NAME OF THE COURSE	Business process simulation					
Code	EUB312	Year of study	1			
Course teacher	Fullprofessor Mario Jadrić, PhD Associate professor Marko Hell, PhD	Credits (ECTS)	5			
Associate teachers	Tea Mijač,PhD	Type of instruction (number of hours)	L	S	E	F
			26		26	
Status of the course	Compulsory	Percentage of application of e-learning	40%			

COURSE DESCRIPTION	
Course objectives	Get a complete insight into the methodologies, methods, techniques and tools needed to effectively simulate business processes. Develop students' ability for the use of specific tools for discrete and continuous simulation of business processes.
Course enrolment requirements and entry competences required for the course	There are no prerequisites for enrollment.
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Critically evaluate the methodologies, methods, techniques and tools needed for effective simulation modeling of business processes. 1. Justify the choice of a computer simulation type and the simulation model for business process modeling. 2. Review the use of queuing theory and distributions of random variables in simulation modeling. 3. Critically evaluate the process of discrete simulation modeling, simulation experiment planning, and simulation results analysis. 4. Critically evaluate simulation what-if business scenarios based on the concept of system dynamics. 5. Evaluate the basic functionalities of discrete-event and system-dynamic simulation modeling tools.

Course content broken down in detail by weekly class schedule (syllabus)

Lectures		**Exercises:**	
Topic	**Hours**	**Topic**	**Hours**
Presentation of the course and planned activities.	2	**Assignment.** Introduction to simulation tools for discrete event simulation.	2
Modeling of complex systems. Concept of simulation.	2	**Assignment.** Discrete-event simulation modeling using ARENA.	2
Approaches to simulation modeling. Types of computer simulation.	2	**Assignment.** Discrete-event simulation modeling using ARENA.	2

	The selection of simulation models.	2	**Assignment.** Discrete-event simulation modeling using ARENA.	2
	Business processes and simulation modeling.	2	**Assignment.** Discrete-event simulation modeling using ARENA.	2
	Projects of simulation modeling. Choosing a process for simulation modeling.	2	**Assignment.** Discrete-event simulation modeling using EXTEND.	2
	Theory of queues. Distribution of random variables for simulation modeling.	2	**Assignment.** Discrete-event simulation modeling using EXTEND.	2
	Test			
	Discrete event simulation. Construction of discrete simulation model.	2	**Assignment.** Discrete-event simulation modeling using EXTEND. Introduction to simulation tools for discrete event simulation (ARIS).	2
	Planning simulation experiments. Analysis of simulation results.	2	**Assignment.** Discrete-event simulation modeling using EXTEND. The final assignments.	2
	Concepts of business process management and simulation modeling.	2	System dynamic modeling using PowerSim tool.	2
	The methodology of system dynamics. Diagrams of the system dynamics.	2	**Assignment.** System dynamic modeling using PowerSim tool.	2
	The archetypes of the system dynamics. The construction of the model.	2	System dynamic modeling using PowerSim tool.	2
	Business process modeling and system dynamics. Critical reviews and presentations of scientific papers in the field of business processes simulation.	2	**Assignment.** System dynamic modeling using PowerSim tool. The final assignments.	2
	Test			

Format of instruction	x lectures ☐ seminars and workshops x exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	x independent assignments x multimedia ☐ laboratory ☐ work with mentor x teamwork assignment
Student responsibilities	The course work can be described as a method of continuous student progress evaluation since a model of accumulation of points has been formulated which enables the student to collect points through various activities. The goal is that every student collects sufficient number of points corresponding to a grade during the semester. In this model, a low result in one activity can be compensated by	

	points in other activities and enabling students to decide how to allocate their efforts. Requirement for taking the test: 4 out of 7 assignments completed for the first test, and 2 out of 4 for the second test. Requirement for the exam: completed all assignment on the exercises, completed final assignment as well as participating in at least 50% of all class meetings (25% for the part-time students).

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	1,7	Research		Practical training	
	Experimental work		Report		Final assignment (Other)	1 ECTS
	Essay	0,7	Seminar essay		(Other)	
	Tests	1,5	Oral exam		(Other)	
	Written exam		Project		(Other)	

Grading and evaluating student work in class and at the final exam	Requirements for the exam exemption: a total of 71 points achieved overall based on the tests, assignments, and homework during the semester. Through additional engagement and active participation (for example by submitting critical review of the book chapters and coursework), the student can get up to 16 bonus points. In the case of exam exemption, the score is based on the total number of points where every five points give a higher grade. Up to 10 points can be achieved in the oral part of the exam. Threshold and related grades: 0-70 insufficient (1) 71-75 sufficient (2) 76-80 good (3) 81-85 very good (4) 86-100 excellent (5) If a student does not have enough points from the assessment activities during the semester, he or she is required to take the final exam. The final exam can be organized in a written and/or oral way. The questions in the exam are of the essay-type.

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	Garača, Ž.(Ur.), Simulacija poslovnih procesa, Ekonomski fakultet Split, Skripta, 2023-2024		Moodle
	Getting started with ArenaDatoteka - Arena Users Guide, Rockwell Software, 2019		Moodle
	OptQuest for Arena - Arena Users Guide Rockwell Software, 2019.		Moodle
	ExtendSim Quick Start Guide, Discrete event, Imagine That Inc, 2018.		Moodle

Optional literature (at the time of submission of study	Papers:

programme proposal)	• Kekez, Ivan; Jadrić, Mario; Ćukušić, Maja, Demonstration Potential of Simulation Modelling in the Urban Mobility Domain // Proceedings of the 16th International Symposium on Operational Research in Slovenia, SOR'21. • Jadrić, Mario; Ninčević Pašalić, Ivana; Ćukušić, Maja, Process Mining Contributions to Discrete-event Simulation Modelling // Business systems research, 11 (2020), 2; 51-72 doi:10.2478/bsrj-2020-0015 • Jadrić, Mario; Mijač, Tea; Ćukušić, Maja, Text Mining the Variety of Trends in the Field of Simulation Modeling Research // Perspectives in Business Informatics Research. BIR 2020. Lecture Notes in Business Information Processing, vol 398. / Springer, 2020. • Jadrić, Mario; Ćukušić, Maja; Pavlić, Dino, Review of Discrete Simulation Modelling Use in the Context of Smart Cities // Proceedings of 43rd International Convention MIPRO 2020 / • Jadrić, Mario, FRAMEWORK FOR DISCRETE-EVENT SIMULATION MODELING SUPPORTED BY LMS DATA AND PROCESS MINING // Proceedings of the 15th International Symposium on Operational Research SOR'19 • Pavlić, Dino; Jadrić, Mario; Ćukušić, Maja: Discrete Simulation Modeling of Intelligent Passenger Boarding // mipro proceedings / Skala, Karolj (ur.). Rijeka: Croatian Society for Information and Communication Technology, Electronics and Microelectronics - MIPRO, 2018. str. 1462-1467 • Hell, M.; Petrić, L. System Dynamics Approach to TALC Modeling. *Sustainability* **2021**, *13*, 4803. • Kvasina, A., Mijač, T. & Hell, M. (2021) Developing System Dynamics Model for Waste Management in Tourism-Oriented Smart City. U: Drobne, S. (ur.)Proceedings of the 16 th International Symposium on Operational Research in Slovenia.
Quality assurance methods that ensure the acquisition of exit competences	Monitoring attendance and performance of other student obligations (teacher) Teaching Supervision (Vicedean for Teaching) Analysis of the success of studies in all subject studies (Vicedean for Teaching) Student Survey on the Quality of Teachers and Teaching for Each Subject Study (UNIST, Center for Quality Improvement) The exam conducted by the subject teacher examines all learning outcomes of the subject. Periodic examination of the content of the exam is conducted on the basis of which the appropriateness of the method of checking the learning outcomes (Vicedean for Teaching)
Other (as the proposer wishes to add)	