GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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| Subject name and code | Equipment for the refinery and petrochemical industry, PG_00068884 | | |
| Field of study | Chemical Technology | | |
| Date of commencement of studies | October 2025 | Academic year of realisation of subject | 2027/2028 |
| Education level | first-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 | at the university |
| Year of study | 3 | Language of instruction | Polish |
| Semester of study | 6 | ECTS credits | 2.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Department of Process Engineering and Chemical Technology -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Bartosz Szulczyński | |
| | Teachers | | |

**Lesson types**

| Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|
| Number of study hours | 10.0 | 0.0 | 20.0 | 0.0 | 0.0 | 30 |

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 | 30 | 5.0 | 15.0 | 50 |

**Subject objectives**

The aim of the course is to familiarize students with the design, operating principles, and operation of equipment used in the refinery and petrochemical industries, with particular emphasis on heat exchangers, process units, and elements of process installations. Students acquire knowledge of the fundamentals of equipment design and selection, process operation, as well as process monitoring and control.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K6_W07] Has knowledge of raw materials and technologies in the chemicaland polymer industries, also covering issues of corrosion and material protection. | The student is familiar with the basic raw materials and technologies used in the refinery and petrochemical industries, and understands issues related to corrosion and methods of material protection. | [SW1] Assessment of factual knowledge |
| [K6_K01] Is aware of the social role of a technical university graduate and understands the need to provide information about technical achievements and engineering activities to society, including through the media. | The student understands the social role of an engineer and the importance of communicating achievements in technology and engineering activities to society, including through mass media. | [SK4] Assessment of communication skills, including language correctness |
| [K6_U08] Is able to select elements of automatic control systems for simple technological processes and use computer programs to control and optimize chemical processes. | The student is able to analyze simple technological processes in terms of control requirements, select appropriate elements of automation systems, and use computer tools supporting the control and optimization of chemical processes. | [SU2] Assessment of ability to analyse information<br>[SU4] Assessment of ability to use methods and tools |

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| Subject contents | Course content – lecture<br>**Introduction to refinery and petrochemical equipment**<br>The role of equipment in technological processes, basic concepts, classification of devices.<br><br>**Heat exchangers**<br>Types, operating principles, basics of design (LMTD, overall heat transfer coefficient, fouling factors).<br><br>**Industrial furnaces and heat transfer (convection and radiation)**<br>Types of furnaces, heat transfer mechanisms, basic operational issues.<br><br>**Process equipment**<br>Reactors, columns (distillation, absorption), adsorbers construction and applications.<br><br>**Auxiliary equipment**<br>Pumps, compressors, fans classification and operating principles.<br><br>**Storage tanks and media storage**<br>Types of tanks and their functions in process installations.<br><br>**Pipelines and industrial fittings**<br>Installation components, valves and gate valves types and applications.<br><br>**Fundamentals of automation and measurement instrumentation**<br>Measurement of temperature, pressure, flow, and level, as well as basic control elements.<br><br>**Technical documentation of industrial installations**<br>Introduction to PFD and P&ID diagrams and their interpretation.<br><br>**Selected modern processes and technologies**<br>PSA, supercritical extraction, selected refinery and petrochemical processes.<br><br>Course content – laboratory<br>**Introduction to equipment and safety procedures**<br>Familiarization with laboratory equipment and/or pilot installation, basic safety rules, introduction to process diagrams (PFD, P&ID).<br><br>**Heat exchangers performance analysis and calculations**<br>Determination of heat transfer coefficients, analysis of exchanger efficiency.<br><br>**Pumps and compressors**<br>Performance characteristics, equipment selection, analysis of operating parameters.<br><br>**Process equipment columns / reactors**<br>Analysis of selected equipment (e.g., distillation column or reactor), interpretation of process parameters.<br><br>**Automation and process measurements**<br>Measurement of temperature, pressure, flow, and level, fundamentals of control, controller operation modes.<br><br>**Technical documentation and process integration**<br>Reading and analysis of P&ID diagrams, identification of installation components, interpretation of system operation. |
| Prerequisites and co-requisites | Basic knowledge of chemical engineering and process equipment, as well as fundamentals of electronics. |
| Assessment methods and criteria | |

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| Written test / exam | 60.0% | 50.0% |
| Laboratory reports | 60.0% | 50.0% |

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| Recommended reading | Basic literature | Towler G., Sinnott R., *Chemical Engineering Design: Principles, Practice and Economics of Plant and Process Design*, Elsevier.<br><br>Coulson J.M., Richardson J.F., *Chemical Engineering*, Vol. 6: *Chemical Engineering Design*, Elsevier.<br><br>Perry R.H., Green D.W., *Perrys Chemical Engineers' Handbook*, McGraw-Hill.<br><br>Kern D.Q., *Process Heat Transfer*, McGraw-Hill.<br><br>Smith R., *Chemical Process Design and Integration*, Wiley. |
| | Supplementary literature | Bausbacher E., Hunt R., *Process Plant Layout and Piping Design*, Prentice Hall<br><br>ISA (International Society of Automation), *ANSI/ISA-5.1 Instrumentation Symbols and Identification* |
| | eResources addresses | |
| Example issues/ example questions/ tasks being completed | Operating principles and fundamentals of heat exchanger design<br><br>Construction and operation of distillation columns, absorbers, and reactors<br><br>Performance characteristics of pumps and compressors and their selection for process conditions<br><br>Pipeline components and industrial fittings classification and operating principles of valves<br><br>Fundamentals of industrial automation measurement of temperature, pressure, flow, and level | |
| Practical activites within the subject | Not applicable | |

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