



## Subject card

|   |   |   |                                     |  |  |         |     |
|---|---|---|-------------------------------------|--|--|---------|-----|
| Subject name and code                       | Random Processes and Stochastic Control , PG_00049220   |   |                                     |  |  |         |     |
| Field of study                              | Automatic Control, Cybernetics and Robotics   |   |                                     |  |  |         |     |
| Date of commencement of studies             | February 2023   | Academic year of realisation of subject   |                                     |  | 2023/2024  |         |     |
| Education level                             | second-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                               | 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. Krzysztof Cisowski  |                                     |  |  |         |     |
|   | Teachers  | dr inż. Krzysztof Cisowski  |                                     |  |  |         |     |
| Lesson types and methods of instruction     | Lesson type   | Lecture   | Tutorial                            | Laboratory   | Project  | Seminar | SUM |
|   | Number of study hours   | 0.0   | 0.0                                 | 15.0   | 15.0   | 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  | 4.0                                 |  | 16.0   | 50      |     |
| Subject objectives                          | Practical verification of knowledge related to stochastic control.  |   |                                     |  |  |         |     |
| Learning outcomes                           | Course outcome  | Subject outcome   |                                     |  | Method of verification   |         |     |
|   | [K7_U07] can apply advanced methods of process and function support, specific to the field of study   | Student can estimate power spectral density of a stochastic process using nonparametric and parametric methods.<br>Student can form predictions of a stochastic process given its parametric model. |                                     |  | [SU1] Assessment of task fulfilment  |         |     |
|   | [K7_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions   | Student can synthesize and simulate minimum-variance/ moving-average controller for a nontrivial plant.   |                                     |  | [SU1] Assessment of task fulfilment  |         |     |
| K7_K02                                      | Student understands the balance between the resolution and variance of periodogram-type estimators.<br>Student understands the consequences of wrong model order selection during parametric spectrum estimation.<br>Student understands the problem of Kalman filter tuning. |   |                                     | [SK5] Assessment of ability to solve problems that arise in practice |  |         |     |

| Subject contents   | Lab 1: Nonparametric spectral estimation<br><br>Lab 2: Parametric spectral estimation<br><br>Lab 3: Prediction of stochastic processes<br><br>Lab 4: Kalman filter<br><br>Project: Synthesis and implementation of a minimumvariance-family controller   |                   |                               |                          |                   |                               |                         |       |       |                         |       |       |
|--|--|-------------------|-------------------------------|--------------------------|-------------------|-------------------------------|-------------------------|-------|-------|-------------------------|-------|-------|
| Prerequisites and co-requisites                                | System identification, stochastic control.   |                   |                               |                          |                   |                               |                         |       |       |                         |       |       |
| Assessment methods and criteria                                | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;">Subject passing criteria</th> <th style="width: 30%;">Passing threshold</th> <th style="width: 30%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Ocena wykonania zadania</td> <td>51.0%</td> <td>50.0%</td> </tr> <tr> <td>Ocena wykonania zadania</td> <td>51.0%</td> <td>50.0%</td> </tr> </tbody> </table> |                   |                               | Subject passing criteria | Passing threshold | Percentage of the final grade | Ocena wykonania zadania | 51.0% | 50.0% | Ocena wykonania zadania | 51.0% | 50.0% |
|  | Subject passing criteria   | Passing threshold | Percentage of the final grade |                          |                   |                               |                         |       |       |                         |       |       |
|  | Ocena wykonania zadania  | 51.0%             | 50.0%                         |                          |                   |                               |                         |       |       |                         |       |       |
| Ocena wykonania zadania  | 51.0%  | 50.0%             |                               |                          |                   |                               |                         |       |       |                         |       |       |
| Basic literature   | K.J. Astrom, Introduction to Stochastic Control Theory, Prentice Hall.   |                   |                               |                          |                   |                               |                         |       |       |                         |       |       |
| Supplementary literature                                       | T. Soderstrom, P. Stoica, System Identification, Prentice Hall.  |                   |                               |                          |                   |                               |                         |       |       |                         |       |       |
| eResources addresses   | Adresy na platformie eNauzanie:  |                   |                               |                          |                   |                               |                         |       |       |                         |       |       |
| Example issues/<br>example questions/<br>tasks being completed |  |                   |                               |                          |                   |                               |                         |       |       |                         |       |       |
| Work placement   | Not applicable   |                   |                               |                          |                   |                               |                         |       |       |                         |       |       |

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