

| FACULTY of CHEMISTRY   |         |         |                       |         |         |
|--|---------|---------|-----------------------|---------|---------|
| <b>SUBJECT CARD</b>  |         |         |                       |         |         |
| <b>Name of subject in Polish ...Wieloletapowa synteza organiczna</b>   |         |         |                       |         |         |
| <b>Name of subject in English .....Multistep organic synthesis....</b>   |         |         |                       |         |         |
| <b>Main field of study (if applicable): ...BIOSCIENCES....</b>   |         |         |                       |         |         |
| <b>Specialization (if applicable): ...Medicinal chemistry</b>  |         |         |                       |         |         |
| <b>Profile: academic</b>   |         |         |                       |         |         |
| <b>Level and form of studies: 2nd level,</b>   |         |         |                       |         |         |
| <b>Kind of subject: obligatory</b>   |         |         |                       |         |         |
| <b>Subject code ... W03BSS-SM2024L</b>   |         |         |                       |         |         |
| <b>Group of courses YES/ NO*</b>   |         |         |                       |         |         |
|  | Lecture | Classes | Laboratory            | Project | Seminar |
| Number of hours of organized classes in University (ZZU)   |         |         | 60                    |         |         |
| Number of hours of total student workload (CNPS)   |         |         | 75                    |         |         |
| Form of crediting (Examination / crediting with grade)   |         |         | crediting with grade) |         |         |
| For group of courses mark (X) final course   |         |         |                       |         |         |
| Number of ECTS points  |         |         | 3                     |         |         |
| including number of ECTS points for practical classes (P)  |         |         | 3                     |         |         |
| including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU) |         |         | 2,8                   |         |         |

\*delete as not necessary

### PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge and skills at the level of completing the "Fundamentals of organic chemistry - laboratory" course or equivalent
2. Basic knowledge of English at a communicative level

### SUBJECT OBJECTIVES

- C1 Acquires students' proficiency in laboratory work using advanced experimental techniques of organic synthesis.
- C2 Ability to practically use various transformation methods in multi-stage synthesis - creating new C-C bonds, transformations on functional groups
- C3 Ability to perform a complex synthetic sequence based on literature data.

## SUBJECT EDUCATIONAL EFFECTS

relating to skills:

PEU\_U01 – is able to carry out a multi-stage synthesis of an organic compound,

PEU\_U02 – knows how to use scientific literature and chemical databases

PEU\_U03 – is able to select the conditions for various transformations and plan methods of isolating and purifying products,

PEU\_U04 – is able to independently interpret the results, measure basic physicochemical constants, interpret spectroscopic spectra of organic compounds

relating to social competences:

PEU\_K01 – knows English at a communicative level, is able to keep a laboratory journal in English

## PROGRAMME CONTENT

| Lecture    |  | Number of hours |
|------------|--|-----------------|
| Lec 1      |  |                 |
| Lec 2      |  |                 |
| Lec 3      |  |                 |
| Lec 4      |  |                 |
| Lec 5      |  |                 |
| ....       |  |                 |
|            | Total hours  |                 |
| Classes    |  | Number of hours |
| Cl 1       |  |                 |
| Cl 2       |  |                 |
| Cl 3       |  |                 |
| Cl 4       |  |                 |
| ..         |  |                 |
|            | Total hours  |                 |
| Laboratory |  | Number of hours |
| Lab 1      | Information on how to conduct and pass exercises and keep a laboratory journal. Basic equipment (glass and metal) and laboratory operations. Work safety in the laboratory: harmful, flammable substances, etc. Synthesis planning - using literature and databases. | 4               |
| Lab 2      | Carrying out one-step syntheses requiring selective reduction of the C=O and C=C bonds - procedures to be selected by the lecturer (from a prepared script)  | 4               |
| Lab 3      |  | 4               |
| Lab 4      |  | 4               |
| Lab 5      |  | 4               |
| Lab 6      | Carrying out a one-step synthesis requiring selective oxidation - procedure to be selected by the instructor (from a prepared script)  | 4               |
| Lab 7      |  | 4               |
| Lab 8      | Conducting a 3- and 4-step synthesis of a compound with known biological   | 4               |

|        |   |   |
|--------|---|---|
| Lab 9  | activity, including both the formation of new C-C bonds and transformations on various functional groups. Purification, identification and characterization of products - measurement of physico-chemical constants. Calculations of the yield at individual stages and total yield. Interpretation of the results. | 4 |
| Lab 10 |   | 4 |
| Lab 11 |   | 4 |
| Lab 12 |   | 4 |
| Lab 13 |   | 4 |
| Lab 14 |   | 4 |
| Lab 15 | Settlement of laboratory equipment and laboratory notes.  | 4 |
|        | Total hours   |   |

| <b>Project</b> |             | <b>Number of hours</b> |
|----------------|-------------|------------------------|
| Proj 1         |             |                        |
| Proj 2         |             |                        |
| Proj 3         |             |                        |
| Proj 4         |             |                        |
| ...            |             |                        |
|                | Total hours |                        |

| <b>Seminar</b> |             | <b>Number of hours</b> |
|----------------|-------------|------------------------|
| Semin 1        |             |                        |
| Semin 2        |             |                        |
| Semin 3        |             |                        |
| ...            |             |                        |
|                | Total hours |                        |

| <b>TEACHING TOOLS USED</b>   |  |  |
|--|--|--|
| N1. Discussion of the experiment: planning the equipment, techniques used and subsequent stages of synthesis |  |  |
| N2. Carrying out experiments independently   |  |  |
| N3. Preparing a report in a laboratory journal (in English)  |  |  |

### **EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT**

| <b>Evaluation</b> (F – forming during semester), P – concluding (at semester end) | <b>Learning outcomes code</b>  | <b>Way of evaluating learning outcomes achievement</b>  |
|---|--------------------------------|---|
| P   | PEU_U01-<br>PEU_U04<br>PEU_K01 | Independent synthesis of given products, measurement of physical and chemical constants for product characterization, preparing a report in the laboratory book in English. |

| <b>PRIMARY AND SECONDARY LITERATURE</b> |
|---|
|---|

**PRIMARY LITERATURE:**

- [1] R. Siedlecka, Multistep organic synthesis. Laboratory course for students of medicinal chemistry, Wrocław, 2020;
- [2] A. Mucha, R. Siedlecka, Multistep organic synthesis. Practical course, Wrocław, 2010;
- [3] A. I. Vogel, Preparatyka organiczna, WNT, Warszawa, 2006;
- [4] Bazy danych: Beilstein, Chemical Abstracts, Current Contents.

**SECONDARY LITERATURE:**

- [1] J. Gawroński, K. Gawrońska, K. Kacprzak, M. Kwit, Współczesna synteza organiczna, PWN, Warszawa, 2004
- [2] L.-T. Ho, *Tactics of Organic Synthesis*, J. Wiley, New York, 1994

**SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)**

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