

Study Programme: Energy And Process Engineering			
Course Unit Title: Pumps and Fans			
Course Unit Code: M3321			
Name of Lecturer(s): Tašin Slobodan, Bikić Siniša			
Type and Level of Studies: bachelors			
Course Status (compulsory/elective): compulsory			
Semester (winter/ summer): summer			
Language of instruction: english			
Mode of course unit delivery (face-to-face/distance learning): face-to-face			
Number of ECTS Allocated: 6			
Prerequisites: none			
Course Aims: Acquiring basic knowledge necessary for designing and application of rotodynamic pumps and fans			
Learning Outcomes: Designing, application, exploitation and maintenance of rotodynamic pumps and fans			
Syllabus. Definition and classification of hydro and pneumatic machines; typical appearance of centrifugal, mixed-flow and axial pumps and fans; basic parts of pumps and fans; performance characteristics of pumps and fans: flow rate, head, shaft power, efficiency, NPSH (pumps); experimental determination of performance characteristics; affinity laws; dimensionless characteristics; cavitation in pumps; flow control; stability of operation; operation in parallel or in series; start-up and shut-down of pumps; general (four-quadrants) characteristics of pumps; flow kinematics and velocity triangles; Euler`s equation for turbomachinery; secondary flow; part-load and over-load operation; axial force; linear (one-dimensional) theory; one-dimensional calculation of centrifugal impellers; calculation of hydraulic stator components of centrifugal pumps; calculation of mixed-flow impellers; planar hydrofoil and airfoil cascades; calculation of axial impellers; differences between pumps and fans; novelties in theory and practice of rotodynamic machines.			
Required Reading: Relevant literature in English, tbd			
Weekly Contact Hours: 2	Lectures: 3	Practical work: 2	
Teaching Methods: Lectures: combination of modern (presentations, simulations) and classic (chalk and blackboard, physical models) Numerical practice: (10 weeks): numerical and graphical problems, computer aided calculation and design of hydraulic parts of pump using one-dimensional theory. Laboratory practice (5 weeks). experimental determination of performance characteristics of centrifugal and axial pump on laboratory test stands.			
Knowledge Assessment (maximum of 100 points):			
Pre-exam obligations	points	Final exam	points
Attendance			
Computer exercises			
Tests (4x)			

