UNIVERSITY OF NIŠ

Course Unit Descriptor	Faculty	Faculty of Mechanical Engineering

GENERAL INFORMATION			
Study Program	Mechanical Engineering		
Study Module (if applicable)	Energetics and Process Techniques		
Course Title	Numerical simulation of fluid flow		
Level of Study	☐ Bachelor	☐ Master's	☒ Doctoral
Type of Course	☐ Obligatory	☒ Elective	
Semester	☒Autumn	☐Spring	
Year of Study	II		
Number of ECTS Allocated	10		
Name of Lecturer/Lecturers	Dragiša D. Nikodijević, Miloš M. Jovanović		
Teaching Mode	☒ Lectures	☐ Group tutorials	☒ Individual tutorials
	☐ Laboratory work	☒ Project work	☐ Seminar
	☐ Distance learning	☐ Blended learning	☐ Other

Purpose and Overview (max. 5 sentences)

To gain new knowledge in the field of numerical simulations of fluid flow. To enable students to independently use CFD software. Carry on the experience in using CFD softwares.

Syllabus (brief outline and summary of topics, max. 10 sentences)

1) Concept of software for numerical simulation of fluid flow: Formulation od physical model of the process. Formulation of mathematical diferential model of the process. Formulation of numerical model of the process. Calibration and validation of the model. 2) Structures of modern software for numerical fluid mechanics: Basic structure. Functional elements od preprocesing. Generating numerical mesh, control volume types, density criterion and numerical solution independence of the generated mesh. 3) Defining physical values, boundary conditions, initialization, defining of numerical parameters, defining of output data. 4) Functional elements of procesor (choosing the flow model, type of solver, monitoring of solution convergence, solution convergence criterion). 5) Steady and unsteady numerical simulation of fluid flow, boundary conditions, initial conditions, time step, dynamics of process, models). 6) Functional elements of postprocesor (formats of output data, graphical postpocesing). Representation of results (figures and diagrams). Creating of animations based on obtained numerical results. 7) Numerical simulations of fluid flow: Two dimensional and three dimensional geometrical domains. Simulations od laminar and turbulent fluid flow. Problems of flow around bodies. Attaching different flow domains, modeling of contact surfaces. Changing the flow domain, moving domains, changing of numerical mesh. Simulations of unsteady flow processes, simulations of compressible fluid flows, shock waves. Simulation of fluid flow in rotational domains. Two-phase flow models – cavitation (valves and flow around the stationary surfaces).
8) Accuracy of numerical simulations. Optimal choice of the model. Choice of the solver, discretization scheme and algorithm. 9) Advantages and disadvantages of numerical simulations. Research costs.

Language of Instruction

☒Serbian (complete course) ☐ English (complete course) ☐ Other _____ (complete course) ☒Serbian with English mentoring ☐Serbian with other mentoring _____			
Assessment Methods and Criteria			
Pre exam Duties	**Points**	**Final Exam**	**Points**
Lecture (participation)	**5**	**Written Examination**	**0* (50)**
Homework	**5**	**Oral Examination**	**Max. 50**
Project work	**40**	**Overall Sum**	**100**
*** Refers to students who have already gained points by completing pre-exam requirements**			