Course: Fluid mechanics (KI)		
Language: English		
Lecturer: Gordana Matijašić, Jasna Prlić Kardum		
TEACHING	*WEEKLY*	*SEMESTER*
Lectures	2	30
Laboratory		
Seminar	1	15
		Overall: 45
		ECTS: 5

PURPOSE: Acquiring knowledge of the mechanical behaviour of fluids. Description of macroscopic phenomena due to practical applications in chemical process and related industries.

THE CONTENTS OF THE COURSE:

Week 1
Introduction to fluid mechanics. Forces in the fluid.

Week 2
Rheological characterization and fluid classification. Newtonian fluids. Newton's law of viscosity. Non-Newtonian fluids.

Week 3
Mathematical description of rheological behaviour. Time dependent rheological behaviour. Rheological diagram. Calculation examples.

Week 4
Pressure and fluid statics. Pascal's law for pressure at a point. Euler equation. Manometers. Calculation examples.

Week 5
Fluid kinematics. Lagrangian and Eulerian descriptions. Dynamics of incompressible fluids. Conservation laws. Calculation examples.

Week 6

Navier-Stokes equation. Approximate solutions of the Navier–Stokes Equation. Calculation examples.

Week 7
Elementary fluid dynamics of non-Newtonian fluids. Flow of pseudoplastic and Bigham fluids in horizontal pipes; velocity distribution; pressure drop; definition of Reynolds number and friction factor. Calculation examples. I

Week8
Flow through narrow orifices; cavitation; flow from tank with maintained constant and variable fluid level. Calculation examples.

Week9
Partial exam I

Week10
Fluid transport. Classification of pumps; scheme, characteristics, selection criteria and pump design. Calculation examples.

Week 11
Complex pipelines. Fundamental energy principles for transport through branched pipelines, resistance factor of pipe fittings, evaluation of flow rate and pressure drop. Calculation examples.

Week 12
Flow of compressible fluids in conduits; definition of ideal gas. Conservation laws. Equation of state. Calculation examples.

Week 13
Isothermal and non-isothermal flow of an ideal gas in horizontal pipe; evaluation of pressure drop. Calculation examples.

Week 14

Two-phase flow (gas-liquid). Fundamentals, flow types in horizontal pipe, methods for prediction of flow type, evaluation of pressure drop. Calculation examples.

Week 15
Partial exam II

GENERAL AND SPECIFIC COMPETENCE: Acquiring knowledge of the principles of fluid behaviour necessary to understand fundamental chemical engineering courses.

KNOWLEDGE TESTING AND EVALUATION: 2 partial exams. Students who do not achieve minimum points through partial exams have to complete the written and oral exam.

MONITORING OF THE COURSE QUALITY AND SUCCESSFULNESS: Student survey.

LITERATURE:

B. S. Masey, Mechanics of Fluids, 2nd Ed., Butler&Tanner, London, 1976.

D. N. Roy, Applied Fluid Mechanics, J. Wiley, New York, 1989.

J. Ferguson, Z. Kemblowski, Applied Fluid Rheology, Elsevier, London

I. H. Shames, Mechanics of Fluids, 4tf Ed., Mc Graw-Hill Companies, New York, 2003.

I. P. Granet, Fluid Mechanics for Engineering Tehnology, Simon&Schuster, New York, 1989.

B. R. Munson, D. F. Young, T. K. Okiishi, Fundamentals of Fluid Mechanics, 5th Ed.,J. Wiley&Sons. Ltd., 2005