COURSE DESCRIPTION CARD - SYLLABUS

Course name
Building materials recycling [S2TOZ1-RMiOC>RMB]

Course

Field of study
Circular System Technologies

Year/Semester
2/3

Area of study (specialization)
Material recycling and chemical recovery

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
15

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of general and inorganic chemistry, including knowledge of construction materials and physical chemistry and chemical industry equipment (core curriculum of the 1st and 2nd years of full- time studies of the 1st cycle). Ability to solve elementary problems of general and inorganic chemistry and materials technology on the basis of acquired knowledge, ability to obtain information from indicated sources in Polish and foreign language. Understanding of the need for further education, understanding of the need to expand one's own competences, willingness to cooperate in a team.

Course objective

To provide the student with knowledge of proper selection, quality assessment and suitability of production processes and characteristics of modern building materials. In addition, to provide engineering knowledge in the field of proper recycling of building materials.

Course-related learning outcomes

Knowledge:
K_W02 - has advanced, structured and theoretically based knowledge of the principles of circular economy and the reasons for its implementation. P7S_WG

K_W03 - has advanced, detailed knowledge of sustainable production issues, principles and trends in circular economy development. P7S_WG
K_W04 - has structured, advanced knowledge that allows to identify, assess the harmfulness and neutralize factors harmful to the natural environment. P7S_WG
K_W05 - has deep and theoretical knowledge of modern environmentally friendly technologies (green chemistry, zero-emission technologies, circular economy). P7S_WG
K_W06 - has extended knowledge allowing to identify and differentiate environmental hazards and knows the principles of waste neutralization and recycling taking into account the requirements of the circular economy. P7S_WG
K_W09 - uses basic legal, economic, and ethical actions taken to protect the environment and the circular economy. P7S_WK
K_W10 - has systematic knowledge in the field of sampling, storage and proper selection of analytical techniques for their determination. P7S_WG
K_W11 - has knowledge of the classification of selected waste materials and the application of appropriate recycling and recovery techniques in accordance with applicable legislation. P7S_WK
K_W12 - has in-depth knowledge of the methods of material recycling, raw material recovery and energy recovery from waste materials required for the design, optimisation and implementation of innovative technological processes. P7S_WG
K_W14 - knows and understands basic processes in the life cycle of materials, advanced devices and equipment, technical objects and systems used in closed-loop technologies. P7S_WG

Skills:
K_U02 - plan, prepare and give a presentation on carrying out a research task and conduct a substantive discussion on a given topic. P7S_UK
K_U03 - is able to use his/her knowledge to identify and select methods for the disposal/management of various industrial wastes, taking into account the principles of the circular economy, and to propose improvements to existing technological solutions, taking into account applicable legislation. P7S_UW
K_U04 - is able to identify and critically evaluate technological solutions in the field of waste recycling in accordance with the principles of the circular economy. P7S_UW
K_U05 - is able to plan and manage lifelong learning in order to improve his or her personal and professional competences. P7S_UU
K_U06 - is able to think creatively, use sources correctly, analyse them critically and formulate opinions on professional issues on the basis of the information they contain. P7S_UW
K_U10 - is able to select methods of recycling, chemical recovery and disposal of various wastes and to formulate assumptions necessary for designing innovative solutions based on the principles of circular economy. P7S_UW
K_U11 - is able to qualify selected waste materials and apply appropriate recycling and recovery techniques in accordance with applicable legislation. P7S_UW
K_U13 - is able to assess the quality of waste materials undergoing reprocessing and to qualify them for further use in different industries. P7S_UW
K_U15 - is able to make skilful use of specialist literature and expert opinions, to integrate, interpret and critically evaluate the information obtained and, on this basis, to formulate competent opinions and reports. P7S_UW

Social competences:
K_K01 - is aware of personal responsibilities arising from the professional role performed and of moral and ethical problems arising in the context of professional activities. P7S_KR
K_K02 - is aware of the need to popularize knowledge in the field of sustainable production and technological solutions in the circular economy. P7S_KO
K_K03 - critically evaluates his/her knowledge and understands the need for continuous learning and improvement of professional, personal and social competences. P7S_KK
K_K04 - is able to think and act entrepreneurially, being aware of his/her social role and public interest. P7S_KO

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
Stationary form - the knowledge gained in the lecture is tested in the form of a written exam at the end of the lecture cycle. The exam consists of 5-10 open-ended questions.

Online form - the knowledge acquired during the lecture is verified in the form of a written or oral exam at the end of the lecture cycle via the eKursy platform. The written exam consists of 5 open questions, which students answer in "live view" mode with a webcam turned on via the eMeeting or Zoom platform, and 10-20 closed test questions (multiple choice), which students answer using the test module on the eKursy platform. The oral exam consists of 5 open questions that each student answers in "live view" mode with a webcam turned on through the eMeeting or Zoom platform during a direct conversation with the instructor.
Grading criteria: 3 - 50.1%-60.0%; 3.5 - 60.1%-70%; 4 - 70.1%-80.0%; 4.5 - 80.1%-90%; 5 - above 90.1%.
Project:
Stationary form - presentation of theoretical and experimental material, solving scientific problems, evaluation of student activity in project classes, evaluation of practical classes, evaluation of teamwork. Criteria: form of presentation, ability to present oneself, active participation in discussion and answering questions.
Online form - presentation of theoretical and experimental material, solving scientific problems, assessment of student activity in project classes, assessment of practical classes, assessment of teamwork, which students present in "live view" mode with a webcam turned on via eMeeting or the Zoom platform. Criteria: form of presentation, ability to present oneself, active participation in the discussion and answers to the questions asked.

Programme content

Basic information about standardization of building materials. Basic parameters and criteria for selection of construction materials. Technical properties of construction materials. General classification of construction materials. Test methods and durability of construction materials. Functions of construction materials. Recycling of building materials.

Course topics

1. Basic information on standardization of construction materials. Technical properties of construction materials.
2. General classification of materials. Test methods. Durability of building materials.
3. Basic parameters and criteria for selection of construction materials.
4. New trends in cement and concrete technology. Self-compacting and photocatalytic concretes. HSC, UHSC and fiber concretes. Transparent and glass concretes. Geopolymer concretes. Flexible and self-healing concretes.
5. Corrosion and durability of construction materials.
6. Nanotechnologies in construction.
7. Recycling of construction materials.

Teaching methods

Lecture: multimedia presentations.
Project: Multimedia presentations, illustrated with examples on the blackboard and carrying out tasks given by the teacher, solving research problems.

Bibliography

Basic:
1. 1. J.A.O. Barros, G. Kaklauskas, E.K. Zavadskas, Modern Building Materials, Structures and Techniques MBMST, 2023.
2. P. Domone, J. Illston, Construction Materials Their Nature and Behaviour, 4th edition, 2010.
3. J. Newman, B.S. Choo, Advanced Concrete Technology II, 2003.
4. M.A. Caldarone, High strength Concrete, 2009.
5. K. Gopalakrishnan, B. Birgisson, P. Taylor, N. Attoh-Okira, Nanotechnology in Civil Infrastructure, 2011.
6. B. Stefańczyk, Budownictwo ogólne, t. 1: Materiały i wyroby budowlane, Warszawa, 2005.
7. K. Zieliński, Podstawy technologii betonu, Poznań, 2015.

Additional:
1. Recent scientific publications in national and international circulation.
2. Information and technical materials from manufacturers of building materials.

3. Additional materials prepared by the instructor.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00