Course Syllabus

Academic year: 2018-2019

Institution	University of Petroşani
Faculty	Mechanical and Electrical Engineering
Field of study	Industrial engineering
Level	Bachelor
Program of study	Machine Building Technology

Course	**Fluid mechanics and hydraulic machines**
Code	2BB5OD35
Year of study (semester)	III (V)
Number of hours	70
Number of credits	6
Professor	Assoc. Prof., Ph.D. DOȘA Ion

No.	Topic
1.	Introduction. The notion of fluid. Continuity hypothesis. Systems of measurement units. Dimensional analysis and similarity
2.	Dimensional analysis and similarity. Physical properties of fluids.
3.	Physical properties of fluids
4.	Transport phenomena
5.	Statics of fluids. The state of tension in a fluid in equilibrium. Solidification principle. Euler's equations in statics of fluids. Law of variation of pressure in a fluid in equilibrium.
6.	Consequences of equilibrium equations. Law of variation of pressure in a fluid in equilibrium in the hypothesis of zero mass forces. Consequences of the hydrostatic law. Law of variation of pressure in a gas in the gravitational field. The Law of Variation of Atmosphere Temperature with Altitude.

7.	Energy interpretation of hydrostatic law. Geometric interpretation and graphic representation of hydrostatic law. Pressure diagrams.
8.	Fluid-static forces. Pressure forces on flat surfaces. Steiner's theorem. Pressure forces on open curved surfaces. Pressure forces on closed curved surfaces. The principle of Archimedes. Determining the volume of a body by weighing.
9.	Floating bodies. Floating stability. Calculation of metacentric distance. Densitimeter.
10.	Relative balance of fluids. Relative equilibrium of a liquid in a vessel in rotation around a vertical axis.
11.	Relative equilibrium of a liquid in a trained vessel in a translation motion. Fluid kinematics. Kinematic parameters and representation methods. Lagrange, Euler representation.
12.	Substantial derivative or Stokes derivative. Characteristic notions and sizes for describing the state of fluid movement. Flow rate, average speed.
13.	Speed rotor, rotary movement and movement. The Stokes theorem. Motion to deform a fluid particle. Equation of continuity. Continuity equation for a current tube.
14.	Dynamics of perfect fluids. Equations of perfect fluid movement. Euler's equations. Bernoulli's equation for a perfect fluid. The geometrical interpretation of Bernoulli's equation.
15.	The fundamental equation of turbomachines. Applications of Bernoulli's equation for a perfectly incompressible fluid
16.	The impulse of a fluid. The impulse theorem. Moment momentum impulse. Consequences of the impulse theorem and momentum impulse theorem
17.	Navier-Stokes equations. Flow of fluids. Load losses in fluid systems.
18.	Getting Hydraulic Machines. Equation of energy at pumps.Scheme of pumping installations. Centrifugal and axial pumps. Components and construction types. Single-stage centrifugal pump. Multi-stage centrifugal pump. Other types of pumps.
19.	Hydraulic machines. The fundamental equation of turbomachines. Hydraulic machines. Power and yields. Hydraulic machines. Characteristic curves at constant speed. Similarity of pumps. Specific speed of pumps.
20.	Operation of pumps in the network. Operating point. Coupling the pumps. Pumps coupled in parallel. Pumps coupled in series. Alternative volumetric pumps. Piston

	pumps. Motor fluid pumps. Ejector. Compressed gas pump.
21.	Hydraulic turbines. Classification of hydraulic turbines. Turbina Pelton. Turbina Francis. Turbina Kaplan. Turbina bulb. Turbina Deriaz-Kviatkovski. Adjustment of hydraulic turbines.