



Electrical and Renewable Energy Engineering Program

Course Specification - (2025-2026)

Industrial Control and SCADA Systems – ERE475

Academic Year	2025/2026	Semester	Fall
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1. Basic Information

Course Title (according to the bylaw)	Industrial Control and SCADA Systems				
Course Code (according to the bylaw)	ERE475				
Prerequisite:	Automatic Control Systems - ERE324				
Department/s participating in delivery of the course	Electrical and Renewable Energy Engineering				
Number of credit hours/points of the course (according to the bylaw)	Credit Hours	Contact Hours			
		Lecture	Tutorial	Practical	Total
	3	2	2	1	5
Course Type	Elective - Minor Requirements of Electrical and Renewable Energy Engineering				
Academic level at which the course is taught	Fifth Level				
Academic Program	Bachelor of Engineering of Electrical and Renewable Energy				
Faculty/Institute	Faculty of Engineering				
University/Academy	Nahda University				
Name of Course Coordinator	Prof. Dr. Eng. Mohamed Ahmed Ebrahim				
Course Specification Approval:	Department council		Faculty council		
Date of Approval of the course Specification:	13 / 9 / 2025		16 / 9 / 2025		



2. Course Overview

Introduction to industrial control, Detecting sensors and actuating elements, Relay logic and their applications, Introduction to programmable logic controllers (PLCs) and their types, Construction and hardware configuration and descriptions of PLCs, Programming and testing basic as well as advanced functions, Industrial applications using PLC, Introduction to SCADA, General types of SCADA, Application of SCADA software, Different packages available with I/O structure, Features of SCADA software, Creating a new SCADA application, Creating Database of Tags, Creating and Editing graphic display with animation, Data Entry / Start Stop command, Analog entry.

3. Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	Text	Code	Text
A1	Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.	CLO6	Develop and test basic as well as advanced PLC functions to solve complex engineering problems using any software packages.
D1	Model, analyze and design physical systems applicable to the specific discipline by applying the concepts of: Thermodynamics, Heat Transfer, Fluid Mechanics, solid Mechanics, Material Processing, Material Properties, Measurements, Instrumentation, Control Theory and Systems, Mechanical Design and Analysis, Dynamics and Vibrations	CLO3	Analyze performance of different types of PLC and SCADA systems.
D2	Identify, analyze and evaluate the energy's conversion processes and management techniques.	CLO1	Recognize industrial control, detecting sensors and actuating elements, relay logic and their applications, programmable logic controllers (PLCs) and their types, construction and hardware configuration and descriptions of PLCs, programming and testing



Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	Text	Code	Text
			basic as well as advanced functions, industrial applications using PLC, SCADA, general types of SCADA, application of SCADA software, different packages available with I/O structure, features of SCADA software, creating a new SCADA application, creating database of tags, creating and editing graphic display with animation, data entry / start stop command, analog entry.
D3	Model, analyze, design, implement, test and operate renewable energy systems such as solar photovoltaics, solar thermal, wind, biomass and waste, hydro-tidal and wave, and other renewable energy applications.	CLO4	Design basic industrial PLC applications.
		CLO5	Design advanced industrial PLC applications.
		CLO2	Perform calibration and testing of both PLC as well as SCADA systems and maintaining major components of PLC and SCADA systems.

4. Teaching and Learning Methods

1. Interactive Lectures
2. Self-Learning
3. Experimental Learning
4. Project Course
5. Hybrid Education
6. Field Visits
7. Report and Research
8. Discussion



Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours				
			Lecture Hours	Tutorial Hours	Practical Hours	Self-learning (Assignments/ Project)	Other
1	Introduction to industrial control, Detecting sensors and actuating elements	7	2	2	1	2	-
2	Introduction to industrial control, Detecting sensors and actuating elements	7	2	2	1	2	-
3	Relay logic and their applications, Introduction to programmable logic controllers (PLCs) and their types, Construction and hardware configuration and descriptions of PLCs	7	2	2	1	2	-
4	Relay logic and their applications, Introduction to programmable logic controllers (PLCs) and their types, Construction and hardware configuration and descriptions of PLCs	7	2	2	1	2	-
5	Programming and testing basic as well as advanced functions	9	2	2	1	2	Quiz 1 (2 Hr)
6	Programming and testing basic as well as advanced functions, Industrial applications using PLC	7	2	2	1	2	-
7	Mid Term Exam						
8	Programming and testing basic as well as advanced functions, Industrial applications using PLC	7	2	2	1	2	-
9	Introduction to SCADA, General types of SCADA, Application of SCADA software	7	2	2	1	2	-
10	Introduction to SCADA, General types of SCADA, Application of SCADA software	9	2	2	1	2	Quiz 2 (2 Hr)
11	Different packages available with I/O structure, Features of SCADA software	7	2	2	1	2	-
12	Creating a new SCADA application, Creating Database of Tags	7	2	2	1	2	-



13	Creating and editing graphic display with animation, Data Entry / Start Stop command, Analog entry, Simulation of PLC industrial project using SIEMENS software Package and Practical implementation of PLC	7	2	2	1	2	
14	Creating and editing graphic display with animation, Data Entry / Start Stop command, Analog entry, Simulation of PLC industrial project using SIEMENS software Package and Practical implementation of PLC	7	2	2	1	2	-
15	Revision	7	2	2	1	2	-
16	Final Exam						

5. Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Mid-term written Exam	7	20	20 %
2	Final Written Exam	16	40	40 %
3	Assignments	6	15	15 %
4	Quizzes	5, 10	15	15 %
5	Final Practical Exam	15	10	10%

6. Learning Resources and Supportive Facilities

Learning resources (books, scientific references, etc.) *	The main (essential) reference for the course (must be written in full according to the scientific documentation method)	1) Rahman, M.A., Alam, S.B., Gupta, K.D., George, R., Siddique, S. and Kobayashi, K., 2026. Securing Industrial Control Systems: Advanced Strategies and Technologies. 2) Ashraf Said AlMadhoun, "PLC SCADA for Beginners", Apress Berkeley, CA, 2025. 3) Akande, O., 2023. Industrial Automation from Scratch: A hands-on guide to using sensors, actuators, PLCs, HMIs, and SCADA to automate industrial processes. Packt Publishing Ltd.
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	Other References	1) Pal, V.C., Tripathi, S.L. and Ganguli, S. eds., 2024. Industrial Control Systems. John Wiley & Sons. 1) Massimo Nardone, "Industrial Control System (ICS) and Operational Technology (OT) Security", Apress Berkeley, CA, 2025
Supportive facilities & equipment for teaching and learning	Devices/Instruments	Data Show
	Supplies	White Board
	Electronic Programs	SIEMENS software Package
	Skill Labs/ Simulators	–
	Virtual Labs	–
	Other	Lecture Hall and Laboratory Usage

Prof. Dr. Eng. Mohamed Ahmed Ebrahim
Course Coordinator

Dr. Mohamed Kourany Saad
Program Coordinator