MODULE INFORMATION SHEET

Name of Module Unit	Fluid mechanics
Name in Polish language	Mechanika Płynów
Module type	compulsory / ~~elective~~
Form of studying	full-time day courses
Level of study	undergraduate course (B.Sc. level)
Type of study (for extra-mural courses)	-
Programme	Environmental Engineering
Speciality	Environmental Engineering
Responsible department	Department of Hydro-Engineering and Hydraulics
Responsible person	Dr inż. Apoloniusz Kodura

Semester	Lectures(E)	Tutorials	Laboratory	Computer Exercises	Projects	ECTS
3	30 (Exam)	15	-	-	-	4

Objectives (summary)

The first goal of this unit is to understand the phenomenon and basic rules of fluids' motion. The second one is practical application of knowledge of fluid mechanics in a field of analysis and hydraulics calculations of flows in pressure pipes, open channels and porous medium and by designing of machinery and installations that are used in environmental engineering.

Prerequisites

Mathematic at the level of the first year of studies (differentials, integrals, differential equations)
Physics (applied mechanics, elements of thermodynamics)

Rules of integrated grade setting

Integrated grade = 0.5 exam's grade + 0.25 tutorials' grade + 0.25 laboratory's grade.

Recommended readings

„Fluid mechanics and hydraulics", R.V. Giles, J.B. Evett, C. Liu, Schaum's Outline Series, McGraw-Hill, New York 1995,
2500 Solved Problems in Fluid Mechanics and Hydraulics. Evett J. B., Liu C. 1989.
Streeter V. L., Wylie B. E., Bedford K. W., 'Fluid Mechanics' 1998 New York, WCB McGraw-Hill

Contents of lectures (syllabus)

	Topics	Time (hrs.)	Scope (S / Ex)
1	A subject of fluid mechanics, basics definitions, properties of fluids, perfect, uncompressible and compressible fluids, forces in fluids. Interpretation of basic equations: equation of continuity, energy equation, motion equation.	2	S
2	Fluid statics. The basic equation of fluid's equilibrium and its application, barometers, piezometers and manometers. Hydrostatic force on surface: force exerted by liquid on a plane area, force exerted by liquid on a curved surface. Buoyancy and floatation.	4	S
3	Fundamentals of fluid flow. Dynamics of perfect liquid: Bernoulli theorem and its interpretation. Flow of real liquid – Reynolds experiment, laminar and turbulent flow.	2	S
4	Flow in closed conduits: local and linear energy loses, hydraulic calculations of single pipes, siphon, complex pipeline systems - pipes in series, pipes in parallel, branching pipes, pipes networks.	5	S
5	Pump in pipeline system.	2	Ex
6	Water hammer.	1	S
7	Flow in open channels, steady uniform flow, critical flow, sewage conduits.	3	S
8	Outflow from orifices, weirs.	2	S
9	Forces developed by moving fluids: impulse momentum principle, drag and lift of bodies in fluids.	1	S
10	Selected problems of compressible fluids.	2	S
11	Low pressure gas piping.	1	Ex
12	Flow in porous medium, Darcy theorem, filtration coefficient, wells.	2	S
13	Unisothermal flow in pipes - energy losses.	1	Ex
14	Venturi phenomenon. Measurement of velocity and flow of fluids.	2	Ex
	Total	**30**	**hours**

S – topics listed in the legal study programme standards from 12.07.2007
Ex – extended topics

Lecturers

dr inż. Apoloniusz Kodura

Assessment method

Exam

Contents of tutorials

	Topics	Time (hrs.)	Scope (S / Ex)
1	Law of communicating vessels. Manometers. Pascal theorem.	2	S/Ex
2	Charts of hydrostatic force on surface. Analytic methods of calculation of hydrostatic force on surface. Stability of submerged and floating bodies.	2	S
3	Hydraulic estimation of flow in single closed conduits.	2	S
4	Pump cooperation with pipeline.	2	Ex
5	Hydraulic estimation of flow in complex pipelines systems, pipes networks..	3	S
6	Steady flow in open channels, sewage channels.	2	S
7	Colloquium	2	-
	Total	**15**	**hours**

S – topics listed in the legal study programme standards from 12.07.2007
Ex – extended topics

Persons responsible for tutorials

dr inż. Apoloniusz Kodura

Assessment method for tutorials

Compulsory presence, obtaining minimum 50% points for colloquium and 50% points for each of two homework tasks. Students may take colloquium twice (regular and repeated chance).