FLUID MECHANICS I (AEROSPACE ENGINEERING, POWER ENGINEERING)

EXPECTED CAPACITIES AFTER PASSING THE COURSE

Knowledge:

ECK1. Students knows theoretical foundations of fluid statics and kinematics.
ECK2. Student acquired basic knowledge on formulation of conservation laws for fluids, governing equations and determination of aero/hydrodynamic forces.
ECK3. Student acquired basic knowledge on the Newtonian fluid model, on the basic engineering methods for laminar and turbulent flows in ducts, and about concept and criteria of dynamic flow similarity.
ECK4. Student knows fundamentals theoretical facts and methods in the area of gas dynamics

Abilities:

ECA1. Student can solve simple problems in fluid statics.
ECA2. Using methods of algebra and analysis, student is able to compute kinematic characteristics of fluid motion..
ECA3. Student can solve simple flow problems using the Bernoulli equation.
ECA4. Student can determine aero/hydrodynamic reactions using an integral form of the linear momentum principle.
ECA5. Student is able to perform a simple analysis of flow similarity and to predict the form of the physical law using dimensional arguments.
ECA6. Student is able to solve simple problems in gas dynamics using energy equation, isentropic relations, or basic results concerning the normal shock wave.

VERIFICATION OF EXPECTED CAPACITIES. RULES OF PASSING THE COURSE.

Tutorial

Knowledge and practical abilities acquired during tutorial meeting are verified by **three** tests. During each test, students are asked to solve two basic and two advanced problems. The correct solution of the basic problems verifies achievement of certain expected capacities. (ECA1-ECA4).

The outcome of each test is evaluated as follows

Grade	Conditions for the grade
2	Solution of at least one basic problem is missing or incorrect
3	Both basic problems are solved correctly
4	As for 3 plus one advanced problem is solved correctly
5	All basic and advanced problems are solved correctly

Other grades like 3.5 or 4.5 may be admitted if partial solution (or solution with minor flaws) is presented.

The condition of passing the course is to achieve the positive grade (at least 3) from all three tests. These test will be organized twice during the winter semester: in a regular time defined

by a tutor and during the "marathon test" in the very end of the winter semester (just before the beginning of the winter examination session). The condition to be admitted for the examination is to pass at least two tests by the last day of the winter semester. One more correction test – giving opportunity to pass one (and only one) failed test – will be organized in the beginning of the spring session. Clearly, this extra test is only for students who passed two out of three tests during the winter semester.

Examination

Each student who passed **all 3 tutorial tests** by the end of the winter semester is eligible to participate in the final exam including the pre-session (0^{th} term) exam if organized. This exam will be organized twice during the winter session and one more time during the spring session terms. During each release of the exam, which lasts 90 minutes, students are asked to solve 6 basic and 4 advanced theoretical problems. The necessary condition of passing this part of the examination is to provide corrects solution to all basic problems (which guaranties the lowest positive grade, i.e., 3). The set of basic problems is design to verify whether all expected competences (not verifiable by the tutorial tests) have been acquired by a student. To obtain a higher grade, a student must additionally provide correct solution(s) to advanced problems; each such solution rises the final grade by 0.5.

REMARK 1: solving any of advanced problems will not be treated as compensation for the lack of solution for any basic problem unless otherwise stated.

The final grade form the FM1 Course is based in two partial grades – one from the tutorial and the other from the exam – accordingly to the following table

EXAM	3	3	3	3	3.5	3.5
	3.5	3	3.5	3.5	4	4
	4	3.5	4	4	4	4.5
	4.5	4	4.5	4.5	4.5	5
	5	4	4.5	5	5	5
		3	3.5	4	4.5	5
		TUTORIAL				

Didactic materials

Lectures are delivered in the form of electronic presentations (PDF slides). All presentations are available freely in the website

https://www.meil.pw.edu.pl/za/ZA/Dydaktyka/Fluid-Mechanics-1

Other materials could be distributed during the course, either via above link or other methods described by the lecturer or the tutor.