1.	Course Title	Software defined networks
2.	Code	F18L3W160
3.	Study program	Software engineering and information systems
4.	Study Program Organizer	Faculty of Computer Science and Engineering
5.	Degree (first, second, third cycle)	first cycle
6.	Academic year / semester 4 / winter / optional	7. ECTS credits 6
8.	Teacher	associate professor SoNja Filiposka
9.	Course enrollment prerequisites	Компјутерски мрежи и (Веб прогрмирање или Интернет технологии или Имплементација на системи со отворен и слободен код)

10.	Course program goals (competencies): Upon completion of the course, the student will understand the architecture of software defined networks and network function virtualization. He/she will have knowledge on software access to networks, converged networks technologies, and the separation of the control and data plane, as well as hardware from the software.

11.	Course program content: Separating the control and data plane, hardwware and software solutions. Fundamentals of SDN and NFV, architecture, protocols. Configuration modes, API communication. SDN controller design, using and configuration of SDN controllers. SDN abstraction, protocol independent forwarding, composition and forwarding tree, verification, network changes. Practical use cases for NFV and SDN. Traffic engineering. Wireless networks solutions. Virtuelization. Whitebox switching. OVS. Error tolerance, SDN and NFV security. End node control, middleboxes. Next steps in the programmable networks evolution. Data networks industry development.

12.	Learning methods: Lectures using presentations, interactive lectures, exercises (using equipment and software packages), teamwork, case studies, invited guest lecturers, independent preparation and defense of a project assignment and seminar work.

13.	Total available time	6 ECTS x 30 hours = 180 hours
14.	Distribution of the available time	30 + 45 + 15 + 15 + 75 = 180 hours

15.	Teaching activity forms	15.1.	Lectures – theoretical teaching	30 hours
		15.2.	Exercises (laboratory, auditory), seminar papers, teamwork	45 hours
16.	Other activity forms	16.1.	Project Tasks	15 hours
		16.2.	Independent Learning Tasks	15 hours
		16.3.	Home learning	75 hours

17.	Assessment methodology	
17.1.	Tests	10 points
17.2.	Seminar paper/project (presentation: written and oral)	10 points
17.3.	Activity and learning	10 points
17.4.	Final exam	70 points

18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)
		51 to 60 points	6 (six) (E)
		61 to 70 points	7 (seven) (D)
		71 to 80 points	8 (eight) (C)
		81 to 90 points	9 (nine) (B)
		91 to 100 points	10 (ten) (A)
19.	Course completion and final exam requirements	Realized activities 15.1 and 15.2	
20.	Teaching Language	Macedonian and English	
21.	Teaching quality evaluation method	Internal evaluation mechanisms and questionnaires	

22.	Course Material

22.1.	Mandatory course material

No.	Author	Title	Publisher	Year
1	Patricia A. Morreale, James. M. Andreson	Software Defined Networking: Design and Deployment	CRC Press	2015
2	Asoke Talukder, Nuno Garcia, Jayateertha	Convergence Through All IP Networks	Pan Stanford Publishing	2013

22.2.	Additional course material

No.	Author	Title	Publisher	Year