



Electrical and Renewable Energy Engineering Program

Course Specification - (2025-2026)

Storage Energy Technologies – ERE171

Academic Year	2025/2026	Semester	Fall
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1. Basic Information

Course Title (according to the bylaw)	Storage Energy Technologies				
Course Code (according to the bylaw)	ERE171				
Prerequisite:	Solar Energy – ERE314, Electrical Machines (2) – ERE317				
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	1	1	4
Course Type	Elective - Minor Requirements of Electrical and Renewable Energy Engineering				
Academic level at which the course is taught	Third 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. Mohamed Mahmoud Samy				
Course Specification Approval:	Department council		Faculty council		
Date of Approval of the course Specification:	13 / 9 / 2025		16 / 9 / 2025		



2. Course Overview

Generalities on Energy Storage, Energy Storage Systems, Comparative Ratings and Properties, Electrochemical Energy Storage, Energy Storage by Means of Super-capacitors, Conventional Batteries and Flow Batteries, Superconducting Magnetic Energy Storage, Energy Storage Systems Based on Compressed Air, Hydropower and Pumped Storage Facilities, Flywheel Systems, Energy Storage Based on Hydrogen, System Arrangements and Applications (The Battery Management System (BMS)). Applications of Energy Storage Technology in the Power Generation. Introduction to Modeling of Several Types of Energy Storage Systems.

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
A4	Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.	CLO4.1	Utilize contemporary technologies and engineering tools to develop and evaluate renewable energy systems in compliance with quality and environmental requirements.
A10	Acquire and apply new knowledge; and practice self ,lifelong and other learning strategies	CLO10.2	Compare between different technologies of energy storage systems
		CLO10.3	Analyze and select the appropriate type of energy storage system
B3	Design and implement elements, modules, sub-systems, or systems in electrical/electronic/digital engineering using technological and professional tools.	CLO3.4	Design, model, and implement integrated renewable energy systems using professional tools while ensuring technical and operational feasibility.
D2	Identify, analyze and evaluate the energy's conversion processes and management techniques;	CLO2.5	Discuss operations of different types of energy storage 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.	CLO3.6	Design renewable energy systems and subsystems to meet specified technical, environmental, and operational requirements.



4. Teaching and Learning Methods

1. Interactive Lectures
2. Self-Learning
3. Experimental Learning
4. Hybrid Education
5. Report and Research
6. 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 (Ass/ Project)	Other
1	Introduction to renewable Energy and Energy Storage Systems	6	2	1	1	2	-
2	Generalities on Energy Storage, Energy Storage Systems, Energy Storage Methods and technologies,	6	2	1	1	2	-
3	Comparative Ratings and Properties of Energy Storage systems	5	2	1	1	Assignments 1 (1 Hr)	-
4	Electrochemical Energy Storage, Energy Storage by Means of Super-capacitors, Conventional Batteries and Flow Batteries,	5	2	1	1	Assignments 2 (1 Hr)	-
5	Electrochemical Energy Storage, Energy Storage by Means of Super-capacitors, Conventional Batteries and Flow Batteries,	7	2	1	1	Assignments 3 (1 Hr)	Quiz 1 (2 Hr)
6	Electrochemical Energy Storage, Energy Storage by Means of Super-capacitors, Conventional Batteries and Flow Batteries,	5	2	1	1	Assignments 4 (1 Hr)	-
7	Mid Term Exam						
8	Superconducting Magnetic Energy Storage and Energy Storage Systems Based on Compressed Air	6	2	1	1	Assignments 5/ Project (2 Hr)	-
9	Energy Storage Systems Based on Hydropower and Pumped Storage Facilities, Energy Storage Systems Based on Flywheel Systems.	6	2	1	1	Assignments 6/ Project (2 Hr)	-
10	Energy Storage Based on Hydrogen, System Arrangements and	8	2	1	1	Project (2 Hr)	Quiz 2 (2 Hr)



	Applications (The Battery Management System (BMS)).						
11	Applications of Energy Storage Technology in the Power Generation and Introduction to Modeling of Several Types of Energy Storage Systems	6	2	1	1	Assignments 7/ Project (2 Hr)	-
12	conditions and methods of starting of three phase induction motor (double cage and deep bar rotors	6	2	1	1	Project (2 Hr)	-
13	Applications of Energy Storage Technology in the Power Generation and Introduction to Modeling of Several Types of Energy Storage Systems	6	2	1	1	Assignments 8/ Project (2 Hr)	
14	conditions and methods of starting of three phase induction motor (double cage and deep bar rotors	6	2	1	1	Assignments 9/ Project (2 Hr)	-
15	Revision and Practical Exam	4	2	1	1	Discussion Project Course	-
16	Final Term 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	2 - 14	10	10%
4	Quizzes	5, 10	10	10%
5	Final Oral Exam	15	10	10%
6	Report / Project	15	10	10%



6. Learning Resources and Supportive Facilities

Learning resources (books, scientific references, etc.) *	The main (essential) reference for the course	Zafirakis D., "Overview of energy storage technologies for renewable energy systems. In: Stand-alone and hybrid wind energy systems technology, energy storage and applications", Kaldellis JK, editor. Woodhead Publishing; 2010.
	Other References	John Twidell and Tony Weir, Renewable Energy Resources, third edition, from Routledge,
	Electronic Sources	www.ekb.eg
	Learning Platforms	https://lms.nub.edu.eg/login/index.php
Supportive facilities & equipment for teaching and learning	Devices/Instruments	Data Show
	Supplies	White Board
	Electronic Programs	MATLAB/Simulink Software Programs
	Skill Labs/ Simulators	Software Packages
	Virtual Labs	Internet Access
	Other (to be mentioned)	-

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Course Coordinator

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