NAME OF THE COURSE	Biology of Aging					
Code	PMB713	Year of study	1			
Course teacher	Miroslav Radman, PhD, Professor	Credits (ECTS)	4			
Associate teachers	Anita Krisko, PhD, Research Associate Branka Bernard, PhD, Research Associate Francois-Xavier Pellay, PhD, Sanja Radman, PhD	Type of instruction (number of hours)	L	S	E	F
			30		20	
Status of the course	Mandatory	Percentage of application of e-learning				
COURSE DESCRIPTION						
Course objectives	The goals of the course are to provide a foundation of the fundamental concepts and terminology of aging, to promote critical thinking of the molecular consequences of aging and to familiraze students with experimental methods in the study of aging.					
Course enrolment requirements and entry competences required for the course	None					
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After passing the exam student will be able to: • Understand process of aging at different scales • Understand molecular mechanisms of aging in physiological and pathological envirronment • Evaluate the use of different experimental models to study aging • Explain what is protein carbonylation and its role in process of ageing • Independently perform methods for quantification of protein carbonylation • Understand the proces of the occurance of protein aggregates and explain their role in process of ageing					
Course content broken down in detail by weekly class schedule (syllabus)	**Lectures:** 1. Introduction course (2H): An overall view of the courses and definition of the biology of aging at different scale. 2. Evolution of Aging (2H): Overview of all the main theory that explain how aging and lifespan have evolved in animals. 3. Comparative Biology of aging (2H): Presentation of the landscape of lifespan in various species and how their comparison leads to a better understanding of mechanisms of aging. Importance in the choice of aging model organisms. 4. Aging at the population scale (1H): Understanding of the demographics as a tool to study aging and introduction to the Gompertz curve. Importance of age in all cause of death in developed countries.					

	5. Aging at the organism scale (1h): Description of normal and pathological aging, from increased frailty and decrease fitness to the extreme case of progeria.
	6. Aging at the organs and system scale (2H): Overview of physiological aging with a focus on immune system aging and inflammaging and its overall consequences.
	7. Aging at the Cellular and Molecular Level
	8. DNA damage Part 1 : Telomere and telomerase (2H)
	9. DNA damage Part 2 : Mutation, DNA oxidation and consequences (2H)
	10. Proteostasis part 1: Importance of protein damage in aging (2H)
	11. Proteostasis part 2: (2H)
	12. Mitochondria and aging part 1: The Mitochondrial Free radical Theory of aging (2H) : Overview of one of the main mechanistic theory of aging and the role of ROS in cellular degeneration.
	13. Mitochondria and aging part 2: Mitochondrial aging and recycling (2H): Other aspects of the role of mitochondria in aging and importance of mitophagy and mitochondrial selection.
	14. Role of degradation mechanisms part 1: Autophagy and lysosome(2H)
	15. Importance of degradation pathways and their failure with age and importance of autophagy and lysosome as main degradation mechanisms.
	16. Role of degradation mechanisms part 2: UPR and proteasome(2H): Focus on protein degradation with description of the UPR as a master regulator of proteostasis and role of the proteasome.
	17. Aging Pathologies (2H): Description of the main age related pathologies with a focus on neurodegeneration and the role of protein damage.
	18. Anti-aging approaches (2H): Overview of all the main anti-aging strategies developed currently to slow, stop or even reverse the aging process.
	Exercises:
	1. Methods for detecting and quantifying protein carbonylation: 1D oxy blot (4H)
	2. 2D OxiDIGE – method for detecting of differential protein carbonylation: students will perform all experimental steps as well as analyze data using the custom developed software (10H)
	3. With mentoring: students will design a project regarding aging and age-related diseases (6H)
Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐ independent assignments ☐ multimedia ☐ laboratory ☐ work with mentor ☐ (other)
Student responsibilities	Students will have to attend lectures and exercises regularly. They are expected to be active during the cours so that they are prepared for lectures (elaboration of basic literature), prepared for exercises, finish successfully the exercises, and to critically discussion thematic units to be covered.	

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	Research		Practical training	1
	Experimental work		Report		(Other)	
	Essay		Seminar essay		(Other)	
	Tests	2	Oral exam		(Other)	
	Written exam		Project		(Other)	
Grading and evaluating student work in class and at the final exam	Attendance, evaluation of student seminars and exercises as well as the results of the written test are included in the overall final grade.					
Required literature (available in the library and via other media)	**Title**				**Number of copies in the library**	**Availability via other media**
	Biology of aging, internal script					
Optional literature (at the time of submission of study programme proposal)	Original and review scientific articles.					
Quality assurance methods that ensure the acquisition of exit competences	Analysis of the quality of teaching by students and teachers Analysis of the exam results					
Other (as the proposer wishes to add)						