# STUDY MODULE DESCRIPTION FORM

| Name of the module/subject | | Code |
|---|---|---|
| **Selected Parts of Technology** | | **1010702211010720078** |
| Field of study: **Chemical Technology** | Profile of study (general academic, practical): **(brak)** | Year /Semester: **1 / 1** |
| Elective path/specialty: **Organic Technology** | Subject offered in: **Polish** | Course (compulsory, elective): **obligatory** |
| Cycle of study: **Second-cycle studies** | Form of study (full-time,part-time): **full-time** | |
| No. of hours: Lecture: **2** Classes: **-** Laboratory: **3** Project/seminars: **-** | | No. of credits: **4** |
| Status of the course in the study program (Basic, major, other): **(brak)** | (university-wide, from another field): **(brak)** | |
| Education areas and fields of science and art: **technical sciences**; **Technical sciences** | | ECTS distribution (number and %): **4 100%**; **4 100%** |

## Responsible for subject / lecturer:

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## Prerequisites in terms of knowledge, skills and social competencies:

| | | |
|---|---|---|
| 1 | **Knowledge** | W1. A student has basic theoretical systematic knowledge of general and inorganic chemistry, organic and chemical technology, including the key issues of natural and synthetic raw materials, products and processes used in the inorganic chemical technology. |
| 2 | **Skills** | U1. A student has the ability to assess the technological suitability of raw material sources and the selection of the technological process in relation to the product quality requirements. He can obtain information from the literature, databases, and other sources in English and to interpret the data obtained, draw conclusions and formulate and justify opinions. |
| 3 | **Social competencies** | K1. A student understands the need for further education and improvement of his professional and personal competences, knows how to interact and work in a group, can think and act in a creative and entrepreneurial way. |

## Assumptions and objectives of the course:

Extending of knowledge of organic chemical technology enabling students to link flows in selected technological processes with the fundamental physico-chemical properties of raw materials, intermediate and end products. Development of guidelines for process design using computer-aided design systems. Deepening of the students? knowledge in the field of the technological process conducting, calculation of the efficiency and selectivity, analytical testing, and the use of by-products and waste.

## Study outcomes and reference to the educational results for a field of study

### Knowledge:

1. A student has broad and deep knowledge of chemistry and related fields of science, allowing him to formulate and solve complex tasks associated with chemical technology. - [K_W02]

2. A student has knowledge of complex chemical processes involving selection of appropriate materials, raw materials, methods, techniques, apparatus and equipment for chemical processes and the characterization of the resulting products. - [K_W03]

### Skills:

1. A student has the ability to obtain and critically evaluate information from literature, databases and other sources and to formulate on the basis of opinions and reports. - [K_U01]

2. A student has the ability to team work and team leadership. - [K_U02]

3. A student is able to design and conduct chemical reactions in the laboratory under various conditions and proper use of the results of that research to scale-up. - [K_U09]

### Social competencies:

| |
|---|
| 1. A student is aware of the need for lifelong learning and professional development. - [K_K01] |
| 2. A student is aware of the limitations of science and technology related to chemical technology, including environmental protection. - [K_K02] |

## Assessment methods of study outcomes

1. Written exam
2. Current examination of the knowledge associated with laboratory
3. Final written test

## Course description

The course covers the topics of preparation, properties and application of the most common organic intermediates and products, carried out on an industrial scale, including relevant materials for the organic industry. Allowing students to learn in detail the selected processes for the industrial organic and inorganic synthesis and analyze the experience of individual process steps, e.g. in the production of organic surfactants based on renewable raw materials. When discussing technology an analysis of the market demand, the use of by-products and waste from the elements of the economic aspects is carried out. The laboratory exercises are performed in two focus groups. Content of the first group covers the use of ion exchangers for separation and chemical catalysis (acid retardation, glycerol desalting by ion exclusion, esterification of fatty acids with methanol, the aldol condensation of formaldehyde and acetic acid to pentaerythritol). The second group of exercises is related to the production of biofuels from rapeseed oil (canola oil methanolysis, obtaining biofuels by reactive distillation, purification glycerin, oxidative stability of methyl esters of rapeseed oil hydrogenation). An important part of the laboratory is to develop guidelines for process design using computer-aided design system. Design exercises should deepen students' knowledge on how to conduct a process, calculation of the efficiency and selectivity, analytical testing, and the use of by-products and waste.

## Basic bibliography:

1. E. Grzywa, J. Molenda, Technologia podstawowych syntez organicznych, t.1, t.2 (Surowce do syntez, Syntezy), WNT, Warszawa 2000.

2. K. Weissermel, H-J Arpe, Industrial Organic Chemistry, VCH, New York, Cambridge 1997.

3. M. S. Peters, K. D. Timmerhaus, Plant design and economics for chemical engineers; Ed. Mc Graw-Hill International Book Company, Aucland, London, Paris, Tokyo 1981.

4. R. Zieliński, Surfaktanty, Wydawnictwo Akademii Ekonomicznej, Poznań 2000.

5. K. Schmidt, J. Sentek, J. Raabe, E. Bobryk, Podstawy technologii chemicznej. Procesy w przemyśle nieorganicznym, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2004.

## Additional bibliography:

1. Podstawy technologii chemicznej i inżynierii reaktorów, red. M. Wiśniewski, K. Alejski, wyd. Politechniki Poznańskiej, Poznań 2006.

2. L. Sobczyk, A. Kisza, Chemia fizyczna dla przyrodników, PWN, Warszawa 1975.

3. Przemysł tłuszczowy, poradnik inżyniera, WNT, Warszawa 1976.

4. M. Anielak, Chemiczne i fizykochemiczne oczyszczanie ścieków, PWN, Warszawa 2000.

5. R. Bogoczek, E. Kociołek Balawejder, Technologia chemiczna organiczna. Surowce i półprodukty, Wydawnictwo Akademii Ekonomicznej we Wrocławiu, Wrocław 1992.

## Result of average student's workload

| Activity | Time (working hours) |
|---|---|
| 1. Preparationf for the exam and the exam | 15 |
| 2. Preparation for the laboratory excercises | 10 |
| 3. Participation in lectures | 30 |
| 4. Participation in laboratories | 45 |

## Student's workload

| Source of workload | hours | ECTS |
|---|---|---|
| Total workload | 100 | 4 |
| Contact hours | 60 | 2 |
| Practical activities | 40 | 2 |