GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | Engineering of Dynamic Systems, PG_00047902 | | |
| Field of study | Electronics and Telecommunications | | |
| Date of commencement of studies | October 2024 | Academic year of realisation of subject | 2025/2026 |
| Education level | first-cycle studies | Subject group | Obligatory subject group in the field of study |
| Mode of study | Full-time studies | Mode of delivery | at the university |
| Year of study | 2 | Language of instruction | Polish |
| Semester of study | 3 | ECTS credits | 2.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Department of Automatic Control -> Faculty of Electronics, Telecommunications and Informatics | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Piotr Kaczmarek | |
| | Teachers | dr inż. Piotr Kaczmarek | |

**Lesson types and methods of instruction**

| Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|
| Number of study hours | 15.0 | 15.0 | 0.0 | 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 | 2.0 | 18.0 | 50 |

**Subject objectives**

Introduction to the methods of dynamic systems analysis and synthesis of basic control systems using feedback.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K6_W03] Knows and understands, to an advanced extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum | The student knows the methods of dynamic systems modeling | [SW1] Assessment of factual knowledge |
| [K6_W05] Knows and understands, to an advanced extent, methods of supporting processes and functions, specific to the field of study | Student can design feedback systems. | [SW1] Assessment of factual knowledge |
| [K6_U06] can analyse the operation of components, circuits and systems related to the field of study, measure their parameters and examine technical specifications | Student can model electronic and mechanical systems | [SU1] Assessment of task fulfilment |
| [K6_U07] can apply methods of process and function support, specific to the field of study | The student is able to use computer software for analysis and synthesis of control systems | [SU1] Assessment of task fulfilment |
| [K6_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions | The student is able to use computer software for designing automation systems | [SU1] Assessment of task fulfilment |

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| Subject contents | 1. Introduction to automatic control. Feedback systems. Basic components of closed-loop control systems.<br>2. Mathematical modelling of continuous-time dynamic systems. Linearisation of non-linear models of physical systems.<br>3. Linear models: transfer functions and state-space representations.<br>4. Stability of linear feedback control systems. Algebraic criteria of stability (Hurwitz and Routh-Hurwitz criterion).<br>5. Transient-response and steady-state error analysis for control systems. First order and second order models.<br>6. Control system design specifications in time domain.<br>7. Fundamental limitations in control system design. Effects of feedback on control systems.<br>8. Introduction to control system design. Model matching method for prototype transfer functions of closed-loop systems.<br>9. Root-locus analysis of control systems.<br>10. Preliminary design proportional regulation, lead, lag and lead-lag compensation.<br>11. Frequency-response analysis of control systems. Nyquist stability criterion. Frequency-domain properties of feedback control systems.<br>12. Frequency-domain methods for control system design. Principles of open-loop compensation.<br>13. Preliminary design – proportional regulation, lead, lag and lead-lag compensation.<br>14. Tuning rules for PID controllers.<br>15. Computer aided control system design |
| Prerequisites and co-requisites | Advanced mathematics and physics |

Assessment methods and criteria

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| Calculation test | 55.0% | 60.0% |
| Theory test | 55.0% | 40.0% |

Recommended reading

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| Basic literature | J. Nowakowski "Podstawy Automatyki" tom 1, Skrypt PG |
| Supplementary literature | F. Golnaraghi, B. C. Kuo "Automatic Control Systems" Willey 2010 |
| eResources addresses | Adresy na platformie eNauczanie: |

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