



## Subject card

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                          |                                                                                                                                                                       |                                     |                                                                                              |            |     |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------|------------|-----|
| Subject name and code                       | CORROSION OF CERAMIC MATERIALS, PG_00064355                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                          |                                                                                                                                                                       |                                     |                                                                                              |            |     |
| Field of study                              | Corrosion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                          |                                                                                                                                                                       |                                     |                                                                                              |            |     |
| Date of commencement of studies             | February 2027                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                          | Academic year of realisation of subject                                                                                                                               |                                     | 2026/2027                                                                                    |            |     |
| Education level                             | second-cycle studies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | Subject group                                                                                                                                                         |                                     | Optional subject group<br>Subject group related to scientific research in the field of study |            |     |
| Mode of study                               | Full-time studies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                          | Mode of delivery                                                                                                                                                      |                                     | e-learning                                                                                   |            |     |
| Year of study                               | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                          | Language of instruction                                                                                                                                               |                                     | Polish                                                                                       |            |     |
| Semester of study                           | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                          | ECTS credits                                                                                                                                                          |                                     | 1.0                                                                                          |            |     |
| Learning profile                            | general academic profile                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                          | Assessment form                                                                                                                                                       |                                     | assessment                                                                                   |            |     |
| Conducting unit                             | Department of Corrosion and Electrochemistry -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          |                                                                                                                                                                       |                                     |                                                                                              |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                          | dr hab. inż. Andrzej Miszczyk                                                                                                                                         |                                     |                                                                                              |            |     |
|                                             | Teachers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                          |                                                                                                                                                                       |                                     |                                                                                              |            |     |
| Lesson types                                | Lesson type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Lecture                                                  | Tutorial                                                                                                                                                              | Laboratory                          | Project                                                                                      | Seminar    | SUM |
|                                             | Number of study hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 15.0                                                     | 0.0                                                                                                                                                                   | 0.0                                 | 0.0                                                                                          | 0.0        | 15  |
|                                             | E-learning hours included: 15.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                          |                                                                                                                                                                       |                                     |                                                                                              |            |     |
| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 15                                                       |                                                                                                                                                                       | 1.0                                 |                                                                                              | 9.0        | 25  |
| Subject objectives                          | The aim of the course is to acquire the ability to recognize and describe the manifestations of corrosion of ceramic materials, understand its mechanisms, learn about research methods and methods of protection or minimize its effects.                                                                                                                                                                                                                                                                                                                                 |                                                          |                                                                                                                                                                       |                                     |                                                                                              |            |     |
| Learning outcomes                           | Course outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                          | Subject outcome                                                                                                                                                       |                                     | Method of verification                                                                       |            |     |
|                                             | [K7_W01] defines the phenomena and processes used to produce consumer goods and run services                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                          | The student has the knowledge necessary to describe the phenomena and processes used in the production of consumer goods and the provision of services.               |                                     | [SW3] Assessment of knowledge contained in written work and projects                         |            |     |
|                                             | [K7_U02] conducts experiments using properly selected techniques and apparatus, taking advantage of new developments in corrosion and related fields                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | The student is able to correctly select techniques and equipment for carrying out research, taking into account current achievements in corrosion and related fields. |                                     | [SU4] Assessment of ability to use methods and tools                                         |            |     |
|                                             | [K7_K02] understands the non-technical aspects and implications of graduate activity, including the impact on the environment                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                          | The student is sensitive to non-technical aspects of his/her activities, including, in particular, the impact on the environment.                                     |                                     | [SK5] Assessment of ability to solve problems that arise in practice                         |            |     |
| Subject contents                            | Course content – lecture<br><br>Properties of ceramics and metals. Basics of degradation of ceramic materials. Diffusion processes in solid bodies. Diffusion processes in oxides. The mechanism of oxidation in thin layers. Thick-layer oxidation. Wagner's theory of oxidation. Oxidation of pure metals. Oxidation of alloys. Oxidation in mixed environments. Corrosion in marine conditions. Coatings resistant to high temperatures. Corrosion problems of ceramic materials in industry and museology. Methods of protection and maintenance of ceramic materials. |                                                          |                                                                                                                                                                       |                                     |                                                                                              |            |     |
| Prerequisites and co-requisites             | Knowledge of the fundamentals of corrosion. Knowledge of the basics of physical chemistry. in particular, atomic and molecular structures, bonds. Basic knowledge of physics and chemistry                                                                                                                                                                                                                                                                                                                                                                                 |                                                          |                                                                                                                                                                       |                                     |                                                                                              |            |     |
| Assessment methods and criteria             | Subject passing criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                          | Passing threshold                                                                                                                                                     |                                     | Percentage of the final grade                                                                |            |     |
|                                             | test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 60.0%                                                                                                                                                                 |                                     | 100.0%                                                                                       |            |     |

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|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Recommended reading                                            | Basic literature                                                                                                                                                                                                                                                                                                                                                                                   | <p>Ronald A. McCauley, Corrosion of Ceramic Materials, 2016</p> <p>Jonathan Salem, Edwin Fuller, Corrosion, Wear, Fatigue, and Reliability of Ceramics, 2009</p> <p>K.G. Nickel , Corrosion of Advanced Ceramics: Measurement and Modelling, 2012</p> |
|                                                                | Supplementary literature                                                                                                                                                                                                                                                                                                                                                                           | scientific journal papers                                                                                                                                                                                                                             |
|                                                                | eResources addresses                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                       |
| Example issues/<br>example questions/<br>tasks being completed | The phenomenon of diffusion in the solid state. Kinetics of layer build up under specific conditions, scale in the presence of oxygen and / or sulfur compounds. Wagner theory. Degradation of ceramic materials. Rapid layers. Methods for corrosion tests of ceramic materials. Methods of protection in corrosion of ceramic materials. Examples of corrosion of ceramic materials in industry. |                                                                                                                                                                                                                                                       |
| Practical activities within<br>the subject                     | Not applicable                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                       |

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