

Subject card

Subject name and code	Population genetics, PG_00179660						
Field of study	Environmental Protection						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2027/2028		
Education level	Master's studies		Subject group		Optional subject group		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	2		Language of instruction		English		
Semester of study	4		ECTS credits		3.0		
Learning profile	academic		Assessment form		credit		
Conducting unit	Laboratory of Molecular Evolution and Bioinformatics -> Department of Evolutionary Genetics and Biosystematics -> Faculty of Biology -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Andre Viola De Moura				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	20.0	0.0	0.0	0.0	0.0	20
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	20		15.0		40.0	75
Subject objectives	Overview of theoretical population genetics and its applications to animal science and conservation. Understanding of factors causing changes in genetic composition of populations over time and space Case studies will illustrate how the theory and molecular techniques are applied to address questions in evolutionary biology, ecology and animal behaviour. Practical applications of population genetics will be discussed, with the particular emphasis identifying operational taxonomic units, distinct populations of wild animals and occurrence of natural selection						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[OŚMU2_K07] Is willing to undertake individual and team activity; to professionally plan and organise its course and set priorities for their actions.	- Can prepare and deliver a presentation on how to use the principles and methods of population genetics, to address a scientific question or practical challenge in the field of animal science and conservation biology.	[SK2] presentation/project/paper/report
	[OŚMU2_K06] Recognises the importance of knowledge in solving encountered cognitive and practical problems and consults experts in the event of difficulties in solving a problem on her/his own.	- Can prepare and deliver a presentation on how to use the principles and methods of population genetics, to address a scientific question or practical challenge in the field of animal science and conservation biology.	[SK2] presentation/project/paper/report
	[OŚMU2_U05] Searches, selects and analyses the literature achievements of environmental sciences, including scientific journals and databases, reading and understanding scientific texts in her/his native language and in English.	- Can prepare and deliver a presentation on how to use the principles and methods of population genetics, to address a scientific question or practical challenge in the field of animal science and conservation biology.	[SU2] presentation/project/paper/report
	[OŚMU2_U06] Defines her/his interests and develops them within the chosen specialisation and themes of her/his master's thesis while implementing the process of self-education and planning of own future career.	- Can prepare and deliver a presentation on how to use the principles and methods of population genetics, to address a scientific question or practical challenge in the field of animal science and conservation biology.	[SU2] presentation/project/paper/report
	[OŚMU2_U03] Plans and performs research tasks in the field or laboratory and interprets research results on environmental issues (working individually or in a team assuming various roles, including managerial functions).	- Understands theoretical population genetics and its applications to animal science. - Can prepare and deliver a presentation on how to use the principles and methods of population genetics, to address a scientific question or practical challenge in the field of animal science and conservation biology.	[SU2] presentation/project/paper/report
	[OŚMU2_W05] Describes development directions and the latest discoveries in the field of scientific disciplines related to environmental protection.	- Demonstrates good capability to identify issues of current importance and identifies recent literature on population genetics.	[SW2] presentation/project/paper/report
	[OŚMU2_K03] Undertakes professional and personal challenges, shows activity, undertakes efforts and is characterized by perseverance in undertaking individual and team actions in the field of environmental protection.	- Can prepare and deliver a presentation on how to use the principles and methods of population genetics, to address a scientific question or practical challenge in the field of animal science and conservation biology.	[SK2] presentation/project/paper/report
	[OŚMU2_U10] Uses Polish/English in the field of environmental protection in accordance with the requirements specified for level B2+ of the Common European Framework of Reference for Languages.	- Can prepare and deliver a presentation on how to use the principles and methods of population genetics, to address a scientific question or practical challenge in the field of animal science and conservation biology.	[SU2] presentation/project/paper/report
	[OŚMU2_W06] Analyses the impact of human activities on biodiversity and environmental quality on a local, regional and global scale.	- Understands factors causing changes in genetic composition of populations over time and space, and how these changes constitute a link between molecular and ecological processes.	[SW2] presentation/project/paper/report
	[OŚMU2_K10] Has a need for continuous professional development.	- Understands methods for quantifying genetic variation in animal populations - Demonstrates good capability to identify issues of current importance and identifies recent literature on population genetics.	[SK2] presentation/project/paper/report

	Course outcome	Subject outcome	Method of verification
	[OŚMU2_W10] Applies the appropriate methodology to prepare and write scientific paper, taking into account empirical data as well as legal and ethical conditions.	- Can prepare and deliver a presentation on how to use the principles and methods of population genetics, to address a scientific question or practical challenge in the field of animal science and conservation biology.	[SW2] presentation/project/paper/report
	[OŚMU2_W04] Chooses methods, techniques and research tools used in environmental protection.	- Understands methods for quantifying genetic variation in animal populations - Can prepare and deliver a presentation on how to use the principles and methods of population genetics, to address a scientific question or practical challenge in the field of animal science and conservation biology.	[SW2] presentation/project/paper/report
	[OŚMU2_K01] Behaves in a professional manner at all times; bears full responsibility for the actions taken relating to the protection of the environment and respects the principles of professional ethics and principles of intellectual honesty.	- Can prepare and deliver a presentation on how to use the principles and methods of population genetics, to address a scientific question or practical challenge in the field of animal science and conservation biology.	[SK2] presentation/project/paper/report
	[OŚMU2_U01] On the basis of the acquired knowledge, proposes to solve environmental problems.	- Understands applications of population genetics principles in animal science and conservation biology - Understands theoretical population genetics and its applications to animal science. - Can prepare and deliver a presentation on how to use the principles and methods of population genetics, to address a scientific question or practical challenge in the field of animal science and conservation biology.	[SU2] presentation/project/paper/report
Subject contents	- Fundamentals of population genetics - Hardy-Weinberg equilibrium - How to quantify genetic variation in wild populations - Genetic drift and population bottlenecks - How to identify wild populations - Genetics of small populations - Mechanisms that maintain genetic diversity - Phylogeny, phylogeography and hybridization - Identifying natural selection and the role of past climate change - Introduction to genomics		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	assignment work – project or presentation	50.0%	100.0%
Recommended reading	Basic literature	Allendorf, F.W., and Luikart, G. (2011) Conservation and the Genetics of Populations. Blackwell Publishing. ISBN 1405121459 Freeland, J.R., Kirk, H. and Petersen, S.D. (2011) Molecular Ecology. 2nd Edition. Wiley-Blackwell. ISBN 0470748338 Hartl, D. and Clark, A.G. (2007) Principles of Population Genetics. 4th Edition. Sinauer Associates. ISBN 0878933085 Supplementary literature	

	Supplementary literature	Moura AE, Shreves K, Pilot M, Andrews KR, Moore DM, Kishida T, Möller L, Natoli A, Gaspari S, McGowen M, Chen I, Gray H, Gore M, Culloch RM, Kiani MS, Sarrouf Willson M, Bulushi A, Collins T, Baldwin R, Willson A, Minton G, Ponnampalam L, Rus Hoelzel A (2020) Phylogenomics of the genus Tursiops and closely related Delphininae reveals extensive reticulation among lineages and provides inference about eco-evolutionary drivers. Mol Phylogenet Evol 146:106756. doi: 10.1016/j.ympev.2020.106756 Moura, A.E., Kenny, J.G., Chaudhuri, R., Hughes, M.A., Welch, A., Reisinger, R.R., de Bruyn, P.J.N., Dahlheim, M.E., Hall, N. & Rus Hoelzel, A. (2014). Population genomics of the killer whale indicates ecotype evolution in sympatry involving both selection and drift. Mol. Ecol. 23, 51795192. doi: 10.1111/mec.12929 Moura, A.E., Tsingarska, E., Dąbrowski, M.J., Czarnomska, S.D., Jędrzejewska, B. & Pilot, M. (2014). Unregulated hunting and genetic recovery from a severe population decline: the cautionary case of Bulgarian wolves. Conserv. Genet. 15, 405417. doi: 10.1007/s10592-013-0547-y
	eResources addresses	
Example issues/ example questions/ tasks being completed	Use population genetics to answer a biological question Example scenarios for the presentations: - Identify the level of inbreeding in a wild animal/captive population - Identify the patterns of population structure in a wild animal group - Test if phenotypic traits are under selection in an animal group	
Work placement	Not applicable	

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