



COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Health informatics	

Lecturer(s)	Department(s) where the course unit (module) is delivered
Coordinator: Doc. Dr. Erinija Prancėvičienė Other(s): Department of Human and Medical Genetics, Institute of Biomedical Sciences, Faculty of Medicine, Vilnius University; Sector of Crystallography and Chemical Informatics, Institute of Biotechnology, Life Sciences Center, Vilnius University, Sauletekio al. 7, LT-10257	Department of Human and Medical Genetics, Institute of Biomedical Sciences, Faculty of Medicine, Vilnius University Santariskiu str. 2, LT-08661

Study cycle	Type of the course unit (module)
Second cycle	Elective

Mode of delivery	Period when the course unit (module) is delivered	Language(s) of instruction
Face-to-face, self-study Lectures, seminars and practice	Second semester	English

Requirements for students	
Prerequisites: English B2 level Linear algebra basics Programming basics UNIX/Linux basics Statistics introductory Cryptography basics	Additional requirements (if any):

Course (module) volume in credits	Total student's workload	Contact hours	Self-study hours
5	135	50	85

Purpose of the course unit (module): programme competences to be developed		
Health Informatics course introduces intersection of cutting-edge technology with patient care that shapes the future of healthcare. This course offers an in-depth exploration of essential topics like Electronic Health Records, Health Data Analytics, and Information Security, empowering students with the expertise to drive innovation in healthcare delivery. Gained hands-on experience unlocks the power of information in the service of health.		
Learning outcomes of the course unit (module)	Teaching and learning methods	Assessment methods
Be able to work autonomously and as a part of a multidisciplinary team; act honestly and according to ethical obligations	Exercises, course projects	Completion of practical assignments, oral and written presentation of course project
Comprehend technology used in enhancement of healthcare; be able to use and apply technologies used in health care enterprises.	Lectures, exercises, seminars with case studies	Completion of practical assignments, oral and written presentation of course project
Be able to transform and analyze data coming from healthcare platforms.	Lectures, exercises, seminars with case studies	Completion of practical assignments, oral and written

		presentation of course project
Be able to analyse, manage and model data healthcare providers.	Lectures, exercises, seminars with case studies	Completion of practical assignments, oral and written presentation of course project
Be able to select an appropriate implementation strategy in need to improve healthcare with technology	Lectures, exercises, seminars with case studies	Completion of practical assignments, oral and written presentation of course project
Be able to gather and analyse information on intersection of technology and healthcare with a critical approach, and to carry out a technological watch	Lectures, exercises, seminars with case studies	Completion of practical assignments, oral and written presentation of course project

Content: breakdown of the topics	Contact hours							Self-study work: time and assignments	
	Lectures	Tutorials	Seminars	Exercises	Laboratory work	Internship/work placement	Contact hours	Self-study hours	Assignments
1. Introduction to Health Informatics	2		2				4	4	Textbook chapter " <i>A Short History of Biomedical and Health Informatics</i> ". Review <i>The Health Information Workforce: Current and Future Developments</i> . (Springer book series https://link.springer.com/book/10.1007/978-3-030-81850-0)
2. Computing Concepts in Healthcare	2			2			4	10	Textbook chapters " <i>Computing Concepts for Biomedicine and Health</i> " and aspects of " <i>Human-Computer Interaction</i> ". Prepare connections to the Linux server, get to know essential system management commands. Prepare to setup open source LIMS.
3. Electronic Health Records (EHRs) and Laboratory Information Systems (LIMS) and application Programming Interfaces(APIs) . Open source Health Information System GNUHealth. Installation and management.	2			4			6	10	Read textbook chapter " <i>Electronic Health Records</i> " and includes elements from " <i>EHR System Selection and Implementation</i> ", and read through the

									<p>GNUHealth documentation https://www.gnuhealth.org/.</p> <p>Exercise hands-on Patient management in the open source LIMS. Install and prepare EHR in GNUHealth.</p>
<p>4. Standards, Interoperability, and Data Exchange. Health Level 7 standardization and FHIR – Fast Healthcare Interoperability Resources. Standardization of Laboratory Informatics. Organizations that publish standards of health informatics: ASTM (American Society for Testing Materials) International, ISO – International Organization for Standardization, CLSI – Clinical Laboratory Standards Institute. Essential documents regulating healthcare informatics requirements in the laboratory.</p>	2			2			4	10	<p>Read textbook chapter "<i>Standards and Interoperability</i>" with "<i>Health Information Exchange (HIE)</i>".</p> <p>Read Standard Guide for Laboratory Informatics and ISO-15189 provided by the instructor.</p> <p>Exercise: write a summary about FAIR and FACT data collection standards and short review of Health Level 7 standard and FHIR medical data exchange interface.</p>
<p>5. Healthcare Data Analytics and AI, Clinical decision support tools. ALGORITHMS.</p>	4			4			8	8	<p>Read textbook chapter "<i>Data Science and Artificial Intelligence</i>" with relevant parts of "<i>Imaging Informatics</i>".</p> <p>Read textbook chapter "<i>Clinical Decision Support</i>" and "<i>practical tools and their applications</i>".</p> <p>Hands on data analysis exercises using R / Python .</p>
<p>6. Telehealth and Telemedicine. Data exchange formats.</p>	2		2				4	10	<p>Read textbook chapter "<i>Telemedicine and Telehealth</i>".</p> <p>Seminar: Short review of a paper of a modern technology application of your choice.</p>
<p>7. Privacy and Security in Health</p>	2			2			4	5	<p>Read textbook chapter</p>

Information									<p><i>"Health Information Privacy and Security" with relevant ethical considerations from "Ethical Issues in Health Informatics".</i></p> <p><i>Hands-on exercise with protocols, keys and digital signatures (GpG , PKI, https, ssl, ssh)</i></p>
8. Search and Information Retrieval, Databases in Healthcare. Database schema and implementation in open source health information management system GNUHealth.	2			2			4	8	<p>Read textbook chapter <i>"Information Retrieval (Search)"</i>.</p> <p>Exercises: Install database administration tool and connect to the example database on the server. Import MIMIC database (https://physionet.org/content/mimiciii/1.4) into your managed database. Make queries to extract information about patient descriptors.</p>
9. Reproducible computational research. Source of data in experimental structural biology: CryoEM, X-ray crystallography.	6			6			12	20	<p>Self-study (reading and analysing related literature (recommended reading: Weissig, 2003); and available open access databases (PDB, COD)). Submission of computational assignments.</p> <p>Preparation of Git and GitLab/GitHub accounts for the sharing of Master Thesis scripts and codes. Documenting and tracking your code.</p>
Total	24		4	22			50	85	

Assessment strategy	Weight,%	Deadline	Assessment criteria
Practical assignments	30%		Completed assignments till due date.
Participation in discussions	15%		Active involvement in discussions in seminars.

Active participation in the classes for activity 7 and 9.	10% each	During lectures and seminars	Students perform and submit all exercises/tasks in each topic. The performance of practical work is assessed on a scale of 1-10 in each topic.
Quizzes at the end of each section.	45%		Multiple choice questions.

Author	Year of publication	Title	Issue of a periodical or volume of a publication	Publishing place and house or web link
Compulsary reading				
Hersh W.R.	2022	Health Informatics: Practical Approach, 8 th edition.	ISBN: 978-1-4357-8775-9	https://dmice.ohsu.edu/hersh/informaticsbook/
Andrew Nguyen	2023	Hands-On Healthcare Data	ISBN: 978-1-098-11292-9	O'Reilly Media https://learning.oreilly.com/library/view/hands-on-healthcare-data/9781098112912/
Optional reading				
Multiple authors	Since 1998 till present	Book series Health Informatics	Electronic ISSN 2197-3741	Springer https://www.springer.com/series/1114
References in the textbooks				