**SYLLABUS**

**regarding the qualification cycle FROM ………TO…..**

1. Basic Course/Module Information

|  |  |
| --- | --- |
| Course/Module title | *Imaging techniques in medicine* |
| Course/Module code \* |  |
| Faculty (name of the unit offering the field of study) | *College of Natural Sciences* |
| Name of the unit running the course | *Institute of Physics* |
| Field of study | Physics |
| Qualification level | Second-cycle studies |
| Profile | *General academic* |
| Study mode | *Full-time studies* |
| Year and semester of studies | *Year II, winter or summer semester* |
| Course type |  |
| Language of instruction | English |
| Coordinator | dr hab. Paweł Jakubczyk, prof. UR |
| Course instructor | dr hab. Paweł Jakubczyk, prof. UR |

\* - as agreed at the faculty

1.1.Learning format – number of hours and ECTS credits

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Semester  (n0.) | Lectures | Classes | Colloquia | Lab classes | Seminars | Practical classes | Internships | others | **ECTS credits** |
|  | 30 |  |  |  |  |  |  |  | 5 |

1.2. Course delivery methods

X conducted in a traditional way

- involving distance education methods and techniques

1.3. Course/Module assessment (exam, pass with a grade, pass without a grade)

Exam

2. Prerequisites

|  |
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| Knowledge of physics and mathematics at undergraduate level |

3. Objectives, Learning Outcomes, Course Content, and Instructional Methods

3.1. Course/Module objectives

|  |  |
| --- | --- |
| O1 | Learning about the physical basis of non-invasive imaging methods used in medical diagnostics |
| O2 | Developing skills in using knowledge of the laws of physics to explain the influences of selected external factors on the human body |
| O3 | Develop the ability to use image processing and analysis methods to extract selected information |

3.2. Course/Module Learning Outcomes (to be completed by the coordinator)

|  |  |  |
| --- | --- | --- |
| Learning Outcome | The description of the learning outcome  defined for the course/module | Relation to the degree programme outcomes |
| LO\_01 | Knows and understands basic medical imaging techniques and methods and can describe them mathematically | K\_W03 |
| LO\_02 | Knows and understands the theoretical basis of selected imaging techniques and has knowledge of their advantages and limitations | K\_W05 |
| LO\_03 | Knows and understands current developments in medical imaging techniques and has knowledge of the latest advances in this field | K\_W06, K\_U04 |
| LO\_04 | Be able to find the necessary information on imaging techniques and methods in the literature, databases and other sources. | K\_U03 |
| LO\_05 | Is ready to recognise the social importance of aspects of the practical application of imaging techniques and skills and the associated responsibilities. | K\_K01 |

**3.3. Course content (to be completed by the coordinator)**

1. Lectures

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| Content outline |
| 1. Overview of imaging techniques used in medical diagnostics |
| 2. Electromagnetic field, elements of the structure of matter |
| 3 Interaction of electromagnetic fields with matter |
| 4. Magnetic resonance imaging |
| 5. Nuclear physics and medicine |
| 6. Sound and ultrasound, ultrasound image construction |
| 7. Computed tomography |
| 8. Selected image reconstruction algorithms used in computed tomography |

3.4. Methods of Instruction

*Lecture supported by a multimedia presentation*

4. Assessment techniques and criteria

4.1 Methods of evaluating learning outcomes

|  |  |  |
| --- | --- | --- |
| Learning outcome | Methods of assessment of learning outcomes (e.g. test, oral exam, written exam, project, report, observation during classes) | Learning format (lectures, classes,…) |
| LO-01 | oral exam | lectures |
| LO-o2 | oral exam | lectures |
| LO-o3 | oral exam | lectures |
| LO-o4 | oral exam | lectures |
| LO-o5 | oral exam | lectures |

4.2 Course assessment criteria

|  |
| --- |
| The written examination consists of five questions covering theory and calculations. Each topic has a score of 0 - 4 points. The written part of the examination is passed after the student has obtained a minimum of 10 points.  Number of points Grade 18 - 20 5.0 17 4.5 14 - 16 4.0 13 3.5 10 - 12 3.0 |

5. Total student workload needed to achieve the intended learning outcomes

– number of hours and ECTS credits

|  |  |
| --- | --- |
| Activity | Number of hours |
| Scheduled course contact hours | 30 |
| Other contact hours involving the teacher (consultation hours, examinations) | 2 |
| Non-contact hours - student's own work (preparation for classes or examinations, projects, etc.) | 28 |
| Total number of hours | 60 |
| Total number of ECTS credits | 5 |

\* One ECTS point corresponds to 25-30 hours of total student workload

6. Internships related to the course/module

|  |  |
| --- | --- |
| Number of hours | *-* |
| Internship regulations and procedures | *-* |

7. Instructional materials

|  |
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| Compulsory literature:   1. Ehsan Samei, Donald J. Peck, Hendee’s Physics of Medical Imaging, Willey, 2019. 2. Mark A. Haidekker, Medical Imaging Technology, Springer, 2013. 3. Russell K. Hobbie, Bradley J. Roth, Intermediate Physics for Medicine and Biology, Springer, 2015. |
| Complementary literature:   1. Michael J. Darby, Dominic A. Barron, Rachel E. Hyland, Oxford Handbook of Medical Imaging, Oxford University Press, 2012. |

Approved by the Head of the Department or an authorised person