COURSE INFORMATION

Course Code	AAM 560	Course Name	Gas Turbines and Jet Engines					
Type of Course	**Level of Course**	**Semester**	**Language**	**Theory**	**Application (Practice)**	**Laboratory**	**Local Credits**	**ECTS**
Elective	Graduate	-	English	3	0	0	3	6

Department	: Aerospace Engineering
Prerequisites/Requirements for Admission	: -
Mode of Delivery	: Face to Face
Course Coordinator	: Asst. Prof. Dr. Mohamed Salem ELMNEFI
Course Lecturer(s)	: Asst. Prof. Dr. Mohamed Salem ELMNEFI
Course Assistant(s)	:
Course Description/Aim	: The aim of this course is to cover gas turbine engines' physical characteristics, such as turbomachinery component analysis and design, combustion physics, nozzle gas dynamics, and systems design perspectives for stationary and space-based operations; to describe the aerodynamics of air-breathing engine components such as inlets, compressors, turbines, afterburners, and nozzles; and to study the methodology for designing turbojet, turbofan, ramjet, scramjet, and mixed-cycle engines.
Course Contents	:Introduction, review of gas turbine thermodynamics cycles. Explanation of the mass, momentum, and energy equations. Cycle Analysis of different types of jet engines which include turbojet, turbofan, and ramjet engines. Describe the various components of an air-breathing such as the inlets, fans, combustion chambers, turbines, afterburners, and nozzles, and study their operational principles and important performance parameters. Matching the engine components.
Recommended Optional Program Components	: AEDsys software & Gas-Turb software.
Compulsory Attendance	: 70%

Course Learning Outcomes

#	Learning outcome	Teaching Methods/Techniques	Assessment method(s)
At the end of this course; students will be able to:			
1	Explain the equations of mass, momentum, and energy, and describe how these are used to develop an understanding of propulsion systems.	Lecture	Standardized examinations, project applications, homework
2	Describe the various components of an air-breathing engine, their operational principles, important performance parameters, and how they fit together to form a system capable of generating thrust.	Lecture	Standardized examinations, project applications, homework
3	Describe the unique aspects of, and perform cycle analyses on ramjets, turbojets, and turbofans to understand the impacts of thrust level, fuel consumption, flight conditions, and mission requirements.	Lecture	Standardized examinations, project applications, homework

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4	Describe the operation of and perform detailed analyses on major engine components including inlets, fans, compressors, combustors, turbines, afterburners, and nozzles.	Lecture	Standardized examinations, project applications, homework

Weekly Detailed Course Content

Week	Content	Recommended Resource(s)	Time (Hours)
1	Introduction and Overview	Textbook and Lecture Notes	3
2	Review of Fluids and Thermodynamics	Textbook and Lecture Notes	3
3	Cycle Analysis	Textbook and Lecture Notes	3
4	Cycle Analysis: Turbojets	Textbook and Lecture Notes	3
5	Cycle Analysis: Turbofans	Textbook and Lecture Notes	3
6	Cycle Analysis: Ramjets	Textbook and Lecture Notes	3
7	Engine Performance / Midterm Exam	Textbook and Lecture Notes	3
8	Engine air inlets/ Fans	Textbook and Lecture Notes	3
9	Axial Compressors / Centrifugal Compressors	Textbook and Lecture Notes	3
10	Combustion: Equilibrium & Kinetics / Combustors	Textbook and Lecture Notes	3
11	Axial Turbines / Turbine Efficiency	Textbook and Lecture Notes	3
12	Turbine Performance and Cooling	Textbook and Lecture Notes	3
13	Nozzles	Textbook and Lecture Notes	3
14	Engine component Matching	Textbook and Lecture Notes	3
15	Final Exam		
16	Final Exam		

Sources

Course Notes / Textbooks	Saeed Farokhi, “Aircraft Propulsion”, Wiley, 2014. P.G. Hill and C.R. Peterson “Mechanics and Thermodynamics of Propulsion”, Pearson Education, 2002. Jack D. Mattingly and Keith M. Boyer “Elements of Propulsion: Gas Turbines and Rockets”, AIAA Education Series, 2006.
Supplemental Readings	None

Evaluation System

Work Placement	Number	Percentage of Grade (%)
Attendance		
Quizzes		
Homework	4	20
Presentation		
Laboratory/Practice		
Report(s)		

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Graduate Thesis/Project		
Seminar		
Projects	1	30
Midterm exam(s)	1	20
Others		
Final exam	1	30
	Total	100
	Percentage of semester work	70
	Percentage of final exam	30
	Total	100

Workload Calculation

Activity	**Number**	**Time (hours)**	**Total Workload (hours)**
Course Hours	14	3	42
Online Activity Hours			
Individual study	14	5	70
Midterm exam(s)	1	3	3
Final exam	1	3	3
Homework	4	6	24
Presentation	1	3	3
Project	1	36	36
		Total	181
		ECTS Credit *(Total/30)*	6

Contribution of Learning Outcomes to Program Outcomes

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
LO1	5	5	5	5	5	5	5	5	5	5	5
LO2	5	5	5	5	5	5	5	5	5	5	5
LO3	5	5	5	5	5	5	5	5	5	5	5
LO4	5	5	5	5	5	5	5	5	5	5	5

Contribution Level: 1: “Very low”, 2: “Low”, 3: “Medium”, 4: “High”, 5: “Very High”
LO: Learning Outcome of the Course
PO: Program Outcome