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

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	Aircraft Engines II محركات الطائرات II	**Module Delivery**	
Module Type	CORE	**Theory** **Lab** **Tutorial**	
Module Code	AIEN355		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	3	**Semester of Delivery**	5
Administering Department	ME	**College**	ME
Module Leader	Dr. Aws Akram Mahmood AL_Akam	**e-mail**	aws@uowa.iq
Module Leader's Acad. Title	Dr.Asst.Prof.Dr	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Review Committee Approval	01/12/2025	**Version Number**	2025

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	AIEN243	**Semester**	4
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Develop the knowledge of the basics concepts in constructing and modifying turbine aircraft engines. 2. Awareness of theoretical concepts dealing with the operating cycle analysis and improving performance. 3. Providing the knowledge in the engine testing under various conditions and identifying the evaluation parameters. 4. Understanding the concepts of engagement between the various components of the turbine aircraft engines. 5. Providing the knowledge of the different types of turbo-engines encountered in aviation sector.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Applying the concepts of thermodynamic cycles according to the second law of thermodynamics. 2. Achieving the principle of energy conservation and the stage analysis for different turbine aircraft engines. 3. Complete awareness of the determination techniques of each kind of turbine engines using basic formulation with testing procedures. 4. Applying the first and second law concepts to the thermodynamic processes associated with the combustion systems in turbo-engines. 5. Exploitation of the acquired knowledge in turbo-engines including description and cycle analysis of various kinds of engines involved.
Indicative Contents المحتويات الإرشادية	**Indicative contents include the following topics:** Part A **Introduction:** Aerostats, Aerodynes, Newton's laws of motion, Classification of turbo aircraft engines. **Turbine aircraft engines:** Turbine engine components, Intake/Diffuser, Compressor, Combustion chamber, Turbine, Nozzle. **Thermodynamic cycles:** Simple Brayton cycle, Brayton cycle with re-heat.[14hrs] **Flow characteristics through turbomachine:** Compressibility effect, Flow momentum through a rotor. **Engine intake:** Flow in varying cross, section ducts, Subsonic intakes, Supersonic intakes, Gas dynamic relations for intakes **Engine nozzle:** Types of nozzles, Flow characteristics in a nozzle, Gas dynamic relations for nozzles, Off-design operation of a nozzle. [14hrs]

	Part B **Centrifugal machines:** Elementary theory of radial turbomachines**,** Centrifugal (Radial) compressor**,** Velocity diagrams**,** Stage analysis Prewhirl, Slip, Rotating stall, Surging, Radial inflow turbine, Radial flow, analysis. [14hrs] **Axial flow machines:** Elementary theory of axial flow turbomachines**,** Blade terminology**,** Axial flow compressor**,** Velocity diagrams**,** Stage analysis of axial compressor**,** Characteristics of axial compressor **,** Axial, flow turbine**,** Velocity diagrams**,** Stage analysis of axial turbine**,** Characteristics of axial turbine. [15hrs] **Combustion system:** Types of aviation fuel, Theory of combustion, Calorific value of fuel, Combustion in turbine engines, Exhaust gas analysis. **Aircraft engines**: Propulsion efficiency , Thrust producing engines, Turbojet engine, Turbofan engine, Afterburning , Power producing engines, Turboprop engine, Turboshaft engine [15hrs]
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Deliver well-structured lectures that explain classification of aero-engines performance, the thermodynamic cycles, flow through turbomachines and the main parts of simple turbojet engine including intakes, compressor (axial and centrifugal) , combustion chamber, turbine, and nozzle. Utilize clear visuals like diagrams, animations, and real-world examples to enhance understanding. • Incorporate active learning activities within lectures. This could involve short quizzes, interactive questions, group discussions, or problem-solving exercises to solidify understanding and encourage student participation. • Provide students with a variety of problem-solving exercises, ranging from introductory to more challenging. This caters to different learning styles and allows students to build confidence as they progress. • Whenever possible, connect the theoretical concepts to real-world engineering applications of gas dynamics. • Incorporate regular quizzes and homework assignments to assess student understanding and identify areas needing improvement. Provide timely and constructive feedback to guide student learning. • Utilize well-designed midterm and final exams that test both theoretical knowledge and problem-solving abilities in aircraft engines.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		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	
	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)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to the different types of aircraft engines
Week 2	Description of the main components of the turbine aircraft engines
Week 3	Description of Brayton standard cycle and Brayton cycle with afterburning.
Week 4	Describing the flow characteristics through turbomachines.
Week 5	Description, classification and analysis of aircraft engine intakes.
Week 6	Description, classification and analysis of aircraft engine nozzles.
Week 7	Elementary theory of radial turbomachinary.
Week 8	Stage analysis and velocity diagrams involved in centrifugal compressor.
Week 9	Performance characteristics of centrifugal compressors and turbines.
Week 10	Elementary theory of axial flow turbomachinary.
Week 11	Stage analysis and performance characteristics for axial flow compressors.
Week 12	Stage analysis and performance characteristics for axial flow turbines.

Week 13	Combustion system description and analysis in turbo-aircraft engines.
Week 14	Description and analysis of the thrust producing aircraft engines (turbojet and turbofan engines).
Week 15	Description and analysis of the power producing aircraft engines (turboprop and turboshaft engines).
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Exp. 1: Turbo jet engine
Week 2	Exp. 2: Turbo fan engine
Week 3	Exp. 3: Turboprop and Turboshaft engines
Week 4	Exp. 4: Two shaft gas turbine unit
Week 5	Exp. 5:
Week 6	Exp. 6:
Week 7	Exp. 7:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	H.I.H. Saravanamnttoo, et al. "Gas Turbine Theory" 7th edition, Pearson Education Limited, 2017.	Yes
Recommended Texts	S.L. Dixon and C.A. Hall, "Fluid Mechanics and Thermodynamics of Turbomachinery".7th edition, Butterworth-Heinemann, Elsever, 2014.	No
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
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.