



Electrical and Renewable Energy Engineering Program

Course Specification - (2025-2026)

Advanced Control on Power Systems – ERE272

Academic Year	2025/2026	Semester	Fall
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1. Basic Information

Course Title (according to the bylaw)	Advanced Control on Power Systems				
Course Code (according to the bylaw)	ERE272				
Prerequisite:	Automatic Control Systems -ERE324, Electrical Power Engineering – ERE222				
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

Power system control objectives, variables and domains. Modeling of power system for the purpose of controlling the voltage and frequency. Frequency control of power systems. Voltage control of power systems for single area and multi-area systems. Power system stabilizer.

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.	CLO6	Develop simulation to demonstrate the controlling of the power systems voltage and frequency using any software packages.
B1	Select, model and analyze electrical power systems applicable to the Electrical Power and Renewable Energy Engineering Program by applying the concepts of: generation, transmission and distribution of electrical power systems.	CLO4	Model and analyze the power systems voltage and frequency control.
B4	Estimate and measure the performance of an electrical/electronic/digital system and circuit under specific input excitation and evaluate its suitability for a specific application.	CLO1	Analyze of power system for the purpose of controlling the voltage and frequency.
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.	CLO5	Estimate the performance of frequency control for power systems.
		CLO2	Perform calibration and testing of voltage as well as frequency control loops of power systems.
D4	Select, analyze and control appropriate driving systems for different energy applications.	CLO3	Apply modern control strategies to control power systems.



4. Teaching and Learning Methods

1. Interactive Lectures
2. Self-Learning
3. Projects
4. Hybrid Education
5. Field Visits
6. Report and Research
7. 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	Power system control objectives	6	2	2	0	2	-
2	Power system control objectives	6	2	2	0	2	-
3	Power system control variables and domains	6	2	2	0	2	-
4	Power system control variables and domains	6	2	2	0	2	-
5	Modeling of power systems for the purpose of controlling the voltage.	8	2	2	0	2	Quiz 1 (2 Hr)
6	Modeling of power system for the purpose of controlling the frequency.	6	2	2	0	2	-
7	Mid Term Exam						
8	Modeling of power system for the purpose of controlling the frequency.	6	2	2	0	2	-
9	Frequency control of power systems.	6	2	2	0	2	-
10	Frequency control of power systems.	8	2	2	0	2	Quiz 2 (2 Hr)
11	Voltage control of power systems for single area systems.	6	2	2	0	2	-
12	Voltage control of power systems for multi-area systems.	6	2	2	0	2	-
13	Power system stabilizer	6	2	2	0	2	
14	Power system stabilizer	6	2	2	0	2	-
15	Revision	6	2	2	0	2	-
16	Final Exam						



1. 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	20	20 %
4	Quizzes	5, 10	20	20 %

2. 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) Eidiani, M. and Rouzbehi, K., 2025. Modern Power Systems Engineering: Analysis, Stability, and Control. CRC Press. 2) Pal, K., Tripathi, S.M. and Pandey, S. eds., 2023. Advanced Control and Optimization Paradigms for Energy System Operation and Management. CRC Press.
	Other References	1) Bizon, N., 2022. Advanced Modeling, Control, and Optimization Methods in Power Hybrid Systems-2021 (p. 292). MDPI-Multidisciplinary Digital Publishing Institute.
Supportive facilities & equipment for teaching and learning	Devices/Instruments	Data Show
	Supplies	White Board
	Electronic Programs	MATLAB and SIMULINK Software Programs
	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