



Subject card

|   |   |   |                                     |            |   |         |     |
|---|---|---|-------------------------------------|------------|---|---------|-----|
| Subject name and code                       | Discrete Time Systems, PG_00048111  |   |                                     |            |   |         |     |
| Field of study                              | Electronics and Telecommunications  |   |                                     |            |   |         |     |
| Date of commencement of studies             | October 2024  | Academic year of realisation of subject   |                                     |            | 2027/2028   |         |     |
| 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                               | 4   | Language of instruction   |                                     |            | Polish  |         |     |
| Semester of study                           | 7   | ECTS credits  |                                     |            | 2.0   |         |     |
| Learning profile                            | general academic profile  | Assessment form   |                                     |            | assessment  |         |     |
| Conducting unit                             | Department of Microelectronic Systems -> Faculty of Electronics, Telecommunications and Informatics   |   |                                     |            |   |         |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor  | dr hab. inż. Grzegorz Blakiewicz  |                                     |            |   |         |     |
|   | Teachers  | dr hab. inż. Grzegorz Blakiewicz  |                                     |            |   |         |     |
| 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  | 2.0                                 |            | 18.0  |         | 50  |
| Subject objectives                          | Gain knowledge on construction and principle of operation of analog functional blocks in discrete-time systems. Gain skills to design, analysis and computer simulations of analog discrete-time functional blocks.   |   |                                     |            |   |         |     |
| Learning outcomes                           | Course outcome  | Subject outcome   |                                     |            | Method of verification  |         |     |
|   | [K6_U03] can design, according to required specifications, and make a simple device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment  | In laboratory student practiced design and computer simulation techniques of discrete-time functional blocks. |                                     |            | [SU4] Assessment of ability to use methods and tools<br>[SU1] Assessment of task fulfilment                   |         |     |
|   | [K6_W32] Knows the parameters, functions and methods of analysis, design and optimization of analogue and digital circuits and electronic systems   | Student gained knowledge about basic analog discrete-time functional blocks.                                  |                                     |            | [SW3] Assessment of knowledge contained in written work and projects<br>[SW1] Assessment of factual knowledge |         |     |
| Subject contents                            | 1. Basic characteristics of integrated systems and CMOS technology<br>2. Characteristics of switched capacitor circuits<br>3. Switched capacitor resistance emulation<br>4. The time domain analysis of switched capacitor circuits<br>5. Switched capacitor amplifiers<br>6. Switched capacitor integrators<br>7. Z-domain models of switched capacitor circuits<br>8. Application of z-domain models to SC circuits analysis<br>9. Simulation of switched capacitor circuits<br>10. First-order switched capacitor filters<br>11. Characteristics of analogue-digital and digital-analogue<br>12. A survey of selected analogue-digital converter architectures<br>13. A survey of selected digital-analogue converter architectures<br>14. A survey of selected sigma-delta modulator architectures<br>15. An example of implementation of a digital-analogue converter with a sigma-delta modulator<br>16. An example of implementation of a analogue-digital converter with a sigma-delta modulator<br>17. Introduction to digital modulation and demodulation<br>18. Final test |   |                                     |            |   |         |     |

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| Prerequisites and co-requisites                                | No requirements          |   |                               |
| Assessment methods and criteria                                | Subject passing criteria | Passing threshold   | Percentage of the final grade |
|  | Practical exercise       | 50.0%   | 30.0%                         |
|  | Midterm colloquium       | 50.0%   | 70.0%                         |
| Recommended reading  | Basic literature         | P. E. Allen, D. R. Holberg „CMOS Analog Circuit Design”, Oxford University Press, New York 2002.  |                               |
|  | Supplementary literature | J. J. Mulawka, „Układy mikroelektroniczne z przełączanymi pojemnościami”, WKŁ, Warszawa 1987.<br><br>P. E. Allen, E. Sanchez-Sinencio, „Switched Capacitor Circuits”, VNR, New York 1984. |                               |
|  | eResources addresses     | Adresy na platformie eNauczanie:  |                               |
| Example issues/<br>example questions/<br>tasks being completed |                          |   |                               |
| Work placement   | Not applicable           |   |                               |

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