



Electrical and Renewable Energy Engineering Program

Course Specification - (2025-2026)

Hydro-Tidal and Wave Energy – ERE274

Academic Year	2025/2026	Semester	Fall
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1. Basic Information

Course Title (according to the bylaw)	Hydro-Tidal and Wave Energy				
Course Code (according to the bylaw)	ERE274				
Prerequisite:	Fluid Mechanics and Turbo-Machinery - GME212				
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

Introduction to Water Renewable Energy Resources, Tidal Energy Principles, Analysis of Tidal Energy Resources and its Relation to Wind, Classification of Tidal Energy Resources, Egypt Tidal Energy, Tidal Energy Utilization, Installation of Turbines for Tidal Energy, Turbines Performance Analysis with Tidal Energy, Energy Storage Techniques with Tidal Energy, Wave Energy Principles, Utilization of Wave Energy, Wave Energy Classification, Wave Energy Turbines, Water and Air Columns, Operation of Wave Energy Turbines, Performance Analysis for Wave Energy Turbines, Characteristics of Used Turbines, Column Separation, Energy Storage Techniques, Wave Energy Utilization in Egypt, Case Studies.

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
B1	Select, model and analyze electrical power systems applicable to the Electrical Power and Renewable Program by applying the Energy Engineering concepts of: generation, transmission and distribution of electrical power systems.	CLO6	Formulate objective function to size hydro-tidal and wave energy systems 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 hydro-tidal and wave energy systems.
D2	Identify, analyze and evaluate the energy's conversion processes and management techniques.	CLO1	Recognize water renewable energy resources, hydro-tidal and wave energy systems principles, analysis of hydro-tidal and wave energy systems and its relation to wind, classification of hydro-tidal and wave energy systems.
D3	Model, analyze, design, implement, test and operate renewable energy systems such as solar photovoltaics,	CLO4	Design a hydro power generation.
		CLO5	Design a tidal as well as wave power generation.



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
	solar thermal, wind, biomass and waste, hydro-tidal and wave, and other renewable energy applications.	CLO2	Perform calibration and testing of both hydro as well as tidal and wave power generation and maintaining major components of hydro-tidal and wave energy 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	Introduction to Water Renewable Energy Resources, Tidal Energy Principles, Analysis of Tidal Energy Resources and its Relation to Wind, Classification of Tidal Energy Resources	6	2	2	0	2	-
2	Introduction to Water Renewable Energy Resources, Tidal Energy Principles, Analysis of Tidal Energy Resources and its Relation to Wind, Classification of Tidal Energy Resources	6	2	2	0	2	-
3	Egypt Tidal Energy, Tidal Energy Utilization, Installation of Turbines for Tidal Energy,	6	2	2	0	2	-
4	Egypt Tidal Energy, Tidal Energy Utilization, Installation of Turbines for Tidal Energy,	6	2	2	0	2	-



5	Turbines Performance Analysis with Tidal Energy,	8	2	2	0	2	Quiz 1 (2 Hr)
6	Energy Storage Techniques with Tidal Energy, Wave Energy Principles, Utilization of Wave Energy,	6	2	2	0	2	-
7	Mid Term Exam						
8	Energy Storage Techniques with Tidal Energy, Wave Energy Principles, Utilization of Wave Energy,	6	2	2	0	2	-
9	Wave Energy Classification, Wave Energy Turbines, Water and Air Columns,	6	2	2	0	2	-
10	Wave Energy Classification, Wave Energy Turbines, Water and Air Columns,	8	2	2	0	2	Quiz 2 (2 Hr)
11	Operation of Wave Energy Turbines, Performance Analysis for Wave Energy Turbines,	6	2	2	0	2	-
12	Characteristics of Used Turbines, Column Separation,	6	2	2	0	2	-
13	Energy Storage Techniques, Wave Energy Utilization in Egypt, Case Studies.	6	2	2	0	2	
14	Energy Storage Techniques, Wave Energy Utilization in Egypt, Case Studies.	6	2	2	0	2	-
15	Revision	6	2	2	0	2	-
16	Final Term 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