MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH
«SALAHADDIN UNIVERSITY – ERBIL (SUE)»
COLLEGE OF ENGINEERING
AVIATION ENGINEERING DEPARTMENT

Subject «Thermodynamics and theory of heat engine**»**

Spring Semester

Class: 1st stage

Lecturer: Dr. Heersh S.A.
B. Sc. In Aerospace Engineering.
M. Sc. In Flight-Type Engines.
PhD. In Aviation and Rocket-Space Technology.

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Erbil 2023 -2024

Syllabus

1. Course name	Thermodynamics and theory of heat engine
2. Lecturer in charge	Dr. Heersh Saleem Ahmed
3. Department/ College	Aviation Engineering Department / College of Engineering
4. Contact	e-mail: heersh.ahmed@su.edu.krd Tel: 07504492302
5. Time (in hours) per week	Theory: 3 Practical: 2
6. Office hours	4 hours
7. Course code	9008
8. Teacher's academic profile	- B.Sc. In Aerospace Engineering, Russia, 2014. - M.Sc. in Flight-Type Engines, Russia, 2016. - PhD. In Aviation and Rocket-Space Technology from Kazan National Research Technical University named after A.N. Tupolev – KAI, Kazan - Russia, 2021. - Laboratory assistant (Turbojet engine TJ-100A-Z), Kazan National Research Technical University named after A.N. Tupolev – KAI, Russia, 2017 - 2021.
9. Keywords	Thermodynamic, Law of thermodynamics, Thermodynamic Equilibrium, Cycles of engine, Heat engine, Process of thermodynamics.

10. Course overview:

This course introduces the student to the terminology, principles and methods used in engineering thermodynamics. Thermodynamics is a subject, which deals with the transfer of energy essential for life. Thermodynamics has long been an essential part of engineering curricula all over the world. It has a broad application area ranging from microscopic organisms to common household appliances, aircraft of engines, transportation vehicles, power generation systems and even philosophy. The knowledge of thermodynamics gained in this course is essential to many other courses studied in the mechanical engineering degree programme, such as advanced thermofluids, aerospace propulsion, internal combustion engines, refrigeration and air conditioning and solar energy.

11. Course objective:

This course aims to prepare students for future studies in thermodynamics through the introduction of some common uses of thermodynamics and the analysis of thermodynamic cycles. Specifically, the aims of the course are to:

- Introduce students to the terminology associated with thermodynamics. Students should develop an understanding of the deeper meanings of familiar words like energy, heat, work, temperature, reversible & irreversible as well as less familiar words like entropy;
- Familiarise students with the 0^{th}, 1^{st}, 2^{nd}, and 3^{rd} laws of thermodynamics and teach students how to apply these laws;
- Instruct students in analysing air standard cycles, such as reciprocating piston engines and gas turbine engines and turbojet engine.

12. Student's obligation

The students are asked to attend al the lectures and they should arrive on time to the class and that is their responsibility to find out what assignment to be made when they are absent. They should active participation in the class for their successes. The student must participate in all quizzes and exams. He has to present all the homework at the required time.

13. Forms of teaching

Using a whiteboard tool to cover in details all the required explanation and data show.

14. Assessment scheme

- 20% Quizzes, Seminar, Report & Activity
- 10% Practical
- 20% Mid-term exam
- 10% Final practical exam
- 40% Final theoretical exam

15. Student learning outcome:

– Use the first law of thermodynamics, including an understanding of heat and work, to solve steady state and transient problems on closed and open systems.

– Demonstrate knowledge of the second law of thermodynamics by solving steady-state problems on closed and open systems.

– Apply the first and second laws to analyze the behavior of internal combustion engines (air–standard cycles), Rankine power cycles (basic, regeneration, reheat) and Vapor compression refrigeration cycles.

– Identify links between theoretical analysis methods learned in class and actual performance of thermodynamics machines and devices.

16. Course Reading List and References:

- J. R. Reisel, (2016) Principles of Engineering Thermodynamics, S.I. Edition, Cengage Learning.
- Y.R. Mayhew and G.F.C. Rogers, Thermodynamic and Transport Properties of Fluids, S.I. Units, Basil Blackwell.

17. The Topics:	**Lecturer's name**
week 1: Basic Concepts and Definitions **week 2:** Work and Heat **week 3:** First Law, Closed Systems **week 4:** Properties of a Pure Substance **week 5:** First Law, Open Systems **week 6:** Open and Closed Systems **week 7:** Second Law of Thermodynamics **week 8:** Thermodynamic Cycles **week 9 :** Simple Brayton cycle, Carnot's principle **week 10:** Property relations of entropy Isentropic efficiencies **week 11:** Energy entering the system **week 12 :** The equation of state for an ideal gas P-v-T surfaces for an ideal gas **week 13 :** enthalpy- thermodynamic properties **week 14:** Further Thermodynamic Cycles **week 15:** Review and Application	**Heersh Saleem Ahmed**

18. Practical Topics	
- Completion of Preliminary Work and Laboratory Analysis. - Demonstrated understanding of physical phenomena. - All lecture material up to the date of the test. - Understanding of application of theoretical thermodynamics to real world device. - All course content from weeks 1-15 inclusive.	
19. Examinations: All relative topics in both theory and practical, the student has to finish the entire requirement to meet the syllabus.	
20. Extra notes: The students should support themselves be able to solve and design project daily by them and not neglect the subject.	
21. Peer review: Attendance at all theory and laboratory experiments to which you are assigned is compulsory and a register is taken. If you are unable to attend, due to illness, it is important that you inform the head demonstrator as soon as possible so that you may be reassigned to a later experiment.	