

# ITEM CARD (SYLLABUS)

## Item description

|                                     |                    |                                                                                                                                   |                          |                       |
|-------------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------|-----------------------|
| Code course                         |                    | course<br>name                                                                                                                    | Systemy akwizycji danych |                       |
| RA/O/I/NST/C.06a                    |                    |                                                                                                                                   | Data acquisition systems |                       |
| language                            |                    | Angielski                                                                                                                         |                          |                       |
| Academic year                       |                    | 2026/2027                                                                                                                         |                          |                       |
| Direction of study                  |                    | Robotics and automatization of processes                                                                                          |                          |                       |
| Specialization                      |                    | -                                                                                                                                 |                          |                       |
| Level of education (study)          |                    | studia pierwszego stopnia                                                                                                         |                          |                       |
| Profile of education (study)        |                    | Ogólnoakademicki                                                                                                                  |                          |                       |
| Form of study                       |                    | studia niestacjonarne                                                                                                             |                          |                       |
| Semester / semester                 |                    | 5                                                                                                                                 |                          |                       |
| Belonging to a course groups        |                    | Grupa zajęć kierunkowych                                                                                                          |                          |                       |
| Course status                       |                    | Do wyboru                                                                                                                         |                          |                       |
| Form of classes, hours, points ECTS |                    | form of classes                                                                                                                   | number of hours          | number of points ECTS |
|                                     |                    | Lecture                                                                                                                           | 10 [h]                   | 4 ECTS                |
|                                     |                    | Exercise                                                                                                                          | 0 [h]                    |                       |
|                                     |                    | Lab                                                                                                                               | 20 [h]                   |                       |
| Relationship subject                | z profilem studiów | związany z prowadzoną działalnością naukową w dyscyplinie inżynieria mechaniczna do której przyporządkowany jest kierunek studiów |                          | 4 ECTS                |
|                                     | z uprawnieniami    | służy zdobywaniu przez studenta kompetencji inżynierskich                                                                         |                          | 4 ECTS                |
|                                     | z dyscypliną       | Inżynieria mechaniczna                                                                                                            |                          | 4 ECTS                |
| Form of teaching                    |                    | traditional - classes organized at the University / classes carried out with the use of distance learning methods and techniques  |                          |                       |
| Prerequisites                       |                    | knowledge of mathematics, mechanics, material strength and CAD modeling                                                           |                          |                       |
| Conducting unit                     |                    | URad. Katedra Mechaniki Stosowanej i Mechatroniki                                                                                 |                          |                       |
| Coordinator                         |                    | dr inż. Krzysztof Olejarczyk                                                                                                      |                          |                       |
| Faculty WWW address                 |                    | http://wm.uniwersytetradom.pl                                                                                                     |                          |                       |
| mail, phone number of coordinator   |                    | <a href="mailto:k.olejarczyki@urad.edu.pl">k.olejarczyki@urad.edu.pl</a>                                                          |                          |                       |

## COURSE OUTCOMES, METHODS OF TEACHING AND VERIFICATION OF THE EFFECTS OF EDUCATION

|                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Purpose of the course:                                                                                                      | <p>C1 - Acquainting with the methods of computer recording of measurements from various sensors</p> <p>C2 - Mastering the ability to build simple acquisition and signal generation systems</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Course teaching content:                                                                                                    | <p>Lecture Content:</p> <p>Basic parameters of a DAQ system: resolution, range, measurement speed, Nyquist sampling theorem, aliasing, and ghosting. Main components of measurement equipment: sensors, analog-to-digital (A/D) converters, digital-to-analog (D/A) converters, signal conditioning, and data acquisition software. Overview of a sample compact DAQ system.</p> <p>Lab Content:</p> <p>Measurement of rotational speed with a tachometer and analysis of the recorded signal.</p> <p>Analysis of degradation of a sample object using the synchronous time averaging (TSA) method in run-to-failure (RTF) tests.</p> <p>Construction of a system for data acquisition using accelerometers and signal analysis.</p> <p>Construction of a system for data acquisition for modal analysis.</p> <p>Construction of a system for data acquisition using strain gauges and signal analysis.</p> |
| Method of teaching:                                                                                                         | <p>informative lecture combined with a power-point presentation; programmed methods (using a computer to build software for measurement systems),</p> <p>practical methods (construction of measuring stands with the use of computers, measuring cards, sensors )</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| The rigor of passing, the criteria for assessing the learning outcomes achieved, the method of calculating the final grade: | <p>Lecture pass requirement: passing the written test. Laboratory pass requirement: passing all lab exercises.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

| Education effects for the course in relation to the direction effects and form of classes |                                                                                                                                                                                                       |                                   |                                 | Verification methods of learning outcomes |                                                 |
|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|-------------------------------------------|-------------------------------------------------|
| number of education effect                                                                | Description effects of education for the subject<br>Student who has completed the course<br>(W) know/(U) be able/(K) can:                                                                             | Directional learning effect (EKK) | Form of realization of teaching | examination form                          | Form check                                      |
| W1                                                                                        | He knows the rules of application of measuring devices and systems in various technical facilities. Has detailed knowledge of the characteristics of analog and digital signals and their parameters. | K_W10                             | lecture                         | Written tests                             | Assessment of the exam                          |
| U1                                                                                        | He has practical skills in setting up measuring equipment and carrying out measurements with the use of computer systems                                                                              | K_U05                             | laboratory classes              | Written tests                             | Assessment of written tests, assessment reports |
| U2                                                                                        | Can speak English sufficiently to read and understand catalog cards, application notes, team and teacher communication, documentation of acquisition systems development                              | K_UK16                            | laboratory classes              | Observation, conversation, report         | Verbal evaluation, report evaluation            |
| K1                                                                                        | Is aware of responsibility for their own work and readiness to submit to the principles of teamwork and responsibility for jointly performed tasks.                                                   | K_U17                             | laboratory classes              | Written tests                             | Assessment of the test                          |

| Recommended reading, literature supplement, teaching aids |                                                                                                                                       |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 1.                                                        | Richard G. Lyons: Understanding Digital Signal Processing, Pearson; 3rd edition (November 1, 2010)                                    |
| 2.                                                        | Presentation of the lectures in pdf format.                                                                                           |
| 3.                                                        | National Instruments information materials from the website <a href="https://www.ni.com/pl-pl.html">https://www.ni.com/pl-pl.html</a> |
| 4.                                                        | Instructions for design tasks                                                                                                         |

| Student workload - the balance of ECTS credits                              |                            |                                 |                  |
|-----------------------------------------------------------------------------|----------------------------|---------------------------------|------------------|
| Participation in classes, activities                                        | student load [h]           |                                 |                  |
|                                                                             | Other hours. Contact (IGK) | Classes without a teacher (ZBN) | classes          |
| Udział w wykładach/ćwiczeniach/laboratorium                                 | X                          | X                               | 10[h]/20[h]/0[h] |
| Udział w konsultacjach                                                      | 5 [h]                      | X                               | X                |
| Przygotowanie do wykładów/ćwicz/lab<br>Przygotowanie do zaliczenia/egzaminu | X                          | 49 [h]                          | X                |
| Sumaryczne obciążenie pracą studenta                                        | 5 [h]/ 0,2 ECTS            | 49 [h]/ 2,4 ECTS                | 30 [h]/ 1,4 ECTS |
| Punkty ECTS za przedmiot                                                    | 4 ECTS                     |                                 |                  |

| Remarks                                                                                                                                                                                                                                                                                                                                                                         |
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| W przypadku studentów ze szczególnymi potrzebami, w tym: z niepełnosprawnością, przewlekłe chorych, określone powyżej (w karcie) metody i formy weryfikacji efektów uczenia się dostosowuje się odpowiednio do indywidualnych potrzeb tych studentów.                                                                                                                           |
| Szczegółowe zasady i formy wsparcia studentów ze szczególnymi potrzebami: w tym z niepełnosprawnością, przewlekłe chorych podczas zajęć, zaliczeń i egzaminów określono w: Regulaminie Studiów, Zasadach Studiowania, Procedurze dotyczącej zapewnienia dostępności procesu kształcenia studentom ze szczególnymi potrzebami, w tym: z niepełnosprawnością, przewlekłe chorych. |

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