



Course Code MENG-460	Course Title Compressible Flow	ECTS Credits 6
Department Engineering	Semester Fall, Spring	Prerequisites MENG-280, MENG-282
Type of Course Elective	Field Engineering	Language of Instruction English
Level of Course 1 st Cycle	Year of Study 4 th	Lecturer(s) Dr Marios Alaeddine
Mode of Delivery Face-to-face	Work Placement N/A	Co-requisites None

Objectives of the Course:

The main objectives of the course are to:

- Introduce students to the fundamental concepts and results for compressible flow dynamics.
- To develop the student's skills in applying essential concepts of compressible flow in real life engineering applications.
- To provide an understanding of analytical and computational methods in compressible flow problems.
- Understand concepts of isentropic and non-isentropic flows.
- Characterize rotational flow.

Learning Outcomes:

After completion of the course students are expected to:

- Understand compressible flow and why it is important.
- Comprehend the difference between incompressible and compressible flow.
- Recognize the phenomena taking place in compressible flows through pipes and nozzles under various conditions.
- Develop the ability to identify problems associated with complex flows.
- Perform flow rate calculations in compressible flows.
- Analyse and solve compressible flow shock waves and choked flow problems.
- Solve compressible flow with friction and pipe flow problems.

Course Contents:

- Revision of incompressible flow.
- Compressible flow, shock waves, choking flow, external flow.
- Energy equation, subsonic flow with friction in pipes.
- Speed of sound in ideal and perfect gases, real gas, in almost incompressible liquids and in solids.
- Isentropic flow through convergent/divergent nozzles.
- Flow regimes, critical pressure ratio and maximum flow rate.

- Stagnation state, Mach Number.
- Normal Shock, operating equations and analysis, moving shocks.
- Rayleigh flow.
- Oblique shock solution of Mach angle.
- Prandtl Meyer Function.
- Combination of Oblique shock and Isentropic.

Learning Activities and Teaching Methods:

Lectures, in-class examples and exercises

Assessment Methods:

Homework, mid-term exam, final exam

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
John D Anderson	Modern Compressible Flow 3 rd Edition	McGraw Hill	2002	0072424435

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Theodore Bergman Adrienne Lavine Frank Incropera David P.De Witt	Fundamentals of Heat and Mass Transfer 7 th Edition	Wiley	2011	0470501979