



## Subject card

|                                             |                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                   |                                     |            |                                                                                                                                                                          |         |     |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----|
| Subject name and code                       | Modern Technologies and Materials - team project, PG_00053167                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                   |                                     |            |                                                                                                                                                                          |         |     |
| Field of study                              | Chemistry in Construction Engineering                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                   |                                     |            |                                                                                                                                                                          |         |     |
| Date of commencement of studies             | February 2024                                                                                                                                                                                                                           | Academic year of realisation of subject                                                                                                                                                                                                                                                                           |                                     |            | 2024/2025                                                                                                                                                                |         |     |
| Education level                             | second-cycle studies                                                                                                                                                                                                                    | Subject group                                                                                                                                                                                                                                                                                                     |                                     |            | Obligatory subject group in the field of study                                                                                                                           |         |     |
| 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                                                                                                                                                                                                                                                                                                      |                                     |            | 6.0                                                                                                                                                                      |         |     |
| Learning profile                            | general academic profile                                                                                                                                                                                                                | Assessment form                                                                                                                                                                                                                                                                                                   |                                     |            | assessment                                                                                                                                                               |         |     |
| Conducting unit                             | Faculty of Chemistry                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                   |                                     |            |                                                                                                                                                                          |         |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                                                                                                                                      | dr hab. inż. Anna Zielińska-Jurek                                                                                                                                                                                                                                                                                 |                                     |            |                                                                                                                                                                          |         |     |
|                                             | Teachers                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                   |                                     |            |                                                                                                                                                                          |         |     |
| Lesson types and methods of instruction     | Lesson type                                                                                                                                                                                                                             | Lecture                                                                                                                                                                                                                                                                                                           | Tutorial                            | Laboratory | Project                                                                                                                                                                  | Seminar | SUM |
|                                             | Number of study hours                                                                                                                                                                                                                   | 0.0                                                                                                                                                                                                                                                                                                               | 0.0                                 | 0.0        | 75.0                                                                                                                                                                     | 0.0     | 75  |
|                                             | 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                                                                                                                                                                                                                   | 75                                                                                                                                                                                                                                                                                                                | 15.0                                |            | 60.0                                                                                                                                                                     | 150     |     |
| Subject objectives                          | Knowledge in the field of modern technologies and materials used in construction. The ability to search for information both in world literature, as well as the database of patents, the ability to design new materials and processes |                                                                                                                                                                                                                                                                                                                   |                                     |            |                                                                                                                                                                          |         |     |
| Learning outcomes                           | Course outcome                                                                                                                                                                                                                          | Subject outcome                                                                                                                                                                                                                                                                                                   |                                     |            | Method of verification                                                                                                                                                   |         |     |
|                                             | K7_U14                                                                                                                                                                                                                                  | Student has a detailed, ordered and theoretically founded knowledge in the field of materials, in particular classification and properties of ceramic, polymeric, metallic, composite and glassy materials for construction and installation applications, knows development trends in the field of new materials |                                     |            | [SU1] Assessment of task fulfilment<br>[SU3] Assessment of ability to use knowledge gained from the subject<br>[SU4] Assessment of ability to use methods and tools      |         |     |
|                                             | K7_W04                                                                                                                                                                                                                                  | Is able to perform advanced design solutions for devices and facilities, in particular devices, facilities, systems, processes, construction chemistry services                                                                                                                                                   |                                     |            | [SW1] Assessment of factual knowledge<br>[SW2] Assessment of knowledge contained in presentation<br>[SW3] Assessment of knowledge contained in written work and projects |         |     |
|                                             | K7_K03                                                                                                                                                                                                                                  | The student makes reflections on the ethical, scientific and social aspects related to the work performed                                                                                                                                                                                                         |                                     |            | [SK4] Assessment of communication skills, including language correctness                                                                                                 |         |     |
|                                             | K7_K02                                                                                                                                                                                                                                  | Student is able to work in a group, solves problems together                                                                                                                                                                                                                                                      |                                     |            | [SK1] Assessment of group work skills                                                                                                                                    |         |     |
|                                             | K7_U05                                                                                                                                                                                                                                  | The ability to search for information in world literature and patent databases, the use of methods and tools necessary to present a solution to a given technological issue                                                                                                                                       |                                     |            | [SU1] Assessment of task fulfilment<br>[SU5] Assessment of ability to present the results of task                                                                        |         |     |

|                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                   |                               |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |                          |                                                                     |  |                      |                                  |  |
|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------------|---------------------------------------------------------------------|--|----------------------|----------------------------------|--|
| Subject contents                                         | 1. Energy-efficient construction<br>2. Solar energy in passive construction<br>3. Renewable energy sources in low-energy building<br>4. New technologies in thermal insulation of buildings<br>5. Modern technologies of cementing of exploratory and operational drilling wells<br>6. Composing and quality of cements and concretes<br>7. Modern construction technologies in the protection of building facades<br>8. Application of nanoparticles in construction<br>9. Innovative solutions and patented technologies in construction<br>10. Elements of design thinking and group work<br>11. Non-destructive test methods in material strength. Ultrasound defectoscopy - construction and operation of defectoscopes. Detection of material defects on the pattern. Impact of measurement parameters on the ability to detect defects. Specifying the thickness of samples.<br>12. Acoustic emission methods in materials diagnostics. Construction and operation of the measuring system. Diagnostics of microcracks and structural defects.<br>13. Computed tomography (CT) - construction and operation of the tomograph. Non-destructive testing. Mapping of material structures         |                   |                               |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |                          |                                                                     |  |                      |                                  |  |
| Prerequisites and co-requisites                          | Completed bechelor studies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                   |                               |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |                          |                                                                     |  |                      |                                  |  |
| Assessment methods and criteria                          | Subject passing criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Passing threshold | Percentage of the final grade |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |                          |                                                                     |  |                      |                                  |  |
|                                                          | presentation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 60.0%             | 60.0%                         |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |                          |                                                                     |  |                      |                                  |  |
|                                                          | project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 60.0%             | 40.0%                         |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |                          |                                                                     |  |                      |                                  |  |
| Recommended reading                                      | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; vertical-align: top;">Basic literature</td> <td colspan="2" style="vertical-align: top;"> M. Blicharski, Wstęp do inżynierii materiałowej, Wydawnictwa Naukowo- Techniczne, Wwa 2003<br/><br/> A. Oleś "Metody doświadczalne fizyki ciała stałego", WNT, Warszawa 1999<br/><br/> Kelsall R.W., Hamley I.W., Geoghegan M., Nanotechnologie, PWN Warszawa 2008<br/><br/> A. Nurek, J. Najbar, Fotochemia i spektroskopia optyczna, PWN 2009<br/><br/> A. Szummer, A. Ciszewski, T. Radomski; Badania własności i mikrostruktury materiałów Oficyna Wydawnicza PW, Warszawa 2000<br/><br/> Lewińska- Romicka A.: Badania nieniszczące. WNT Warszawa 2001.<br/><br/> Leszek Stoch, Przegląd metod analizy termicznej, II Szkoła Analizy Termicznej, Zakopane, 1998<br/><br/> Śliwiński A. „Ultradźwięki i ich zastosowania”; WNT, Warszawa 1993 </td> </tr> <tr> <td>Supplementary literature</td> <td colspan="2">Scientific articles from the Elsevier database and patent databases</td> </tr> <tr> <td>eResources addresses</td> <td colspan="2">Adresy na platformie eNauczanie:</td> </tr> </table> |                   |                               | Basic literature | M. Blicharski, Wstęp do inżynierii materiałowej, Wydawnictwa Naukowo- Techniczne, Wwa 2003<br><br>A. Oleś "Metody doświadczalne fizyki ciała stałego", WNT, Warszawa 1999<br><br>Kelsall R.W., Hamley I.W., Geoghegan M., Nanotechnologie, PWN Warszawa 2008<br><br>A. Nurek, J. Najbar, Fotochemia i spektroskopia optyczna, PWN 2009<br><br>A. Szummer, A. Ciszewski, T. Radomski; Badania własności i mikrostruktury materiałów Oficyna Wydawnicza PW, Warszawa 2000<br><br>Lewińska- Romicka A.: Badania nieniszczące. WNT Warszawa 2001.<br><br>Leszek Stoch, Przegląd metod analizy termicznej, II Szkoła Analizy Termicznej, Zakopane, 1998<br><br>Śliwiński A. „Ultradźwięki i ich zastosowania”; WNT, Warszawa 1993 |  | Supplementary literature | Scientific articles from the Elsevier database and patent databases |  | eResources addresses | Adresy na platformie eNauczanie: |  |
| Basic literature                                         | M. Blicharski, Wstęp do inżynierii materiałowej, Wydawnictwa Naukowo- Techniczne, Wwa 2003<br><br>A. Oleś "Metody doświadczalne fizyki ciała stałego", WNT, Warszawa 1999<br><br>Kelsall R.W., Hamley I.W., Geoghegan M., Nanotechnologie, PWN Warszawa 2008<br><br>A. Nurek, J. Najbar, Fotochemia i spektroskopia optyczna, PWN 2009<br><br>A. Szummer, A. Ciszewski, T. Radomski; Badania własności i mikrostruktury materiałów Oficyna Wydawnicza PW, Warszawa 2000<br><br>Lewińska- Romicka A.: Badania nieniszczące. WNT Warszawa 2001.<br><br>Leszek Stoch, Przegląd metod analizy termicznej, II Szkoła Analizy Termicznej, Zakopane, 1998<br><br>Śliwiński A. „Ultradźwięki i ich zastosowania”; WNT, Warszawa 1993                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |                               |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |                          |                                                                     |  |                      |                                  |  |
| Supplementary literature                                 | Scientific articles from the Elsevier database and patent databases                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |                               |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |                          |                                                                     |  |                      |                                  |  |
| eResources addresses                                     | Adresy na platformie eNauczanie:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                               |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |                          |                                                                     |  |                      |                                  |  |
| Example issues/ example questions/ tasks being completed | Patent search, patent purity, application preparation in Poland and in the world<br><br>Modern building materials, environmental, economic and technological aspects<br><br>Special-purpose materials, environmental, economic and technological aspects<br><br>Modern construction, environmental, economic and technological aspects<br><br>Alternative construction, environmental, economic and technological aspects                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                   |                               |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |                          |                                                                     |  |                      |                                  |  |
| Work placement                                           | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                               |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |                          |                                                                     |  |                      |                                  |  |