

DEREE COLLEGE SYLLABUS FOR: BMS 4530 BIOINFORMATICS AND HEALTH INFORMATION SYSTEMS 3/0/3	
<p>(Previously: BMS 4430 Health Information Systems and Technology) (Updated: Fall 2024)</p> <p style="text-align: right;">UK LEVEL: 6 UK CREDITS: 15</p>	
PREREQUISITES:	ITC 2088 Introduction to Programming or ITC 1070 Information Technology Fundamentals MA 2025 Applied Statistics for Sciences or MA 2021 Applied Statistics BI 1000 Introduction to Biology I BI 1101 Introduction to Biology II BI 3204 Human Genetics
CATALOG DESCRIPTION:	The course provides an overview of Information Technology related to health and biomedical sciences. It covers the basics of computer science and its applications in genomics, transcriptomics, gene expression studies, structural bioinformatics, machine learning and artificial intelligence.
RATIONALE:	The course provides students with a systems framework for understanding bioinformatics, biomedical and healthcare informatics. It focuses on the applications of information technology for healthcare delivery, education and research. The skills developed throughout the course will help students comprehend and make use of computer-based applications of modern biology.
LEARNING OUTCOMES:	<p><i>As a result of taking this course, the student should be able to:</i></p> <ol style="list-style-type: none"> 1. Describe the development of Health Information Technology and the emergence of Health and Biomedical Informatics as a discipline. 2. Demonstrate knowledge of the basic concepts of genome, transcriptome, and proteome bioinformatics. 3. Analyze data types obtained by high-throughput experimental platforms using R. 4. Explain the application of health information technology to healthcare, education, and research. 5. Perform a critical literature analysis, regarding state of the art bioinformatics and health information technology research topics.
METHOD OF TEACHING AND LEARNING:	<p>In congruence with the teaching and learning strategy of the college, the following tools are used:</p> <ul style="list-style-type: none"> • Class lectures, interactive learning (class discussions, group work) audiovisual presentations, model, databases, and other and practical problems solved in class. • Exercises and primary source documents are assigned as homework, the solutions of which are reviewed in class • Office hours: students are encouraged to make full use of the office hours of their instructor, where they can ask questions, see their exam paper, and/or go over lecture/lab material. • Use of a blackboard site, where instructors post lecture notes, assignment instructions, timely announcements, as well as additional resources.

ASSESSMENT:	<p>Summative:</p> <table border="1" data-bbox="655 185 1457 544"> <tr> <td data-bbox="655 185 1265 398"> 1st assessment: Midterm exam (2 hour) It includes the following components: a) Questions regarding basic bioinformatics knowledge b) Questions on a scientific article or report </td><td data-bbox="1265 185 1457 398">40%</td></tr> <tr> <td data-bbox="655 398 1265 544"> Final assessment: Student project on a specific topic leading to a written report (3000 – 4000 words, 30%) and oral presentation (30%) </td><td data-bbox="1265 398 1457 544">60%</td></tr> </table> <p>Formative:</p> <table border="1" data-bbox="655 616 1457 728"> <tr> <td data-bbox="655 616 1265 689">Multiple on-line tests and short practice projects</td><td data-bbox="1265 616 1457 689">0</td></tr> <tr> <td data-bbox="655 689 1265 728">Essay questions</td><td data-bbox="1265 689 1457 728">0</td></tr> </table> <p>The formative assessments aim to prepare students for their coursework portfolio. The first assessment tests Learning Outcomes 1-3. The final assessment tests learning outcomes 4-5.</p> <p><i>The final grade for this module will be determined by averaging all summative assessment grades, based on the predetermined weights for each assessment.</i></p>	1 st assessment: Midterm exam (2 hour) It includes the following components: a) Questions regarding basic bioinformatics knowledge b) Questions on a scientific article or report	40%	Final assessment: Student project on a specific topic leading to a written report (3000 – 4000 words, 30%) and oral presentation (30%)	60%	Multiple on-line tests and short practice projects	0	Essay questions	0
1 st assessment: Midterm exam (2 hour) It includes the following components: a) Questions regarding basic bioinformatics knowledge b) Questions on a scientific article or report	40%								
Final assessment: Student project on a specific topic leading to a written report (3000 – 4000 words, 30%) and oral presentation (30%)	60%								
Multiple on-line tests and short practice projects	0								
Essay questions	0								
INDICATIVE READING:	<p>REQUIRED READING:</p> <ol style="list-style-type: none"> 1. Andreas D. Baxevanis, Gary D. Bader, David S. Wishart (2020). Bioinformatics, latest edition, Wiley 2. Hoyt, R.E., Yoshihashi, A.K., & Bailey, N.J. (2018). Health informatics: A practical guide for healthcare and informatics technology professionals, latest edition, Amia <p>RECOMMENDED READING:</p> <ol style="list-style-type: none"> 1. Shortliffe, E. H., & Cimino, J. J. Biomedical Informatics: Computer Applications in Health Care and Biomedicine (Health Informatics), 2014, 4th edition 2. Gordon D. Brown, PhD, Timothy B. Patrick, & Kalyan Pasupathy. Health Informatics: A Systems Perspective, 2013, latest edition, Chicago: Health Administration Press. 3. Coiera, E., Magrabi, F., & Sintchenko, V. Guide to Health Informatics, 2015, 3rd edition 4. Lytras, M. D., & Papadopoulou, P. Applying Big Data Analytics in Bioinformatics and Medicine, 2018, pp. 1-465, Hershey, PA: IGI Global. doi:10.4018/978-1-5225-2607-0 5. Papadopoulou, P., Lytras, M., & Marouli, C. Applying Big Data Analytics in Bioinformatics and Medicine, 2018, pp. 1-25. Hershey, PA: IGI Global. doi:10.4018/978-1-5225-2607-0.ch001 								
INDICATIVE MATERIAL: (eg. audiovisual, digital material, etc.)	N/A								
COMMUNICATION REQUIREMENTS:	Verbal and written skills using academic / professional English.								

SOFTWARE REQUIREMENTS:	MS Office, MS teams and Blackboard CMS
WWW RESOURCES:	https://www.ncbi.nlm.nih.gov/pubmed/ https://www.informaticseducation.org/ https://www.informaticseducation.org/single-post/2016/09/20/Data-Science-Resources https://www.informaticseducation.org/single-post/2016/09/02/IBM-Watson-Analytics-Academic-Program http://imia-medinfo.org/wp/welcome-to-imia-2/ http://genomicsandhealth.org https://www.ebi.ac.uk/about https://www.ebi.ac.uk/services Examples of databases: https://www.ncbi.nlm.nih.gov/genbank/ https://www.ncbi.nlm.nih.gov/nucleotide/ https://blast.ncbi.nlm.nih.gov/Blast.cgi https://www.ncbi.nlm.nih.gov/refseq/ https://www.ncbi.nlm.nih.gov/omim/ http://www.ehr4cr.eu/
INDICATIVE CONTENT:	<ul style="list-style-type: none"> • Overview of health and biomedical informatics, core competencies and definitions • Concepts, models and systems thinking, the language of Biomedical Informatics and data types • Vocabulary, Data standards & Semantics • Databases, Data mining, Analytics and Data visualization • Genome and proteome bioinformatics; next generation sequencing, automatic analysis, alignment, comparison and annotation of biological sequences; analysis of genome evolution and variation; molecular biology databases; structural bioinformatics; protein structure prediction; biomolecular systems simulation; systems biology; biological networks; pharmacoinformatics and biomedical computing. • Electronic Medical Records & Electronic Health Records • Healthcare Management and Clinical Decision Support Systems • Health Information Exchange & Architectures of information systems • Health information privacy, security and ethics • Personal Health Information & Consumer health informatics • Knowledge representation & clinical ontology • Evidence based medicine and clinical practice guidelines • Quality improvement strategies, patient safety and health information technology • Cognitive, Human Factors, Usability, and Human Centered Aspects • Natural Language & Text Processing • Bioinformatics Projects and Centers • Specialty Informatics: Medicine, Nursing, Dentistry & Public Health • Translational Informatics