COURSE CONTENT

(1) GENERAL INFO

SCHOOL	ENGINEERING			
DEPARTMENT	BIOMEDICAL ENGINEERING			
MSc PROGRAM	BIOMEDICAL ENGINEERING AND TECHNOLOGY			
STUDY LEVEL	POSTGRADUATE, MSc			
COURSE CODE	**BMET207**	**SEMESTER**	**B**	
COURSE TITLE	**Human-Machine Interaction in Healthcare**			
TEACHING			**HOURS**	**ECTS**
LECTURES AND WORKSHOPS			26	5
COURSE TYPE	SPECIALIZATION			
COURSE REUIREMENTS:	-			
TEACHING AND EXAMINATION LANGUAGE:	ENGLISH			
IS THIS COURSE OFFER TO ERASMUS STUDENTS	YES (IN ENGLISH)			
COURSE WEBPAGE (URL)	https://eclass.uniwa.gr/courses/321/			

(2) LEARNING OUTCOMES

Learning outcomes

Course Objectives:

The main objectives of the course are:

1. Describe the Principles of Human-Machine Interaction (HMI) in healthcare:
   a. Define key concepts related to human-machine interaction and their application in healthcare contexts.
   b. Identify and discuss the factors influencing successful HMI design in healthcare, including user needs, usability, and accessibility.
2. Describe Healthcare Technology Trends and Innovations:
   a. Evaluate current trends and emerging technologies in healthcare, such as telemedicine, wearable devices, and artificial intelligence.
   b. Critically assess the potential benefits and challenges associated with the adoption of new technologies in healthcare.
3. Design and Evaluate User-Centered Healthcare Interfaces:
   a. Apply user-centered design principles to create healthcare interfaces that prioritize user experience and meet the needs of diverse user groups.
   b. Conduct usability testing and analyze user feedback to iteratively improve healthcare interfaces.
4. Explore Ethical and Regulatory Considerations:
   a. Examine ethical issues related to human-machine interaction in healthcare, including privacy, data security, and the responsible use of AI.
   b. Understand the regulatory landscape governing healthcare technology and its implications for design and implementation.
5. Demonstrate Effective Communication of HMI Concepts:
   a. Articulate HMI concepts, design decisions, and research findings through written reports, presentations, and interactive demonstrations.
   b. Tailor communication for both technical and non-technical audiences to facilitate knowledge dissemination.
6. Apply Practical Skills in HMI Prototyping and Development:
   a. Gain hands-on experience in prototyping and developing human-machine interaction solutions for healthcare applications.

Utilize relevant tools and platforms to implement and test interactive healthcare technologies.

Learning Outcomes:
By the end of this course, students should be able to:
1. Describe human-machine interaction (HMI) technologies applied to the healthcare context.
2. Propose solution for a given HMI problem while considering design requirements, technological possibilities and restriction.
3. Design evaluation scenarios for HMI technology and identify metrics for performance assessment.
4. To address ethical concerning within the HMI context as well as in application cases.

Achievement of Course Objectives and Learning Outcomes:
To fulfill the above objectives and learning outcomes, students will be taught basic concepts of HMI. In the laboratory, students will experiment HMI technologies and implement HMI solutions. The development of a final project focused on a real HMI problem will allow the student to encompass all of the learning outcomes while promoting self-development in a real-world application case.
More specifically, learning outcome A will be supported by objectives 1 and 2, learning outcome B will be covered by objectives 3, learning outcome C will be achieved by objectives 5 and 6, and learning outcome D will be addressed by course objective 4.

General abilities

- Search, analysis and synthesis of data and information, using the necessary technologies
- Adaptation to new situations
- Decision-making
- Autonomous work
- Teamwork
- Working in an international environment
- Working in an interdisciplinary environment

(3) COURSE CONTENT

"Introduction"
- General topics on Human-Machine Interaction in Healthcare
- General topics about image and signal processing in healthcare
- Examples and practical exercises covering image and signal pre-processing

"Computer assisted detection of non-pathological conditions"
- Emotional state
- Pain
- Airway obstruction
- Snoring and sleep quality
- Applications
- Examples and applications

"Computer assisted detection of pathological conditions"
- Parkinson, Alzheimer, Schizophrenia
- Depression
- COVID-19
- Examples and applications

"Computer assisted detection of pathological conditions"
- Designing and Evaluating Human-Machine interfaces
- Workshop

(4) TEACHING AND LEARNING METHODS - EXAMINATIONS

<table>
<tr><td>COURSE DELIVERY</td><td>Physical presence, face to face at the auditorium</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES</td><td>The course involves the use of a projector for presenting fundamental concepts and is supplemented by the use of the blackboard at the auditorium.</td></tr>
<tr><td>TEACHING ORGANIZATION</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Teaching / lectures</td><td>26</td></tr>
<tr><td>Lecture material study</td><td>30</td></tr>
<tr><td>Unsupervised literature review and preparation of the final project</td><td>69</td></tr>
<tr><td>Total</td><td>125</td></tr>
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<tr><td>STUNDET EVALUATION</td><td>100% Individual project about a topic selected by the student based on examples present in class. The project involves describing the supporting theoretical aspects and an implementation of a solution, towards a practical human-machine interaction problem.</td></tr>
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(5) SUGGESTED LITERATURE

Books, scientific articles and related scientific resources:

[1] Cooper, A., Reimann, R., Cronin, D., & Noessel, C. (2014). About Face: The Essentials of Interaction Design (4th edition). Wiley.
[2] Goodwin, K., & Cooper, A. (2009). Designing for the Digital Age: How to Create Human-Centered Products and Services (1st edition). Wiley.
[3] Picard, R. W. W. (2000). Affective Computing (Reprint edition). MIT Press.
[4] Tian, L., Oviatt, S., Muszynski, M., Chamberlain, B. C., Healey, J., & Sano, A. (2022). Applied Affective Computing (1st ed., Vol. 41). Association for Computing Machinery.

Scientific journals:

[1] Nature Machine Intelligence, https://www.nature.com/natmachintell/.
[2] IEEE Transactions on Cybernetics, https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=6221036.
[3] (Elsevier) Computers in Human Behavior, https://www.journals.elsevier.com/computers-in-human-behavior%0A.
[4] IEEE Transactions on Affective Computing, https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=5165369.