

NAME OF THE COURSE		Nutrigenomics				
Code	PMB737	Year of study	2			
Course teacher	Jasna Puizina, PhD, Professor	Credits (ECTS)	3			
Associate teachers	Željana Fredotović, PhD, Assistant Professor	Type of instruction (number of hours)	L	S	E	F
			15	15		
Status of the course	Elective	Percentage of application of e-learning	10			
COURSE DESCRIPTION						
Course objectives	Students will learn about structure of the human genome, genetic diversity among humans, and the mechanisms of onset and inheritance of some congenital diseases related to nutrition and metabolism. They will learn about the effects of certain nutrients and / or their metabolites on the genome, epigenome and the regulation of gene expression in humans. Students will be introduced to the existing technical possibilities and limitations in the detection of metabolism disorders. A specific objective will be to train students how to advise people about genetic tests and their interpretation. The additional goal is to train students for lifelong learning - independent research, use online databases, scientific articles and other literature, to develop their critical thinking, and to introduce them to some of the ethical, legal and social dilemmas of genetic testing.					
Course enrolment requirements and entry competences required for the course	Basic biology, basic molecular biology and basic genetics					
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	<p>After passing the course students will be able to:</p> <ul style="list-style-type: none"> <li>• Know the main characteristics of the structure of the human genome and understand the main sources of genetic diversity among people.</li> <li>• Explain the mechanisms of onset and inheritance of certain metabolic disorders.</li> <li>• Understand the impact of some nutrients on the genome, transcriptome and proteome</li> <li>• Distinguish rare hereditary diseases from predispositions for developing the disease</li> <li>• Distinguish between inherited from acquired disorders of metabolism and nutrition</li> <li>• Suggest genetic testing and interpret the results</li> <li>• Suggest the individually tailored diet, and other possible interventions.</li> <li>• Explain the basic facts about cancer genetics and its relationship to nutrition.</li> <li>• Use relevant online databases, scientific paper and other literature with the aim of lifelong learning.</li> <li>• Develop a critical and objective view on some of the ethical, legal and social dilemmas and risks of genetic testing</li> </ul>					
Course content broken down in detail by weekly class schedule (syllabus)	<p><b>Lectures:</b></p> <ol style="list-style-type: none"> <li>1. Introduction. The structure of the human genome (unique genes, repetitive, regulatory and transposable DNA sequences) and transcriptome</li> <li>2. Genetic diversity of people, single nucleotide polymorphisms (SNPs), OMIM</li> </ol>					

	<ol style="list-style-type: none"> <li>3. Mutations of DNA, micronutrients and genomic stability and function</li> <li>4. Molecular methods for identification of mutations and SNPs.</li> <li>5. Control of gene expression</li> <li>6. Monogenic diseases related to diet: galactosemia, phenylketonuria, alkaptonuria, favism etc: mechanisms of inheritance, treatments.</li> <li>7. Examples of genetic tests: cardiovascular health and metabolic disorder of folate metabolism, disorders of metabolism of glucose and insulin</li> <li>8. Genetic control of appetite and obesity (leptin, ghrelin, FTO, etc.), intolerance of lactose and gluten (celiac disease),</li> <li>9. Disorders of vitamin D metabolism and osteoporosis, the metabolism of alcohol and caffeine, muscle activity (potential, cramps), detoxification of the body</li> <li>10. Epigenetics – molecular mechanisms, examples</li> <li>11. The impact of diet on epigenetic modification and gene expression</li> <li>12. Cancer genetics, nutrients and the cancer formation / protection</li> <li>13. Molecular biology of aging. 'Anti-aging' micronutrients.</li> <li>14. Micronutrients and the human evolution: optimization of gametogenesis and reproductive fecundity (milk, migrations, skin pigmentation)</li> <li>15. Genetic counseling and ethical dilemmas in genetics.</li> </ol> <p><b>Seminar:</b></p> <ul style="list-style-type: none"> <li>- Overview of research methods in nutrigenomics: PCR, DNA sequencing, RFLP analysis, analysis of gene expression by RT-PCR, q-PCR, DNA chips, next generation sequencing, the basic techniques of proteomics, genome - wide association studies (GWAS).</li> <li>- Bioinformatics and searching of relevant databases such as PubMed, OMIM, WoS, GeneCard, UniProt and similar</li> <li>- Each student writes and orally presents seminar work according to his/her own choice.</li> <li>- If technically possible, students will be demonstrated and explained the work of the devices for the new generation sequencing and qPCR</li> </ul>					
Format of instruction	<input checked="" type="checkbox"/> lectures <input checked="" type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>on line</i> in entirety <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work		<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			
Student responsibilities	Students are obliged to be present in the amount of at least 70% of scheduled lectures. They are also obliged to give a seminar and to write a written report.					
Screening student work ( <i>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</i> )	Class attendance	0,5	Research		Practical training	
	Experimental work		Report		(Other)	
	Essay		Seminar essay	1	(Other)	
	Tests		Oral exam		(Other)	
	Written exam	1,5	Project		(Other)	

Grading and evaluating student work in class and at the final exam	<p>Active participation of students in the classroom is scored as follows: inadequate (1) student does not participate actively in the classes; a sufficient (2) student actively participates in teaching only after the question is asked, a good (3) student occasionally actively participates in the lessons but hardly makes independent conclusions; very good (4) student often actively participates in teaching and often makes independent conclusions; an excellent (5) student almost always actively participates in teaching, critically reflects and independently brings conclusions. A written exam is passed if the student achieves at least 55% of the total number of points. Scoring: &lt;55% of students did not satisfy; 55-67% sufficient (2); 68-78% good (3); 79-89% very good (4); 90-100% excellent (5). The final grade represents a combination of individual grades 1) active participation in teaching, 2) seminar work, 3) written exam.</p>																	
Required literature (available in the library and via other media)	<table border="1"> <thead> <tr> <th data-bbox="444 615 1081 726">Title</th> <th data-bbox="1081 615 1247 726">Number of copies in the library</th> <th data-bbox="1247 615 1424 726">Availability via other media</th> </tr> </thead> <tbody> <tr> <td data-bbox="444 726 1081 821">M. Lucock: Molecular Nutrition and Genomics: Nutrition and the Ascent of Humankind, Wiley-Blackwell (2007)</td> <td data-bbox="1081 726 1247 821">1</td> <td data-bbox="1247 726 1424 821">-</td> </tr> <tr> <td data-bbox="444 821 1081 884">Power point presentations of the lecturer in PDF format</td> <td data-bbox="1081 821 1247 884">-</td> <td data-bbox="1247 821 1424 884">yes</td> </tr> <tr> <td data-bbox="444 884 1081 936">Selected original and review scientific articles</td> <td data-bbox="1081 884 1247 936">-</td> <td data-bbox="1247 884 1424 936">yes</td> </tr> <tr> <td data-bbox="444 936 1081 999">Strachan T, Read A., 2003: <i>Human Molecular Genetics</i>. 3. izd. Garland Science</td> <td data-bbox="1081 936 1247 999">1</td> <td data-bbox="1247 936 1424 999">-</td> </tr> </tbody> </table>	Title	Number of copies in the library	Availability via other media	M. Lucock: Molecular Nutrition and Genomics: Nutrition and the Ascent of Humankind, Wiley-Blackwell (2007)	1	-	Power point presentations of the lecturer in PDF format	-	yes	Selected original and review scientific articles	-	yes	Strachan T, Read A., 2003: <i>Human Molecular Genetics</i> . 3. izd. Garland Science	1	-	Number of copies in the library	Availability via other media
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Optional literature (at the time of submission of study programme proposal)	<p>Watson JD, Baker TA, Bell SP, Gann A, Levine M, Losick R., 2003: <i>Molecular Biology of the Gene</i>. 5. izd. Menlo Park: Benjamin Cummings.  Review and original scientific articles,  Information from online websites</p>																	
Quality assurance methods that ensure the acquisition of exit competences	<p>Quality monitoring will be performed at three levels: (1) University (2) Faculty Level by the Commission for improvement the quality of teaching, (3) teacher level.</p>																	
Other (as the proposer wishes to add)																		