	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	Aircraft Engines I	**Module Delivery**	
Module Type	CORE		
Module Code	AIE243		
ECTS Credits	5		
SWL (hr/sem)	150		

Module Level	2	**Semester of Delivery**	4
Administering Department	Aircraft Engineering	**College**	Engineering
Module Leader	Dr. Aws Akram Mahmood	**e-mail**	aws@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	AIE233	**Semester**	3
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	

	1. Knowledge of the basics concepts in constructing and modifying piston type 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 normal engines with supercharging aiming higher outputs. 5. Providing the knowledge of the different types of compressors encountered in turbocharged piston type aircraft engines.
Module Learning Outcomes	1. Applying the concepts of thermodynamic cycles according to the second law of thermodynamics. 2. Achieving the principle of energy conservation and the thermal balance for different aircraft engines involving piston type. 3. Complete awareness of the determination techniques of each kind of piston 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 piston type engines. 5. Exploitation of the acquired knowledge in turbocharged engines including description and cycle analysis of various kinds of compressors involved.
Indicative Contents	Indicative content includes the following. • Applying the governing laws in cycle analysis of piston type aircrafts. Realizing thermodynamics processes and subject it to energy production procedures. [13 hrs] • Using the basic concepts of evaluation procedures on piston engines to formulate the tests conducted and providing the design parameters and selection procedure. [13 hrs] • Using the air-standard cycles to approximate the actual internal combustion aircraft engines and driving the evaluation approach related to them. [13 hrs] • Formulation for heat and work transfer in thermodynamic Fuel-Air cycles and deriving the performance characteristics. [13 hrs] • The engineering application of thermodynamics and fluid dynamics in various processes in work and heat exchange in piston type engines. [13 hrs] • Applying the operational concepts of supercharging on the cycle analysis of piston type aircraft engines. [11 hrs] • Providing the essential knowledge in design and operating various kinds of compressors used in turbocharged aircraft engines. [11 hrs]

Learning and Teaching Strategies

Strategies	1. Class active discussions during comprehensive presentations. 2. Home works and technical reports related to the explored course items. 3. Quizzes and prepared exams to motivate student's realization. 4. Organization of semester examinations. 5. Laboratory oral discussions.

Student Workload (SWL)

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	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

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	Introduction to the piston type aircraft engines
Week 2	Two and four stroke operation cycles in reciprocating internal combustion engines.
Week 3	Description of Otto standard cycles, and actual cycle spark ignition engine.
Week 4	Deviation in operational characteristics between ideal and actual cycles.

Week 5	Basic parameters involved in testing piston type aircraft engines.
Week 6	Energy balance and performance evaluation of piston type engines.
Week 7	Constant speed and variable speed test procedures
Week 8	Fuels used in aircraft engines along with combustion theory.
Week 9	Calculation formulae of the heat of combustion of fuels.
Week 10	Combustion process involved in piston type aircraft engines, exhaust gas analysis.
Week 11	Concept of supercharging applied to piston type aircraft engines.
Week 12	Turbocharging theory and analysis.
Week 13	Methods and limitations applied to the turbocharged piston type aircraft engines.
Week 14	Roots blower and its indicator diagram, cycle analysis of Roots blower.
Week 15	Vane type compressor and its indicator diagram, cycle analysis of vane type compressor.
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Exp. 1: Study parts of the different engine types & determination of valve timing diagram.
Week 2	Exp. 2: Diesel engine test at constant speed
Week 3	Exp. 3: Diesel engine test at variable speed
Week 4	Exp. 4: Petrol engine test at constant speed
Week 5	Exp. 5: Petrol engine test at variable speed
Week 6	Exp. 6:
Week 7	Exp. 7:

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	J.B. Heywood, "Internal combustion engine fundamentals", McGraw-Hill publications, 1988.	Yes
Recommended Texts	• R.J. Rajput, "A text book for internal combustion engines", 2nd Edition, Laxmi publications Ltd, 2008. • Sadhu Singh, "Internal combustion engines and gas	No

	turbines", Kataria & Sons Co, 2012	
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.