Course name: ***Artificial intelligence in medicine***		
Field of study: **Computer science**	Type of study: ***Full-time***	Course code: **CIDM3_02**
Course characteristics: **Mandatory within the additional content**	Level: **Second (M.Sc.)**	Year: **II** Semester: **III**
Type of classes: **lectures, laboratories, project**	Hours per week: **2 lect, 2 lab, 1 proj**	ECTS points amount: **5 ECTS**

COURSE GUIDE

AIMS

A1. Obtaining knowledge about possibilities to solve various problems encountered in medicine using computational intelligence systems.

A2. Practice by students of deciding which aspects of the medical problems are important to the problem being solved, and of finding the appropriate soft computing method to solve it.

PRELIMINARY REQUIREMENTS FOR THE KNOWLEDGE, SKILLS AND OTHER COMPETENCIES

1. Basic knowledge about diagnostic methods in medicine.
2. Knowledge about computational intelligence systems.
3. Programming skills in chosen development environment.
4. Ability to chose a proper numerical method for problem solving given tasks.
5. Ability to perform mathematical operations to solve given problems.
6. Ability to work independently and in the group.
7. Ability to correct interpretation and to presentation of own action.

LEARNING 0UTCOMES

EE 1 – students will posses theoretical knowledge in the fields of application of the artificial intelligence systems in medical diagnostics,

EE 2 – students will be able to identify the scope of functionality of the computational intelligence systems in the diagnosis process,

EE 3 – students will be able to design independently computer systems which have implemented methods of the computer-aided medical diagnostics,

EE 4 – students will be able to prepare a report from a designing process of computer system.

CONTENT

Lectures	**Hours**
Lect. 1 – The role of medical diagnostics, scheme of the decision-making.	**2**
Lect. 2,3 – Traditional methods of image recognition.	**4**
Lect. 4,5,6 – The use of the soft computing techniques to design computer-aided medical diagnostics systems: artificial neural networks, fuzzy-systems, evolutionary and genetic systems. Application of the rough sets and Dempster-Shafer theory.	**6**
Lect. 6 – Systems with experts database to assist the comparative diagnostics in practice of the general practitioners.	**2**
Lect. 7 – Data mining on medical databases: recent trends and future directions.	**2**
Lect. 8,9 – Methods of signal processing applied to cardiograph and cardio-tocography, and the use of the computer-aided medical diagnostic systems to these techniques.	**4**
Lect. 10,11 – Tele-medical diagnostic and monitoring systems: cardiology and obstetric systems.	**4**
Lect. 13 – Computer-aided laboratory diagnostics systems.	**2**
Lect. 14,15 – Automatic interpretation and analyses of the medical images: steps of the image processing process.	**4**
Laboratories	**Hours**
Lab. 1. Introduction to the chosen programming environment. Design of a simple application.	**2**
Lab. 2,3,4 Implementation of a neural network system solving a classification problem.	**6**
Lab. 5,6,7 Implementation of a fuzzy system solving a classification problem.	**6**
Lab. 8,9,10 Implementation of a genetic system solving a classification problem.	**6**
Lab. 11,12 Designing of a data base application.	**4**
Lab. 13,14,15 Designing of the simple tele-medical system realizing a medical consultation functionality.	**6**
Project	**Hours**
Proj. 1 – Determination of the type and the responsibility extent of the designed computer implementation of the diagnostic system.	**1**
Proj. 2,3 – Selecting of the program life cycle for the made application. Determination of the features of the application.	**2**
Proj. 4,5 – System analysis: modeling of the system.	**2**
Proj. 6 – Performance of the system design.	**1**
Proj. 7-13 – Implementation of the system in the chosen programming environment.	**7**
Proj. 14,15 – System validation and testing.	**2**

TEACHING TOOLS

1. – lectures using multimedia presentations
2. – chosen programming environment
3. – computer stations with software
4. – laboratory instructions
5. – forms of the test protocols

LITERATURE

1. L. Rutkowski, Computational Intelligence, Springer-Verlag 2010
2. L. Rutkowski, Flexible Neuro-Fuzzy Systems, Kluwer Academic Publishers, 2004
3. M. Mitchell, An Introduction to the Genetic Algorithms, the MIT Press, Cambridge, Massachusetts, London, 1998
4. Z. Pawlak, Rough Sets: Theoretical Aspects of Reasoning About Data, Kluwer Academic Publishers, Dordrecht, 1991.
5. P. Jackson, Introduction to Expert Systems, Pearson, Harlow, 1999.

COURSE COORDINATOR AND ACADEMIC TEACHER

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