	Ministry of Higher Education and Scientific Research - Iraq University of Warith Al-Anbiyaa College of Engineering Aircraft Engineering Department	

MODULE DESCRIPTOR FORM

Module Information

Module Title	Fundamentals of Aeronautics		**Module Delivery**	
Module Type	CORE			
Module Code	AIE244			
ECTS Credits	4			
SWL (hr/sem)	100			
Module Level	2	**Semester of Delivery**	4	
Administering Department	Aircraft Engineering	**College**	Engineering	
Module Leader	Ahmad Saddy Mohamad	**e-mail**	ahmad.saddy@uowa.edu.iq	
Module Leader's Acad. Title	Assist. Prof.	**Module Leader's Qualification**	Ph.D.	
Module Tutor	None	**e-mail**	None	
Peer Reviewer Name		**e-mail**		
Review Committee Approval	01/01/2025	**Version Number**	2024	

Relation With Other Modules

Prerequisite module	AIE232	**Semester**	3
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	1. To help students learn as much introduction to flight and flight theory principle as possible in which this subject is regarded as the base for all aeronautic subjects.

	2. The development of the basic principles of aeronautics is the entry point for consolidating the necessary principles of specialized aircraft mechanics engineering subjects and providing the necessary materials for them, which include topics of aerodynamic, flight theory, design, control and stability of aircraft, gas dynamic, jet propulsion theory and aircraft performance.
Module Learning Outcomes	1. Knowledge and understanding. - Standard Atmosphere. - Principles of Aviation. - Aerodynamic forces and moments on the aircraft. - Wings and infrasound sections - and ultrasonic / characterization and characteristics. - Aerodynamic forces in stable horizontal flight. - Performance curves in terms of propulsion and performance curves in terms of power. 2. Subject-specific skills. - Explanation of the flight principles of fixed-wing and rotary-wing aircraft (helicopters). - Determination of the anaerobic forces acting on a fixed-wing and rotary-wing aircraft. - Determining the required thrust, the available thrust, the lift to drag ratio. 3. Thinking Skills. - To fully comprehend the scientific material and develop students' engineering sense. - Understand and comprehend the applications of the scientific material on the fuselage (structure), power station (engines), control surfaces, wing, aircraft systems and instrumentation. - Understand the limits of the aircraft's performance. - To prepare students for psychological connection and a feeling of satisfaction, happiness and reassurance for the department and the branch in which they are studying 4. General and Transferable Skills. Develop the student's ability to use software, modern equipment, information technology, and the use of the Internet to obtain advanced, promising and future knowledge, assimilate and understand and link its relationship to engineering applications.
Indicative Contents	Lectures are used to deliver the fundamental knowledge in relation to various aspects of aerodynamic characteristics for aircraft as well as their influence in determining the aircraft performance for atmospheric flight (All Outcomes). Indicative content includes the following.

	Part A - Fundamentals Aircraft Nomenclature History of aeronautics; Physical properties of atmosphere; Airfoil lift, drag and moments; Airfoil data; Compressibility correction; Finite wing aerodynamics; Induced drag; High-lift mechanisms. [25 hrs] Part B - Aircraft Performance Drag polar; Typical steady level flight; Thrust and power requirements for cruising flight; Altitude effects; Indicated and True Air Speed. [27 hrs]

Learning and Teaching Strategies

Strategies	Develop the student's ability to understand aircraft theory and arrange knowledge related to aircraft mechanics from a correct and logical understanding and analysis of the various sciences related to aircraft, understanding hypotheses, and interpreting the performance of the aircraft physically, to obtain the initial knowledge necessary to understand the specialized topics in the field of aircraft mechanics engineering. Develop the student's ability and familiarize him with the pattern of exam questions and the arrangement and sequence of the solution in order to be able to correctly analyze the question and thus outline the appropriate solution sequence through method books, auxiliary books and theoretical lectures, in addition to solving exercises and getting used to the method of reaching the correct solution.

Student Workload (SWL)

Structured SWL (h/sem)	48	**Structured SWL (h/w)**	3
Unstructured SWL (h/sem)	52	**Unstructured SWL (h/w)**	3.5
Total SWL (h/sem)	100		

Module Evaluation

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	20% (20)	3,6,9,12	All
	Assignments	2	10% (10)	5, 10	All
	Projects / Lab.	Lab. 4	10% (10)	Continuous	All
	Report	-	-	-	-
Summative assessment	**Midterm Exam**	2 hrs.	10% (10)	7	All
	Final Exam	3 hrs.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	**Fundamentals:** Introduction History of aeronautics Pilot's Operating Handbook
Week 2	**Standard atmosphere (ISA):** The atmosphere. Physical properties of gases in atmosphere.
Week 3	**Airplane types:** Airplane classification. Airplane parts.
Week 4	**Nomenclature:** Airfoils-Nomenclature. Wings-Nomenclature. Flaps. Types of airfoils. Modern airfoils.
Week 5	**Wings and airfoils characteristics:** Mean aerodynamic chord. Wing Area. Aerodynamic center. Center of pressure.
Week 6	**Aerodynamic forces and moments on airplane:** The airplane as a rigid body. Airplane axis system. Forces and moments.
Week 7	**Flight principles:** Bernoulli's principle. Venturi effect. Relative wind.
Week 8	**Lift:** Lift coefficient. Lift curves characteristics. Change of lift coefficient with the angle of attack.
Week 9	**Drag:** Drag estimation at low speeds. Drag estimation at high speeds. **Types of drag:** Parasite drag. Induced drag. Wave drag.
Week 10	**Aerodynamic forces on steady level flight:** Lift force. Drag force.

	Gravity force. Thrust force.
Week 11	**Level flight Performance:** Steady level flight. Typical steady level flight. Cruise flight.
Week 12	Holding flight. Mach number. Indicated Air Speed. True Air Speed.
Week 13	**Performance curves in terms of thrust:** Change of required thrust with airspeed. Change of required thrust with altitude. Change of available thrust with airspeed and altitude.
Week 14	**Performance curves in terms of power:** Change of required power with airspeed. Change of required power with altitude.
Week 15	Change of available power with airspeed and altitude. Minimum power required.
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Exp. 1: Atmosphere calculator
Week 2	Exp. 2: Airfoil design and analysis
Week 3	Exp. 3: Wing design and analysis
Week 4	Exp. 4: Airplane Performance
Week 5	Exp. 5: Wind Tunnel
Week 6	Exp. 6:
Week 7	Exp. 7:

Learning and Teaching Resources

	Text	**Available in the Library?**
Required Texts	John D. Anderson, "Introduction to Flight", McGraw-Hill, 7th Edition, 2012	Yes
Recommended Texts	W. Austyn Mair, David L. Birdsall, "Aircraft performance", Cambridge University Press, 2003	Yes
Websites		

APPENDIX:

GRADING SCHEME				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.