

Course title:	Geopolymers - innovative and eco-friendly materials for construction industry
Institute/Division:	Chair of Material Engineering, Faculty of Material Engineering and Physics
Number of contact hours:	30 hours
Course duration:	1 semester
ECTS credits:	6

Course description:

This course gives comprehensive knowledge of geopolymers and their composites as modern and environmentally friendly materials for the construction industry, including their design for required properties, manufacturing methods, and specific applications. Moreover the topic connected with assessment of the influence of additives on the properties of geopolymers as well as impact of building materials on the environment are delivered.

Topics covered include:

- Fundamentals of geopolymers (historical overview, material classification, basic chemistry of geopolymers, raw materials used for the production of geopolymers)
- Properties of geopolymers (mechanical properties, thermal properties, resistance to corrosive factors, durability, effect of additives on material properties)
- Applications in construction industry (construction material, decorative elements, insulating materials and others, barriers to a wider use of geopolymers)
- Technologies of manufacturing building elements from geopolymers (casting, production of foamed materials, additive technologies)
- Impact of the building materials on the environment (using waste materials for production, recyclability, minimizing energy consumption in the manufacturing process, carbon footprint)
- The use of geopolymers in terms of the applicable building standards

Literature:

- Davidovits, J. Geopolymer Chemistry and Applications, 4th ed.; Geopolymer Institute: Saint-Quentin, France, 2015; p. 644.
- Korniejenko, K.; Figiela, B.; Ziejewska, C.; Marczyk, J.; Bazan, P.; Hebda, M.; Choińska, M.; Lin, W.-T. Fracture Behavior of Long Fiber Reinforced Geopolymer Composites at Different Operating Temperatures. *Materials* 2022, 15, 482.
- Figiela, B.; Šimonová, H.; Korniejenko, K. State-of-the-Art, Challenges and Emerging trends: Geopolymer Composite Reinforced with Dispersed Steel Fibers. *Rev. Adv. Mater. Sci.* 2022, 61.
- Korniejenko, K.; Łach, M. Geopolymers reinforced by short and long fibres - innovative materials for additive manufacturing. *Curr. Opin. Chem. Eng.* 2020, 28, 167–172.

Course type:	Lectures (15 hours) + Laboratories (15 hours)
Assessment method:	Attendance, activity, oral presentation, oral exam
Prerequisites:	At least one college level math, physics and chemistry course
Primary target group:	Material Engineering
Lecturer:	Kinga Korniejenko, PhD / Beata Figiela, MSc
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