GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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| Subject name and code | , PG_00071039 | | |
| Field of study | Mathematics | | |
| Date of commencement of studies | October 2025 | Academic year of realisation of subject | 2025/2026 |
| Education level | second-cycle studies | Subject group | |
| Mode of study | Full-time studies | Mode of delivery | e-learning |
| Year of study | 1 | Language of instruction | Polish |
| Semester of study | 2 | ECTS credits | 2.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Department of Mechanics of Materials and Structures -> Faculty of Civil and Environmental Engineering -> Faculties of Gdańsk University of Technology | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Marzena Kurpińska | |
| | Teachers | dr inż. Marzena Kurpińska | |

| Lesson types | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|---|
| | Number of study hours | 30.0 | 0.0 | 0.0 | 0.0 | 0.0 | 30 |
| | E-learning hours included: 30.0 | | | | | | |

| 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 |

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| Subject objectives | The aim of the course is to familiarize students with the concept of sustainable development in construction and to develop their awareness of the impact of construction activities on the natural environment and society. The course is intended to enhance students ability to critically analyze both traditional and modern construction solutions in terms of their durability, energy efficiency, innovativeness, and compliance with the principles of ecology and sustainable development. Students will acquire knowledge of technologies, materials, standards, and legal frameworks that enable the evaluation of construction projects at both local and global scales. This will prepare them for informed design and decision-making that supports the creation of more sustainable and environmentally friendly solutions in their future professional practice. |

| Learning outcomes | Course outcome | Subject outcome | Method of verification |
|---|---|---|---|
| | [K7_K71] is able to explain the need to apply knowledge from humanistic, social, economic or legal sciences in order to function in a social environment | The ability to critically analyze solutions in construction. Students will learn how to evaluate construction projects in terms of their innovativeness, compliance with ecological principles, and their impact on society. | [SK5] Assessment of ability to solve problems that arise in practice |
| | [K7_U71] is able to apply knowledge from humanistic, social, economic or legal sciences in order to solve problems | Understanding the relationships between traditional construction and sustainable development. Students will gain knowledge of how construction technologies and practices affect the natural environment and society. They will learn to evaluate the design and implementation of buildings and infrastructure in terms of durability, energy efficiency, and their impact on people’s quality of life. This understanding will provide the foundation for developing more sustainable and environmentally friendly solutions in the future. | [SU2] Assessment of ability to analyse information |
| | [K7_W71] has general knowledge in humanistic, social, economic or legal sciences, including their fundamentals and applications | Students will acquire analytical tools, including knowledge of relevant legal frameworks and applicable standards, which will enable them to analyze case studies from Poland and around the world. These tools will allow them to identify best practices as well as potential areas for improvement. | [SW3] Assessment of knowledge contained in written work and projects |

## Subject contents

Course content – lecture

Course Content (Lectures):

1. Introduction to sustainable development in construction. Discussion of key concepts and their significance for the future of the construction industry.
2. Principles of ecological design, production of building materials, and construction of buildings, including passive heating and cooling systems, green roofs, and water and energy management systems.
3. Building materials with a reduced carbon footprint. Life-cycle perspectives, environmental impact, and recycling potential, with particular emphasis on innovative materials such as eco-concrete and recycled aggregates.
4. Energy efficiency and renewable energy sources in construction. Analysis of methods for reducing energy consumption in buildings and integrating renewable energy sources such as solar panels and wind turbines.
5. Water and waste management. Discussion of strategies for efficient management of water resources and waste.
6. Bioclimatic and adaptive approaches to design. Presentation of design methods that use natural environmental conditions to maximize thermal comfort and energy efficiency.
7. The social dimension of sustainable construction. Analysis of the impact of construction on local communities and cultural aspects of design, including housing accessibility, public spaces, and heritage protection.
8. Technological innovations in sustainable construction. Discussion of new technologies and construction methods that promote sustainable development, e.g., 3D printing in construction and smart buildings.
9. The future of sustainable construction. Discussion of future trends in sustainable construction, including the role of innovation and technology in shaping future building practices.
10. Designing construction with climate change in mind. Discussion of design and construction strategies that support climate change adaptation and mitigation, including risk management related to extreme weather events.

## Prerequisites and co-requisites

**Prerequisites:**

1. Basic knowledge of construction engineering.
2. General knowledge of the principles of ecology and sustainable development.
3. Analytical and critical thinking skills.

**Additional requirements:**

1. Interest in environmental issues.
2. Willingness to work in a team.

## Assessment methods and criteria

| Subject passing criteria | Passing threshold | Percentage of the final grade |
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| Written assignment | 60.0% | 50.0% |
| Presentation | 60.0% | 30.0% |
| Attendance in classes | 80.0% | 20.0% |

## Recommended reading

Basic literature

**1. Kibert, C. J.** (2016). *Sustainable Construction: Green Building Design and Delivery* (4th ed.). Hoboken: John Wiley & Sons.

**2. Ding, G. K. C.** (2008). *Sustainable ConstructionThe Role of Environmental Assessment Tools. Journal of Environmental Management*, 86(3), 451464.

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|---|---|---|
| | Supplementary literature | **1. Edwards, B.** (2014). *Rough Guide to Sustainability: A Design Primer* (4th ed.). London: RIBA Publishing.<br><br>**2. Halliday, S.** (2018). *Sustainable Construction* (2nd ed.). London: Routledge. |
| | eResources addresses | |
| Example issues/ example questions/ tasks being completed | Written assignments (example topics):<br><br>1. Life Cycle Assessment (LCA) of a selected building material e.g., concrete, steel, or timber.<br><br>2. Low-carbon concrete and geopolymers innovative solutions for reducing CO emissions.<br><br>3. Natural insulation materials wood wool, hemp, and cellulose.<br><br>4. Recycling of construction materials in practice examples from Europe and around the world.<br><br>5. Green roofs and green walls as elements of sustainable architecture.<br><br>6. Passive design solutions in buildings examples of passive and zero-energy buildings.<br><br>7. Use of renewable energy in residential and public buildings.<br><br>8. Circular construction and the principles of design for disassembly reuse of materials from demolition.<br><br>9. Nanotechnologies in building materials self-cleaning coatings, advanced insulation materials, and high-performance concretes.<br><br>10. The future of sustainable construction 3D printing, bio-inspired materials, and plus-energy buildings. | |
| Practical activites within the subject | Not applicable | |

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