	UNIVERSITY OF EAST SARAJEVO Faculty of Technology Zvornik	
	Study programme: *Chemical Engineering and Technology*	
	Cycle I / Year III	

Course title	PROCESS MODELING AND SIMULATION
Department	Department for Process Engineering – Faculty of Technology Zvornik

Course code	**Course status**	**Semester**	**ECTS**
04-1-028-5	Compulsory	V	5

Teacher	Goran Tadić, PhD, Full Professor
Teaching assistant	Goran Tadić, PhD, Full Professor

Number of classes/ teaching workload (per week)			**Individual student workload (in hours per semester)**			**Student workload coefficient S_o**
Lectures	**Auditory exercises**	**Laboratory exercises**	**Lectures**	**Auditory exercises**	**Laboratory exercises**	**S_o**
2	0	2	45	0	45	1.50
2*15 + 0*15 + 2*15 = 60 hours			2*15*1.5 + 0*15*1.5 + 2*15*1.5 = 90 hours			
Total course workload 60 + 90 = 150 hours per semester						

Learning outcomes	After finishing the course, students will be able to: 1. form mathematical models of simpler chemical engineering problems and choose appropriate methods for solving them; 2. recognize and understand the applied approach in modeling and the level of detail of the mathematical description for the corresponding chemical engineering system; 3. create MATLAB programs for solving mathematical models and simulating chemical processes; 4. use the CHEMCAD process simulator for chemical process simulation; 5. analyze the results obtained according to the set models and compare and differentiate the results of simulations obtained using different programs.
Prerequisites	No prerequisites
Teaching methods	Lectures, exercises, work in the computer laboratory, seminar paper, mid-term tests (colloquia).
Syllabus outline per week	1. Introduction. Chemical processes modeling. Methodological principles of mathematical modeling. 2. System analysis. Process analysis and synthesis. Process simulation. 3. Model construction and classification. 4. Number of degrees of freedom of the chemical-technological system. Algorithm of the mathematical model of the chemical-technological system. 5. Models based on physical-chemical principles. General forms of some basic physico-chemical laws and definitions. 6. Derivation of models based on transport phenomena. Molecular description. Models of microscopic description. 7. Multiple gradient models. Maximum gradient models. 8. Models of macroscopic description. 9. Models of complex systems. Derivation of mathematical models of complex systems using system analysis. Block diagrams. 10. Decomposition of large-scale systems. Graphs and Boolean matrices. 11. Process simulation methodologies. Program modules. Software packages and simulators. Matlab. 12. Specialized simulators for chemical processes - Chemcad 6.0. 13. Specialized simulators for chemical processes - Chemcad 6.0. 14. Process optimization. Formulation of the problem. The objective function. 15. Classification of chemical process optimization methods. Method of general search. Analytical optimization methods. Mathematical programming – basic concepts. Mid-term tests are taken after the 8th week and the 15th week. Semester verification is required after the 15th week.
Obligatory reading	

Author	Title, publisher	Year	Pages
Tadic, G.	Mathematical modeling and simulation of chemical processes	2017	1-233
Additional reading			
Author	**Title, publisher**	**Year**	**Pages**
Savković- Stevanović , J.	Process modeling and simulation, Faculty of Technology and Metallurgy, Belgrade	1995	1-100
Ahmetović, E.,Tadic, G.	Sustainable technologies and chemical industry, Design and modeling of sustainable industrial processes, Faculty of Technology, Novi Sad	2013	67-99
Suljkanović, M., Ahmetović, E.	Analysis and simulation of chemical processes-situational approach, Faculty of Technology, Tuzla	2007	1-322
Peruničić, M.	Mathematical modeling of technological processes, Faculty of Technology, Banja Luka	2001	1-157
Gilat, A.	MATLAB: An Introduction with Applications, John Wiley&Sons	2008	1-357
Rasmuson, A., Andersson, B., Olsson, L., Andersson, R.	Mathematical Modeling in Chemical Engineering, Cambridge University Press, Cambridge	2014	1-167
Seider, W.D., Seader, J.D., Lewin, D.R.	Process Design Principles, John Wiley&Sons, Inc., New York	1999	1-548
Himmelblau, D.M., Riggs, J.B.	Basic Principles and Calculations in Chemical Engineering, Prentice Hall	2012	1-589
Luyben, W.L.	Process Modeling, Simulation, and Control for Chemical Engineers, McGraw-Hill, New York	1996	1-710
Westerberg, A.W.	Process flowsheeting, Cambridge University Press, Cambridge	1979	1-240

	Type of student evaluation	Grade points	Percentage
Obligations, assessment methods and grading system	Pre-exam obligations		
	Attendance	6	6 %
	Seminar paper	14	14 %
	Mid-term test (Colloquium) 1	25	25%
	Mid-term test (Colloquium) 2	25	25%
	Final examination		
	Final examination (oral)	30	30 %
	Total	100	100 %
Web page	www.tfzv.ues.rs.ba		
Date	2023		