Course code	**BUM101**		
Course title	**Systems biomedicine**		
General information			
Study programme	Graduate study „ Biotechnology in medicine“	Academic year	
Lecturer	Prof. Dr. Sc. Sandra Kraljević Pavelić		
Status	**Required**	Elective	
ECTS system			**6**

Course objectives

Introduction to the fundamentals of systems biomedicine, primarily as a discipline based on the analysis of dynamical interactions among individual members of a biological system with the aim to understand the system as a whole, and not just its individual components.

Course description

Modern experimental approaches in disease research based on simultaneous analysis of thousands of genes/proteins/metabolites and their interactions in a living system; monitoring of biological system functions in four dimensions (space and time); the importance of visualization (i.e. ‘imaging’) in systems biomedicine; the fundamentals of global, comprehensive ‘-omics’ methods (DNA-chips, RT-PCR, proteomics methods) in studying molecular pathological processes; the role of ‘-omics’ methods in early diagnostics, prognostics, disease development, discovery of new molecular targets for treatment as well as in research on drug mechanisms of action and drug safety; the fundamentals of bioinformatics in systems biomedicine

Seminars:

A certain portion of the materials for seminars will be provided to the students, awhile the students will be required to complete them through internet resources and library searches. The students will be able to pick one of the following topics (or possibly suggest their own topic):

1. ‘-omics’ methods in modern diagnostics
2. ‘-omics’ methods in tumor classification
3. prognostic bioinformatics tests for breast cancer
4. nanotechnology in DNA-chip development
5. the importance of studying genes that have experienced modifications in diseases
6. the importance of studying proteins that have experienced modifications in diseases
7. bioinformatics approaches to analysis of ‘-omics’ datasets
8. ethical aspects and concerns regarding the use of ‘-omics’ methods in medicine
9. accessing and using systems biomedicine databases on the internet
10. physical methods in protein structure research
11. new visualization methods in biomedicine

Learning outcomes

Upon the successful completion of the course, the students will gain a comprehensive understanding of terms used in systems biomedicine. They will also gain insights into modern laboratory approaches based on ‘-omics’ methods and the importance of such methods for understanding and discovery of key factors in diseases development. Furthermore, the students will gain knowledge on how to integrate the ‘-omics’ results into a meaningful whole and in this way define the global model of biological processes responsible for disease development. Furthermore, the students will learn about the usage of global ‘-omics’ methods in early (pre-symptomatic) diagnostics, prognostics and drug development.