Course title	Cancer Systems Biology				
Course code	MCB660				
Course type	Elective				
Level	Master's (2nd Cycle)				
Year / Semester	1st Year / 2nd Semester				
Teacher's name	TBA				
ECTS	10	**Lectures / week**	3 Hours/14 weeks	**Laboratories / week**	None
Course purpose and objectives	The main objective of Cancer Systems Biology course is to provide students with a detailed understanding of the study of cancer biology at a systems level. Cancer systems biology approaches are based on the use of computational and mathematical methods to unravel the complexity involved in tumorigenesis as well as tumor heterogeneity.				
Learning outcomes	Upon completion of the course, students will be able to: • Demonstrate integrative knowledge and critical understanding of the concepts underlying mathematical and statistical approaches used in modelling tumorigenesis and cancer progression from a systems perspective. • Build networks from large –omics cancer data sets • Demonstrate general cognitive skills that they can, in a creative and critical way, use computer programs to apply a range of key algorithms in the analysis of demonstration datasets in order to learn and extract patterns from cancer-related biological data. • Critically evaluate a range of modelling paradigms and apply them correctly in different situations to verify or refute scientific hypotheses. • Interpret model predictions, formulate hypotheses and design appropriate experiments to address them. • Connect pathways for network building & visualization – Analyze and organize data • Combine annotation of nodes with network topology • Differentially approach and process deterministic vs. stochastic systems • Analyze of directed graphs, regulatory motifs in cancer cell signaling networks • Integrate reasoning: merge bottom up and top down reasoning • Develop projects from model predictions to laboratory experiments				
Prerequisites	None	**Co-requisites**	None		
Course content	**Description:** • Introduction to –omics technologies • Data mining: Gathering and Analyzing Large Data Sets (genomics, epigenomics, transcriptomics, proteomics, metabolomics) • Genomics and cancer: mutations, copy number variation, epigenomi • Introduction to networks and graphs • Protein-protein interaction networks				

	• Connecting Pathways for Network Building & Visualization - Analysis and Data Organization • Combining Annotation of Nodes with Network Topology • Deterministic vs. Stochastic Systems • Analysis of Directed Graphs, Regulatory Motifs in Cancer Cell Signaling Networks • Integrated Reasoning: Merging Bottom Up and Top Down Reasoning • From Model Predictions to Laboratory Experiments
Teaching methodology	Face-to-face
Bibliography	An Introduction to Systems Biology: Design Principles of Biological Circuits, (ebook), Uri Alon Chapman and Hall/CRC https://www.ebooks.com/en-cy/book/209687886/an-introduction-to-systems-biology/uri-alon/ Systems Biology: A Textbook, Edda Klipp, Wiley https://www.wiley.com/en-ie/Systems+Biology%3A+A+Textbook%2C+2nd+Edition-p-9783527675678 A First Course in Systems Biology, (ebook) Eberhard Voit, Garland Science https://www.ebooks.com/en-cy/book/209908253/a-first-course-in-systems-biology/eberhard-voit/ Fundamentals of Systems Biology: From Synthetic Circuits to Whole-cell Models (ebook), Markus W. Covert, CRC Press https://www.ebooks.com/en-cy/book/1864042/fundamentals-of-systems-biology/markus-w-covert/ Systems Biology of Cancer (ebook), Sam Thiagalingam, Cambridge University Press https://www.ebooks.com/en-cy/book/1873546/systems-biology-of-cancer/sam-thiagalingam/
Assessment	Mid-Term Examination 30% Final Examination 40% Oral presentations/Assignments 20% Class participation and attendance 10% **Total 100%**
Language	English