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## Subject card

| Subject name and code | Methods of Reconstruction and Analysis of Images, PG_00053512 | | |
|---|---|---|---|
| Field of study | Biomedical Engineering | | |
| Date of commencement of studies | October 2021 | Academic year of realisation of subject | 2023/2024 |
| Education level | first-cycle studies | Subject group | Optional subject group<br>Subject group related to scientific research in the field of study |
| Mode of study | Full-time studies | Mode of delivery | at the university |
| Year of study | 3 | Language of instruction | Polish |
| Semester of study | 6 | ECTS credits | 2.0 |
| Learning profile | general academic profile | Assessment form | exam |
| Conducting unit | Department of Biomedical Engineering -> Faculty of Electronics, Telecommunications and Informatics | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Artur Poliński | |
| | Teachers | | |

| Lesson types and methods of instruction | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|---|
| | Number of study hours | 15.0 | 0.0 | 15.0 | 0.0 | 0.0 | 30 |
| | E-learning hours included: 0.0 | | | | | | |

| Learning activity and number of study hours | Learning activity | Participation in didactic classes included in study plan | Participation in consultation hours | Self-study | SUM |
|---|---|---|---|---|---|
| | Number of study hours | 30 | 3.0 | 17.0 | 50 |

| Subject objectives | Introduction to image reconstruction and analysis |
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| Learning outcomes | Course outcome | Subject outcome | Method of verification |
|---|---|---|---|
| | [K6_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions | Knows selected methods of image reconstruction | [SU1] Assessment of task fulfilment |
| | [K6_W04] Knows and understands, to an advanced extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, and organisation of systems using computers or such devices | Student<br>- Describes forward and inverse problem for the various modalities<br>- Describes the stages of measurement data collection and processing<br>- Calculates results for the reconstruction of simple objects<br>- Compares the quality of reconstruction for selected modalities | [SU1] Assessment of task fulfilment |

| Subject contents | 1. Forward problem 2. Inverse problem 3. Source inverse problem 4. Existence, uniqness, condition and stability of IP 5. Examples of inverse and forward problems 6. Fourier Transformation in imaging 7. Forward problem in CT 8. Methods of reconstruction in CT 9. Methods of reconstruction in CT - back projection 10. Methods of reconstruction in CT - algebraic 11. Methods of reconstruction in CT - Fourier 12. Methods of reconstruction in CT - filtered BP 13. Forward problem in MRI 14. Inverse problem and reconstruction in MRI 15. Reconstruction in parallel measurement systems 16. Dynamic and activity examinations 17. FMRI-reconstruction and properties 18. Brain in dymanic MRI and CT 19. Parametric images synthesis in brain perfusion evaluation 20. Fusion of multimodal images 21. Description and analysis of images 22. Representation of regions - region description (RLE, ..) 23. Representation of regions - description of contours (chain codes, signitures, Fourier descriptors, ...) 24. Parametrization and descriptors, descritpors of geometrical properties 25. Parametrization and descriptors, statistical moments 26. Parametrization and descriptors, intensity descriptors 27. Parametrization and descriptors, colour descriptors 28. Parametrization and descriptors, texture descriptors 29. Parametrization and descriptors, texture descriptors - statistic description 30. Parametrization and descriptors in MPEG7 |
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| Prerequisites and co-requisites | No requirements |

| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|---|
| | exam | 51.0% | 40.0% |
| | Laboratory | 51.0% | 60.0% |

| Recommended reading | Basic literature | B.H. Brown i inn. Medical physics and biomedical engineering, IOP, 2001 Instrukcje do ćwiczeń L. Chmielewski, J.K. Kulikowski, A. Nowakowski, Biocybernetyka i Inż. Biomed. 2000, t. 8, Obrazowanie Biomedyczne, Exit, 2003 R. B.Buxton, Introduction to functional magnetic resonance imaging, Cambridge University Press, 2002 Z.-H. Cho, J.P. Jones, M.Singh, Foundations of medical imaging, J.Wiley&Sons, 1993 |
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| | Supplementary literature | No requirements |
| | eResources addresses | |

| Example issues/ example questions/ tasks being completed | |
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| Work placement | Not applicable |