

Semester: Spring

2. Define basic electrical and instrumentation processes as it relates to the water and wastewater industry.

Measure of assessment: Exams, Homework

Year assessed, or planned year of assessment: 2017

## **CONTENT, STUDENT PERFORMANCE OBJECTIVES, OUT-OF-CLASS ASSIGNMENTS**

Curriculum Approval Date: 11/13/208

12 Hours

Content: Basic Electrical Theory and Components - resistors, capacitors, and inductors.

Student Performance Objectives: Demonstrate basic skills with VOM meters, OHM's law, etc. as they relate to circuit analysis and DC electricity including series circuits, parallel circuits, and passive devices (capacitors, inductors, and resistors).

12 Hours

Content: AC Electricity. Mid-term Exam.

Student Performance Objectives: Describe AC theory and evaluate AC electrical impact on passive devices and active devices. Outline the basic components of AC electricity.

3 Hours

Content: Pressure Theory.

Student Performance Objectives: Describe the importance of pressure instrumentation and theory as it applies to a water/wastewater utility. Explain the concept of pressure as it relates to electrical and instrumentation processes in the water industry.

3 Hours

Content: Level Theory.

Student Performance Objectives: Discuss level instrumentation and theory as it applies to a water/wastewater utility. Describe the concept of level as it relates to electrical and instrumentation processes in the water industry.

3 Hours

Content: Flow Theory.

Student Performance Objectives: Describe the importance of flow instrumentation and theory as it applies to a water/wastewater utility. Explain the concept of flow as it relates to electrical and instrumentation processes in the water industry.

3 Hours

Content: Temperature and Heat, PH and Viscosity.

Student Performance Objectives: Discuss temperature, and PH instrumentation and theory as it applies to a water/wastewater utility. Outline the concepts of temperature and heat as they relates to electrical and instrumentation processes in the water industry.

3 Hours

Content: Actuators and Controllers.

Student Performance Objectives: Describe the type of devices and controllers commonly used in a water/wastewater environment. Explain the concept of actuators and controllers as they relate to electrical and instrumentation processes in the water industry.

3 Hours

Content: Process Control, Calibration Practices, Including PID , Zero and Span.

Student Performance Objectives: Describe the calibration process for instruments and actuators used to control water flow and distribution. Explain the concepts of process control, calibration practices, including PID, zero, and span, as it relates to electrical and instrumentation processes in the water industry.

6 Hours

Content: Introduction to Programmable Logic Controllers.

Student Performance Objectives: Demonstrate proficiency with PLC programming techniques. Describe the roles of programmable logic controllers as they relate to electrical and instrumentation processes in the water industry.

3 Hours

Content: Supervisory Systems and Data Acquisition (SCADA).

Student Performance Objectives: Describe the use of SCADA systems and applications in the water/wastewater utilities. Describe the role of Supervisory Systems and Data Acquisition (SCADA) in the water industry.

2 Hours

#### **METHODS OF INSTRUCTION:**

Lecture, Discussion, Multi-media

#### **OUT OF CLASS ASSIGNMENTS:**

Required Outside Hours: 24

Assignment Description: Out-of-Class Assignments: Read Chapter 2 Dunn Book. Complete homework assignments for DC electrical theory.

Required Outside Hours: 24

Assignment Description: Out-of-Class Assignments: Read Chapter 3 of Dunn Book. Complete homework assignments for AC theory. Study for midterm.

Required Outside Hours: 6

Assignment Description: Out-of-Class Assignments: Read Chapter 5 of Dunn Book. Answer study guide questions if provided.

Required Outside Hours: 6

Assignment Description: Out-of-Class Assignments: Read Chapter 6 of Dunn Book. Answer study guide questions if provided.

Required Outside Hours: 6

Assignment Description: Out-of-Class Assignments: Read Chapter 7 of Dunn Book. Answer study guide questions if provided.

Required Outside Hours: 6

Assignment Description: Out-of-Class Assignments: Read Chapters 8, 9 of Dunn Book. Answer study guide questions if provided.

Required Outside Hours: 6

Assignment Description: Out-of-Class Assignments: Read Chapter 3 of Dunn Book. Answer study guide questions if provided.

Required Outside Hours: 6

Assignment Description: Out-of-Class Assignments: Read Chapter 14 of Dunn Book. Answer study guide questions if provided.

Required Outside Hours: 12

Assignment Description: Out-of-Class Assignments: Read Chapters 1, 2, 3 of Bolton Book. Answer study guide questions if provided. Study for final.

Required Outside Hours: 6

Assignment Description: Out-of-Class Assignments: Read Chapter 4 of Bolton Book. Answer study guide questions if provided. Study for final.

#### **METHODS OF EVALUATION:**

Writing assignments

Percent of total grade: 0.00 %

Course primarily involves skill demonstration or problem solving

Problem-solving assignments

Percent of total grade: 40.00 %

Percent range of total grade: 30% to 50% Homework Problems, Quizzes, Exams

Objective examinations

Percent of total grade: 50.00 %

Percent range of total grade: 40% to 60% Multiple Choice, Other: Math - Show Work

Other methods of evaluation

Percent of total grade: 10.00 %

**REPRESENTATIVE TEXTBOOKS:**

Required Representative Textbooks

William Dunn. Fundamentals of Industrial Instrumentation and Process Control, or other appropriate college level text.. New York: McGraw-Hill Books,2016.

Reading Level of Text, Grade: 11th Verified by: Dana Young

**ARTICULATION and CERTIFICATE INFORMATION**

Associate Degree:

CSU GE:

IGETC:

CSU TRANSFER:

Not Transferable

UC TRANSFER:

Not Transferable

**SUPPLEMENTAL DATA:**

Basic Skills: N

Classification: Y

Noncredit Category: Y

Cooperative Education:

Program Status: 1 Program Applicable

Special Class Status: N

CAN:

CAN Sequence:

CSU Crosswalk Course Department:

CSU Crosswalk Course Number:

Prior to College Level: Y

Non Credit Enhanced Funding: N

Funding Agency Code: Y

In-Service: N

Occupational Course: C

Maximum Hours: 3

Minimum Hours: 3

Course Control Number: CCC000588724

Sports/Physical Education Course: N

Taxonomy of Program: 095800