COURSE DESCRIPTION CARD - SYLLABUS

Course name
Medical Informatics [S2ETI1>IM]

Course

Field of study
Education in Technology and Informatics

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
30

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge in informatics, statistics, data analysis and physics acquired during first-cycle studies. Ability to use mathemathical knowledge acquired during first-cycle studies for developing models and expressing algorithms; ability to acquire information from provided sources. Understanding the need to enhance personal competencies.

Course objective

1. Providing students with basic knowledge in medical informatics, mainly related to medical data and methods of their acquisition (diagnostic devices), coding, standardization, storage, sharing, advanced analysis and presentation. 2. Providing students with basic knowledge about the characteristics and organization of health care units from the perspective of employed information systems and their architectures. 3. Familiarizing students with example information systems and programming tools used in medicine.

Course-related learning outcomes

Knowledge:
1. student has organized and theoretically founded general knowledge on key issues in medical

informatics.
2. student has knowledge on important development directions and achievements in medical informatics and other related disciplines.
3. student knows basic techniques, methods and tools used to solve problems in medical informatics.

Skills:
1. student is able to obtain information related to medical informatics from various sources (publications, internet resources), integrate it and properly interpret.
2. student is able, when formulating and solving tasks specific to medical informatics, apply appropriately selected methods, including simulation or computational-experimental methods.
3. student is able - following a given specification - to design a widely understood it system in medical informatics, pointing to the appropriate tools and standards.

Social competences:
1. student understands that knowledge and skills in medical informatics very quickly become outdated.
2. student is aware of the importance of knowledge in solving problems in medical informatics and knows examples of malfunctioning medical information systems or devices.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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The knowledge and skills acquired during the course are verified by a 45-minute exam, consisting of 5-10 questions (test and open), with diversified scores. Passing threshold: 50% of overall score. Issues and topics condiered when developing the questions will be sent to students by e-mail using the university e-mail system. In the case of a small number of students, it is possible to change the form of the exam from written to oral.

Programme content

1. Types of medical data, their sources and characteristrics, including privacy-related aspects.
2. Main types of information systems used in medicine, with a special focus on hospital information systems (HIS), relevant medical standards used to encode and transmit non-image information, in particular HL7, SNOMED CT, LOINC and ICD.
3. Selected medical device for laboratory, signal and imaging diagnostics. Within laboratory diagnostics: devices performing morphological and protein tests, and laboratory information systems (LIS) integrating diagnostic devices. Within signal diagnostics: devices generating multi-dimensional waveforms (EEG, ECG). Within imaging diagnostics: traditional X-ray, computed tomography (CT) and nuclear magnetic resonance (MRI) devices.
4. Standards and IT solutions related to medical diagnostics, including picture archiving and communication systems (PACS), radiology information systems (RIS) and the DICOM standard.
5. Application of advanced data analysis techniques in medicine, including AI, machine learning and knowledge discovery methods. Examples of clinical decision support systems, as well as IT solutions for effective information retrieval and supporting the paradigm of evidence-based medicine.
6. Selected topics in telemedicine, including the use of IT resources to support teleconsultation processes, creating shared repositories of medical knowledge and remote medical education.

Teaching methods

Multimedia presentation, solving simple problems on a whiteboard.

Bibliography

Basic
1. E.H. Shortliffe, J.J. Cimino (red.): Biomedical Informatics: Computer applications in Health Care and Biomedicine. Springer, 2014.
2. R. Tadeusiewicz: Informatyka medyczna. Wydawnictwo UMCS, 2011 (darmowy e-book: http://otworzksiazke.pl/ksiazka/informatyka_medyczna/).
Additional
1. R. Rudowski (red.): Informatyka medyczna. Wydawnictwo Naukowe PWN, 2012.
2. E. Piętka: Zintegrowany system informacyjny w pracy szpitala. Wydawnictwo Naukowe PWN, 2004.

3. A. Winter, R. Haux, E. Ammenwerth, B. Brigl. N. Hellrung, F. Jahn: Health Information Systems. Architectures and Strategies. Springer 2011
4. T. Benson: Principles of Health Interoperability. HL7 and SNOMED. Springer, 2012.
5. R. Greenes (red.): Clinical Decision Support: The Road to Broader Adoption. Elsevier, 2014.
6. W. Hersh: Information Retrieval: A Health and Biomedical Perspective. Springer 2009.
7. Sz. Wilk, W. Michalowski, D. O"Sullivan, K. Farion, J. Sayyad-Shirabad, C. Kuziemsky, B. Kukawka: A Task-based Support Architecture for Developing Point-of-care Clinical Decision Support Systems for the Emergency Department. Methods of Information in Medicine, vol. 52, no. 1, 2013, 18-32.
8. P. Liskowski, K. Krawiec: Segmenting Retinal Blood Vessels with Deep Neural Networks. IEEE Transactions on Medical Imaging, vol. 35, no. 11, 2016, 2369-2380.

Breakdown of average student's workload

	Hours	ECTS
Total workload	90	4,00
Classes requiring direct contact with the teacher	30	1,40
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	60	2,60