



Electrical and Renewable Energy Engineering Program

Course Specification - (2025-2026)

Digital Control – ERE271

Academic Year	2025/2026	Semester	Fall
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1. Basic Information

Course Title (according to the bylaw)	Digital Control				
Course Code (according to the bylaw)	ERE271				
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	0	4
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

This course deals with Review of continuous control. Introduction to digital control theories and systems. The approach of discrete systems analysis: linear difference equations models, the discrete transfer function, discrete models of sampling-based data, signal analysis and dynamic response, frequency response, the approach of the z, transform.

Transform techniques and state, space methods used in design control systems. Sample rate selection: the sampling theorem's limit, time response and smoothness, errors analysis.

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
A3	Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the Electrical and Renewable Energy Engineering Program and within the principles and contexts of sustainable design and development.	CLO1	Explain basic principles, components of digital control systems, and application of digital control systems in computer engineering and control.
B4	Design and implement: elements, modules, sub-systems or systems in electrical / electronic / digital engineering using technological and professional tools..	CLO2	Analyze the digital systems and the other components of the digital control products by using the digital control system design methods.
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	CLO3	Apply the digital control system hardware & software-based information technology tools to measure, evaluate and solve the computer and control systems performance and problems.



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
		CLO4	Design the digital controllers and the others components of the digital control systems by using the digital control system design methods.
D4	Select, analyze and control appropriate driving systems for different energy applications;.	CLO5	Work productively as an individual and as a member of a team / multi-disciplinary team

4. Teaching and Learning Methods

1. Interactive Lectures
2. Self-learning
3. Case study
4. Report and Research
5. Tutorials.

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	7	2	2	0	3	-
2	Review of continuous control.	7	2	2	0	3	-
3	Introduction to digital control theories and systems.	7	2	2	0	3	-
4	The approach of discrete systems analysis	7	2	2	0	3	-
5	linear difference equations models	9	2	2	0	3	Quiz 1 (2 Hr)
6	the discrete transfer function	7	2	2	0	3	-
7	Discrete models of sampling-based data	7	2	2	0	3	
8	The approach of discrete systems analysis: signal analysis and dynamic response, Part 1	7	2	2	0	3	-



9	The approach of discrete systems analysis: signal analysis and dynamic response, Part 2	7	2	2	0	3	-
10	The approach of discrete systems analysis: frequency response,	9	2	2	0	3	Quiz 2 (2 Hr)
11	The approach of discrete systems analysis: the approach of the z transform.	7	2	2	0	3	-
12	Transform techniques and state space methods used in design control systems.	7	2	2	0	3	-
13	Sample rate selection: the sampling theorem's limit	7	2	2	0	3	-
14	Sample rate selection: time response and smoothness,	7	2	2	0	3	-
15	Sample rate selection: errors analysis	7	2	2	0	3	-
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	Weekly	10	10%
4	Quizzes	5 & 12	15	15%
5	Report / Project / presentation	13, 14	15	15%

6. Learning Resources and Supportive Facilities

Learning resources (books, scientific references, etc.) *	The main (essential) reference for the course	Hemchandra M. S., Digital Control Applications Illustrated with MATLAB, 1st Edition, CRC Press, 2018.
	Other References	M. Sami Fadali and A. Visioli, Digital Control Engineering, Academic Press, Burlington, MA, 2013.
	Electronic Sources	www.ekb.eg
	Learning Platforms	https://lms.nub.edu.eg/login/index.php
	Devices/Instruments	Data Show



Supportive facilities & equipment for teaching and learning	Supplies	White Board
	Electronic Programs	MATLAB and Proteus Software Programs
	Skill Labs/ Simulators	https://www.simultrain.swiss/
	Virtual Labs	-----
	Other (to be mentioned)	Lecture Hall and Internet Usage

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Course Coordinator

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