1.	Course title	**Information processing in biological systems**		
2.	Course code	InIS-Ro-03		
3.	Study program	Intelligent Systems Engineering		
4.	Unit offering the course	**FCSE**		
5.	Undergraduate/master/PhD	**Master**		
6.	Year/semester 1(2)/winter/mandatory	7. ECTS: **6**		
8.	Teacher(s)	Nevena Ackovska, Marija Mihova		
9.	Course prerequisites	None		
10.	Goals (competences): The living systems are the most complex systems known to man and as such represent constant interest in bio-medical as well as engineering sciences. This course describes the sub-systems and the components of the living systems and their communication. It gives insight to the modeling if the living systems, tools for systems' modeling and the communication on the nano, micro and macro level. Generating, transmitting and processing the signals and information they carry in the living beings is the core of this course. Upon completion of this course the students should be able to: • understand the bio-molecular specificity of the living organisms, • envision the influence of the abstraction and modelling of living systems and their sub-systems • be able to model the processing of the signals in the living beings. • understand the way of transmitting the information to and through the living systems • critically discuss and research the key concepts of communication and information transfer in the living beings.			
11.	Course contents: Genetic system. Processing information in the genetic system. Modelling of the cellular level – prokaryotes and eukaryotes. Transmission and processing information on cellular level. Cell groups, tissues, organs. Modelling of functional cell groups. Organism. Modelling organisms. Transmission and processing information in organism level. Populations. Population's dynamics. Evolution. Information transfer and processing on population level. Systems with different entities – ecosystems. Modelling population's interactions. Transfer and information processing on ecosystems' level.			
12.	Teaching methods: Lectures supported by slide presentations, interactive lectures, trainings (using lab equipment and software packages), team work, case studies, invited guests and lectures, individual practical assignments presentations, seminar paper, e-learning (forums, consultations).			
13.	Total available time	6 ECTS x 30 hours = 180 hours		
14.	Distribution of the available time	30+30+40+40+40 = 180 hours		
15.	Teaching activities	15.1.	Lectures	30 hours

		15.2.	Training (labs, problem solving), seminar and team work	30 hours
16.	Other activities	16.1.	Project work	40 hours
		16.2.	Self study	40 hours
		16.3.	Home work	40 hours

17.	Grading		
	17.1.	Tests	20 points
	17.2.	Seminar work/project (written or oral presentation)	70 points
	17.3.	Active participation	10 points

18.	Grading criteria	to 59 points	5 (five) (F)
		from 60 to 68 points	6 (six) (E)
		from 69 to 76 points	7 (seven) (D)
		from 77 to 84 points	8 (eight) (C)
		from 85 to 92 points	9 (nine) (B)
		from 93 to 100 points	10 (ten) (A)
19.	Final exam prerequisites	Successfully completed activities 15.1 and 15.2	
20.	Course language	Macedonian and English	
21.	Quality assurance methods	Internal evaluation and student questionnaires	

22. Literature

22.1. Compulsory

No.	Authors	Title	Publisher	Year
1	Amine Naït-Ali	Advanced Biosignal Processing	Springer	2009
2.	Vladimir B. Bajić, Tin Wee Tan	Information Processing And Living Systems	Imperial College Press	2005

22.2. Additional

No.	Authors	Title	Publisher	Year
1.	Gennaro Auletta	Cognitive Biology: Dealing with Information from Bacteria to Minds	Oxford University Press	2011
2.				
3.				