	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 III محركات الطائرات III	**Module Delivery**	
Module Type	CORE	**Theory** **Tutorial**	
Module Code	AIEN365		
ECTS Credits	5		
SWL (hr/sem)	125		

Module Level	3	**Semester of Delivery**	6
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	None	**e-mail**	None
Peer Reviewer Name	Dr.	**e-mail**	
Review Committee Approval	01/12/2025	**Version Number**	2025

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	AIEN355	**Semester**	5
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 a comprehensive understanding of the fundamental thermodynamic, aerodynamic, and mechanical principles that govern aircraft engine operation. 2. Gain in-depth knowledge of different aircraft engine types (piston, turboprop, turbofan, jet) along with their specialized applications in various aircraft categories. 3. Master the ability to analyze and predict engine performance metrics. 4. Investigate the intricacies of key aircraft engine components.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain the fundamental thermodynamic cycle principles governing aircraft engine operation and engine performance. 2. Distinguish between different types of aircraft engines (piston, turboprop, turbofan, jet) and their suitability for various applications. 3. Understand the effect of compressibility and the principle behind the flow momentum through rotors. 4. Understand the mechanical design of engine main parts including compressors (axial and centrifugal), combustion chambers, axial turbine, Nozzles and Air-intakes. 5. Describe the function and interrelationships of key engine components like compressors, combustors, turbines, and exhaust systems. 6. Explain the principles behind advanced engine technologies like afterburners and thrust vectoring and materials and manufacturing
Indicative Contents المحتويات الإرشادية	Part A **Introduction:** Classification of Propulsion Systems, The Thrust Equation. **Engine Performance:** Engine Performance and A/C Range. **Theory of Jet Propulsion:** Turbo Jet Engine, Turbo Fan Engine, Turbo Prop Engine, Turbo Shaft Engine, Ram Jet Engine. [16hrs] **Design of Axial and Centrifugal flow Compressors:** Compressor Aerodynamics, Repeating Stage and Repeating Raw, Mean Line Design. Axial Variation, Radial Variation, Mechanical Design. **Compressor's Technology:** Materials and Manufacturing Technology. [13hrs] **Compressor Air Flow Control:** Low Speed Stall, Change of Duct Characteristics, Change of Compressor Characteristics, **Design of Combustion System:** The Processes (Ignition, Stability, Length Scaling,

	Diffusers), After Burner Design,Flame Holding, Fuel Injection. **Combustion Chambers Technology:** Materials and Manufacturing Technology. [13hrs] Part B **Design of Axial Flow Turbines:** Turbine Aerodynamics, Zero Exit Swirl, Constant Axial Velocity, Mean Line Stage Design, Other Design Considerations. **Mechanical Design of Axial Flow Turbines:** Rotor Blade Centrifugal Stresses, Rim Web Thickness, Disc of Uniform Stresses, Disc Thermal Stresses, Airfoil Aspect Ratio. **Turbines Technology:** Materials and Manufacturing Technology, Balancing. [8hrs]. **Design and Technology of Air Intakes and Nozzles:** **Inlet Design:** Subsonic Inlets, Supersonic Inlets. **Design of nozzles:** Convergent Nozzle, Convergent- Divergent Nozzle, Thrust Reversing and Thrust Vectoring, Nozzle Coefficients. **Inlets and Nozzles Technology:** Materials & Manufacturing Technology. **Accessory Drives and Engine Control Systems:** Construction of Gearboxes and Drives, Engine/Airframe Interfaces, Control Systems. [12hrs]
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 design of engine main parts including intakes, compressor, 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	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	20% (20)	3,5,9,11	All
	Assignments	2	10% (10)	4, 10	All
	Projects / Lab.	-	-	-	
	Report	1	10% (10)	13	All
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**
Week 2	**Engine Performance**
Week 3	**Theory of Jet Propulsion**
Week 4	**Theory of Jet Propulsion**
Week 5	**Design of Axial and Centrifugal flow Compressors**
Week 6	**Design of Axial and Centrifugal flow Compressors**
Week 7	**Design of Axial and Centrifugal flow Compressors**
Week 8	**Compressor Air Flow Control**
Week 9	**Design of Combustion System**
Week 10	**Design of Combustion System**
Week 11	**Design of Axial Flow Turbines**

Week 12	**Mechanical Design of Axial Flow Turbines**
Week 13	**Design and Technology of Air Intakes and Nozzles.**
Week 14	**Design and Technology of Air Intakes and Nozzles.**
Week 15	**Accessory Drives and Engine Control Systems**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Exp. 1:
Week 2	Exp. 2:
Week 3	Exp. 3:
Week 4	Exp. 4:
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	1. H.I.H. Saravanamnttoo, et al. "Gas Turbine Theory" 7th edition, Pearson Eduction Limited, 2017. 2. S.L. Dixon and C.A. Hall, "Fluid Mechanics and Thermodynamics of Turbomachinery".7th edition, Butterworth-Heinemann, Elsever, 2014.	Yes
Recommended Texts	1. Philip G. Hill, Carl R. Peterson "Mechanics and thermodynamics of propulsion".	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.