<table>
<tr><td>Course code</td><td></td></tr>
<tr><td>Type and description</td><td>Background Course</td></tr>
<tr><td>ECTS credit</td><td>2</td></tr>
<tr><td>Course name</td><td>Physics of Building Materials</td></tr>
<tr><td>Course name in Polish</td><td>Fizyka porowatych materiałów budowlanych</td></tr>
<tr><td>Language of instruction</td><td>English</td></tr>
<tr><td>Course level</td><td>8 PRK</td></tr>
<tr><td>Course coordinator</td><td>Dariusz Gawin</td></tr>
<tr><td>Course instructors</td><td>Dariusz Gawin, Marcin Koniorczyk</td></tr>
<tr><td>Delivery methods and course duration</td><td>
<table>
<tr><th></th><th>Lecture</th><th>Tutorials</th><th>Laboratory</th><th>Project</th><th>Seminar</th><th>Other</th><th>Total of teaching hours during semester</th></tr>
<tr><td>Contact hours</td><td>15</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>15</td></tr>
<tr><td>E-learning</td><td>Yes</td><td>No</td><td>No</td><td>No</td><td>No</td><td>No</td><td></td></tr>
<tr><td>Assessment criteria (weightage)</td><td>1.0</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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<tr><td>Course objective</td><td>Aims of the course is:
1. to extend knowledge in the field of Porous Materials Physics,
2. to learn formulating mathematical models of coupled energy and mass and linear momentum transport phenomena,
3. to learn numerical methods for simulation of coupled heat and moisture transport problems.</td></tr>
<tr><td>Learning outcomes</td><td>After the course student:
1. knows and understands basics of Porous Materials Physics (W1,W4),
2. knows and is able to formulate initial-boundary problems for analysis of coupled energy and mass and linear momentum transport (W4),
3. knows the physical origins of mutual couplings between energy and mass and linear momentum transport in porous media (W1, W4),
4. can derive a weak form of the mathematical model of coupled energy and mass and linear momentum transport (U3),
5. can derive macroscopic balance equations of coupled energy and mass and linear momentum transport in porous materials (U3),
6. knows and can apply numerical methods and/or softwares to analysis of coupled heat and mass transport in deformable porous building materials (U3).
7. can critically analyse scientific achievements in the field of Mechanics of Porous Materials (K2)
8. can present the obtained results (K1).</td></tr>
<tr><td>Assessment methods</td><td>Effects W1, W4– oral examination

effects U3, K1, K2 – presentation

The final evaluation is based on:

Exam - 80%

Presentation - 20%</td></tr>
</table>

Prerequisites	
Course content with delivery methods	Basics of porous materials physics: microstructure, physics of transport phenomena, effective stress principle. Mathematical models of coupled energy and mass and linear momentum transport. Strong and weak formulation of the energy/mass/linear momentum transport in porous media. Application of Finite Element and Finite Difference Methods for simulation of coupled energy and mass and linear momentum transport. Numerical analysis of coupled heat and mass transport in deformable porous building materials Examples of practical application.
Basic reference materials	1. Aitkins, P., de Paula, J., 2002. Aitkins' Physical Chemistry, Seventh Edition. Oxford University Press Inc., New York. 2. Gregg, S.J., Sing, K.S.W., 1982. Adsorption, Surface Area and Porosity. Academic Press, London. 3. Lewis, R.W., Schrefler, B.A., 1998. The Finite Element Method in the Static and Dynamic Deformation and Consolidation of Porous Media, 2nd edition. John Wiley & Sons, Chichester. 4. Gawin, D., 2000. Modelling of coupled hygro-thermal phenomena in building materials and building components (in Polish), Scientific Bulletin of Łódź Technical University No 853. Editions of Łódź Technical University, Łódź.
Other reference materials	
Average student workload outside classroom	35h
Comments	
Last update	2025