



Electrical and Renewable Energy Engineering Program

Course Specification - (2025-2026)

Aerodynamics – GME214

Academic Year	2025/2026	Semester	Fall
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1. Basic Information

Course Title (according to the bylaw)	Aerodynamics				
Course Code (according to the bylaw)	GME214				
Prerequisite:	Dynamics – BAS023				
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	Contact Hours			
	Hours	Lecture	Tutorial	Practical	Total
	3	2	2	0	4
Course Type	Compulsory - 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 Saber Gad				
Course Specification Approval:	Department council		Faculty council		
Date of Approval of the course Specification:	13 / 9 / 2025		16 / 9 / 2025		



2. Course Overview

Aerodynamic forces and moments, Dimensional analysis, Buckingham theorem, Dynamic similarity, Type of flow, Aero dynamical coefficients, Continuity and momentum integral equations, Applications to air force drag calculation, Energy equations, Path lines and stream lines, Angular velocity and vortices, Stream function and velocity potential, Relation between stream function and potential, Incompressible motions of ideal fluid, Euler equation and Bernoulli theorem, Wind tunnel for low velocity, Velocity conditions for motions of an ideal fluid Equation for velocity potential and Laplace equation..

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
A10	Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.	CLO1	Define fundamental concepts of fluid flow and aerodynamics (flow field, streamline, boundary layer).
		CLO2	Explain fluid properties and governing equations (continuity, momentum, energy).
		CLO3	Describe lift, drag, and aerodynamic forces acting on bodies.
D1	Model and analyze electrical power systems and electrical machines by applying energy systems concepts of: generation, transmission, distribution and protection of electrical power systems. Use wind tunnel data and experimental techniques in aerodynamics.	CLO5	Use wind tunnel data and experimental techniques in aerodynamics.
		CLO6	Apply governing equations to analyze aerodynamic flows. Interpret aerodynamic performance using experimental data and graphs
D2	Select, analyze and control appropriate driving systems for different energy applications. Apply governing equations to analyze aerodynamic flows.	CLO4	Analyze aerodynamic forces, Buckingham theorem and continuity. Analyze energy equations, Euler equation and Bernoulli theorem.



4. Teaching and Learning Methods

1. Interactive Lectures
2. Self-Learning
3. Field Visits
4. Discussion
5. Report and Research

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	Aerodynamic forces and moments, Dimensional analysis, Buckingham theorem,	6	2	2	0	2	-
2	Dynamic similarity, Type of flow, Aero dynamical coefficients	6	2	2	0	2	-
3	Continuity equations	6	2	2	0	2	-
4	momentum integral equations	6	2	2	0	2	-
5	Applications to air force drag calculation,	8	2	2	0	2	Quiz 1 (2 Hr)
6	Energy equations	6	2	2	0	2	-
7	Mid Term Exam						
8	Path lines and stream lines	6	2	2	0	2	-
9	Angular velocity and vortices, Stream function	6	2	2	0	2	-
10	velocity potential, Relation between stream function and potential	8	2	2	0	2	Quiz 2 (2 Hr)
11	Incompressible motions of ideal fluid	6	2	2	0	2	-
12	Euler equation	6	2	2	0	2	-
13	Bernoulli theorem, Wind tunnel for low velocity	6	2	2	0	2	
14	Velocity conditions for motions of an ideal fluid Equation for velocity potential and Laplace equation	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	2 - 14	15	15%
4	Quizzes	5, 10	15	15%
5	Report	12	10	10%

2. Learning Resources and Supportive Facilities

Learning resources (books, scientific references, etc.) *	The main (essential) reference for the course	1) Peiqing Liu, Aerodynamics, Springer 2025. 2) John D. Anderson, Fundamentals of Aerodynamics ISE, McGraw-Hill, 2024.
	Other References	Steven Collicott, Daniel T. Valentine, Aerodynamics for Engineering Students Eight edition, Elsevier, 2023.
	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	-----
	Skill Labs/ Simulators	—
	Virtual Labs	—
	Other (to be mentioned)	Lecture Hall and Laboratory Usage

Prof. Dr. Mohamed Saber Gad
Course Coordinator

Dr. Mohamed Kourany Saad
Program Coordinator