GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | Monitoring of both buildings and energy sources, PG_00057326 | | |
| Field of study | Power Engineering, Power Engineering, Power Engineering | | |
| 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 |
| Mode of study | Full-time studies | Mode of delivery | at the university |
| Year of study | 1 | Language of instruction | Polish |
| Semester of study | 2 | ECTS credits | 3.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Katedra Wytrzymałości Materiałów -> Faculty of Civil and Environmental Engineering | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr hab. inż. Mikołaj Miśkiewicz | |
| | Teachers | | |

**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 | 8.0 | 37.0 | 75 |

**Subject objectives**

The goal of the course is to familiarize students with the basic information on diagnostics and monitoring of engineering structures.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K7_W01] has extended and deepened knowledge of mathematics indispensable for describing phenomena related to processes of energy conversion and transfer; uses advanced information technologies | The student has the knowledge and skills required for independent interpretation of data recorded by diagnostic tools and technical monitoring systems of buildings. | [SW2] Assessment of knowledge contained in presentation<br>[SW3] Assessment of knowledge contained in written work and projects |
| [K7_U03] has the necessary preparation to work in an industrial environment, is prepared to undertake third degree studies, applies the principles of safety and hygiene | The student has the knowledge and skills required to independently design a technical monitoring system for a building. | [SU3] Assessment of ability to use knowledge gained from the subject<br>[SU5] Assessment of ability to present the results of task<br>[SU1] Assessment of task fulfilment<br>[SU2] Assessment of ability to analyse information |

**Subject contents**

1 Fundamentals of structural monitoring.2 Selected applications of monitoring systems.3 Structural damage and diagnostics.4 Maintenance of engineering structures.5 Wind turbine blade diagnostics and monitoring.6 Geodetic monitoring.7 BIM in the maintenance of engineering structures.Development of a monitoring system concept for a selected civil structure

**Prerequisites and co-requisites**

The student entering the course should have a basic knowledge of structural mechanics and strength of materials.

**Assessment methods and criteria**

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| Presentation | 50.0% | 30.0% |
| Development of a structural monitoring system concept | 50.0% | 70.0% |

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| Recommended reading | Basic literature | 1. Balageas D., Fritzen C. P., Güemes A, Structural Health Monitoring, Wiley-ISTE, January 2006<br>2. Baker J. F., Choice of a Strain Gauge, Geotechnical Instrumentation News, 2007<br>3. Beard S., Kumar A., Qing X., Chan H., Zhang Ch., Ooi T., Practical issues in real-word implementation of structural health monitoring systems, Acellent Technologies, Missile Defense Agency, 2005<br>4. Boller Ch., Chang F., Fujina Y., Encyclopedia of Structural Health Monitoring, John Wiley & Sons, 2009 (ISBN: 9780470058220)<br>5. Caffrey J., Networked Sensing for Structural Health Monitoring, 4th International Workshhop on Structural Control, Columbia University, New York, June 2004<br>6. Furtner P., Wenzel H., Structural Health Monitoring at the Civil Infrastructure: Recent progress & Future Demands, 4th International Conference on SHM of Intelligent Structure, Zurich, 2009<br>7. Ustawa Prawo budowlane |

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|---|---|---|
| | Supplementary literature | 1) Miśkiewicz M., Pyrzowski Ł., Sobczyk B.: Short and long term measurements in assessment of FRP composite footbridge behavior. Materials, SI: Advanced Structural Health Monitoring in Materials . 2020, 13, 525. DOI:10.3390/ma13030525<br><br>2) Miśkiewicz M.: Structural response of existing spatial truss roof construction based on Cosserat rod theory. Continuum Mechanics and Thermodynamics. Vol. 31, iss. 1 (2019), pp.79÷99. DOI:10.1007/s00161-018-0660-8.<br><br>3) Miśkiewicz M., Meronk B., Brzozowski T., Wilde K.: Monitoring system of the road embankment. Baltic Journal of Road and Bridge Engineering. Vol. 12(4), pp.218÷224, 2017. DOI:10.3846/bjrbe.2017.27.<br><br>4) Miśkiewicz M., Pyrzowski Ł., Wilde K., Mitrosz O.: Technical monitoring system for a new part of Gdańsk Deepwater Container Terminal. Polish Maritime Research. Vol. 24, nr. S1(93), pp.149÷155, 2017. DOI:10.1515/pomr-2017-0033.<br><br>5) Miśkiewicz M., Mitrosz O., Brzozowski T.: Preliminary field tests and long-term monitoring as a method of design risk mitigation: a case study of Gdańsk deepwater container terminal. Polish Maritime Research. Vol. 24, nr. 3(95), pp.106÷114, 2017. DOI:10.1515/pomr-2017-0095.<br><br>6) Miśkiewicz M., Pyrzowski Ł., Wilde K..: Structural Health Monitoring System for Suspension Footbridge. Proceedings 2016 Baltic Geodetic Congress (Geomatics), IEEE, pp.321÷325, 2017. DOI: 10.1109/BGC.Geomatics.2017.8.<br><br>7) Miśkiewicz M., Pyrzowski Ł., Wilde K..: Structural Health Monitoring of Composite Shell Footbridge for Its Design Validation. 2016 Baltic Geodetic Congress (Geomatics), IEEE, pp.228÷233, 2016. DOI:10.1109/BGC. Geomatics.2016.48.<br><br>8) Mariak A., Miśkiewicz M., Meronk B., Pyrzowski Ł., Wilde K.: Reference FEM model for SHM system of cable-stayed bridge in Rzeszów. 3rd Polish Congress of Mechanics (PCM) / 21st International Conference on Computer Methods in Mechanics (CMM), 2016, CRC Press/Balkema, pp.383÷387. DOI:10.1201/b20057-82.<br><br>9) Kaminski W., Makowska K., Miśkiewicz M., Szulwic J., Wilde K.: System of monitoring of the Forest Opera in Sopot structure and roofing. 15th International Multidisciplinary Scientific GeoConference SGEM 2015, Book 2 Vol. 2, 2015, pp.471÷482, DOI:10.5593/SGEM2015/B22/S9.059.<br><br>10) Wilde K., Miśkiewicz M., Chróścielewski J.: SHM System of the Roof Structure of Sports Arena Olivia. 9th International Workshop on Structural Health Monitoring (IWSHM). Vol. II, pp.1745÷1752,<br><br>11) Chróścielewski J., Miśkiewicz M., Pyrzowski Ł., Rucka M., Sobczyk B., Wilde K., Meronk B.: Dynamic Tests and Technical Monitoring of a Novel Sandwich Footbridge. Dynamics of Civil Structures, Volume 2, 2019.<br><br>12) Miśkiewicz M.: Nieliniowa analiza MES i monitoring konstrukcji prętowo cięgnowych. Wydawnictwo Politechniki Gdańskiej, 2016. 176 s. ISBN 978-83-7348-653-9. |
| | eResources addresses | Adresy na platformie eNauczanie: |
| Example issues/ example questions/ tasks being completed | Construct a monitoring system concept for the indicated building facility.What are inclinometers used for? Describe monitoring strategies for building infrastructure. | |
| Work placement | Not applicable | |