

Detailed course description (SUBJECT CARD)

Course title: BASIC BIOTECHNOLOGY

Course code:

Classification of a course group:

Course type: field-related/ general/
obligatory

Field of study: **Chemical Technology**

Level of study: second-cycle

Profile of study: general academic

Mode of study: full-time programme

Specialty (specialisation): All specialisations

Year of study: II

Semester: 2

Teaching modes and teaching hours:

lectures – 30 h;
classes –; etc.

Language/s of instruction: English

Number of ECTS credits (according to the study programme): 2

* – leave the appropriate option

1. Course objectives:

The objective is to study the basics of biochemistry and biotechnology, especially basics of metabolic pathways, structure and function of proteins, nucleic acids; basics of genetic engineering. The biotechnological processes of great importance will be analysed and discussed in details. Main legislation, economic and ethical aspects as well as public perception of biotechnology are also objective of this course.

2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes <i>a student who completed the course:</i>	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W03	Has an extended and profound knowledge of chemistry and other related fields of science, allowing to formulate and solve complex tasks associated with chemical technology	Lecture	Written test and presentation
K2A_W06	Has the knowledge of raw materials, products and biotechnological processes	Lecture	Written test and presentation
K2A_W08	Knows modern methods of determination of structure and properties of materials, necessary for the characterization of raw materials and products of the chemical industry and related	Lecture	Written test and presentation
Skills: a student can			
K2A_U04	Has the ability to communicate with experts and non-experts in the area of chemical technology and related fields	Lecture	Presentation
K2A_U05	Can independently determine the direction of further education and pursue self-directed learning	Lecture	Presentation
...	...		
Social competences: a student is prepared to			
...	...		
...	...		
...	...		

3. The content of study programme ensuring learning outcomes (according to the study programme):

- A. Extended and in-depth knowledge of biochemistry and other related areas of science, allowing to formulate and solve complex tasks related to chemical technology and biotechnology.
- B. Knowledge of raw materials, products and biotechnological processes.
- C. Knowledge of modern methods of structure and properties determination, necessary to characterize raw materials and products from biochemical and related industries.
- D. Ability to communicate with specialists and non-specialists in the field of biotechnology and related fields.

E. Ability to independently outline the directions of further education.

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30/1
Student's workload 1* - preparation for a test	15/0,5
Student's workload 2* literature overview and preparation of presentation	15/0,5
Student's workload n*	-
The other - consultation	10
Total hours:	70
Number of ECTS credits allocated to a course	2

Explanation:

* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation and report, doing written assignment, etc.*

** – the other e.g. *extra course hours*

5. Summary indexes:

- number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students; 30/1
- number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile;
- number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies; 0
- number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace. 30/1

6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

Danuta Gillner, PhD, DSc, Associate Professor

7. Detailed description of teaching modes:

1) lectures:

- detailed programme's content:

- Fundamentals and rules of biotechnology, biochemistry, physiology of growth and metabolism; kinetics of microorganisms growth.
- Fundamentals of genetic engineering, mutagenesis and genetic recombination.
- Selection, screening, improvement and characteristics of microorganisms used in biotechnology; mechanisms of adaptation; identification of metabolites.
- Upstream and downstream processes in biotechnology; fermentation, separation and purification processes. Bioreactors –classic and modern solutions – the most important aspects of selection of bioreactors.
- The most important biotechnological processes – detailed discussion (production of amino acids, organic acids, polysaccharides, pharmaceuticals, enzymes, antibodies, recombinant proteins. Application of biotechnology in environment protection and biotransformations.
- Public perception, regulations and economic aspects of biotechnology.

- teaching methods, including distance learning:

- Multimedia presentation
- Distance learning platform <https://platforma.polsl.pl> – teaching materials, discussion/consultation via chat
- Individual consultations (distance learning platform or ZOOM)

- form and criteria for semester completion, including retake tests, as well as conditions for admission to the examination:

- Positive grades from written test as well as from oral presentation prepared and given by student.

- B. Written test – minimum 26 points/50
- C. Oral presentation – elaboration of chosen topic from biotechnological industry and consultation with lecturer (max. 10 points); oral presentation and answering the questions asked by lecturer or/and students (40 points)
- D. Test retake – once; oral

– course organisation and rules of participation in the course, with an indication whether a student's attendance is obligatory

Students attendance in lectures is not obligatory, but attendance during presentation is obligatory.

2) description of other teaching modes:

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8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):

Final grade: 50% of grade from the written test + 50% from oral presentation

9. Method and procedure for making up for

- student's absence from the course,
- differences in study programmes for students changing their field of study, changing university or resuming studies at the Silesian University of Technology,

Additional oral test

10. Prerequisites and additional requirements, taking into account the course sequence:

Basic knowledge of organic chemistry, unit operations, biology (high school level); reactors engineering

11. Recommended sources and teaching aids:

- A. Colin Ratledge, Bjorn Kristiansen, Basic Biotechnology, 3rd Ed., Cambridge University Press May 2006
- B. Biocatalysts and Enzyme Technology, K. Buchholz, V. Kasche, U.T. Bornscheuer, II ed., Wiley-Blackwell, Weinheim, Germany, 2012
- C. Industrial Biotransformations, A. Liese, K. Seelbach, C. Wandrey, II ed., Wiley-VCH, Weinheim, Germany, 2006
- D. J. Polaina, A. P. McCabe Ed., Industrial Enzymes. Structure, function and Applications, Springer, 2007, Netherlands
- E. Newest review papers from the journals: Trends in biotechnology; Chem. Soc. Rev. (The Royal Society of Chemistry); Current Opinion in Biotechnology; Current Opinion in Chemical Biology; Bioresource Technology and related to biotechnology field

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):

Habilitation – Chemical Sciences; Biotechnology;

Chosen publications: 1. G. Pastuch-Gawolek, D. Gillner, E. Król, K. Walczak, I. Wandzik. Selected nucleos(t)ide-based prescribed drugs and their multi-target activity, Eur. J. Pharmacol. 2019 vol. 865, s. 1-13; 2. J. Kania, A., Mączyńska, M., Głazek, T. Krawczyk, D. M. Gillner, The influence of chosen fungicides on the activity of aminopeptidases in winter oilseed rape during pods development, Pesticide Biochemistry and Physiology 2018, 148, 166-174; 4. J. Kania, D. Gillner, Characterisation of the aminopeptidase from non-germinated winter rape (*Brassica napus* L.) seeds, Food Chemistry 207 (2016) 180–186; 5. A. Starus, B. Nocek, B. Bennett, J. A. Larrabee, D. L. Shaw, W. Sae-Lee, M. T. Russo, D. M. Gillner, M. Makowska-Grzyska, A. Joachimiak, R.C. Holz; Inhibition of the dapE-Encoded N-Succinyl-L,L-diaminopimelic Acid Desuccinylase from *Neisseria meningitidis* by L-Captopril, Biochemistry 2015, 54, 4834–4844;

Collaboration with industry and projects from biotechnology and biotransformations area (e.g. Danone, ZAK Kędzierzyn-Koźle);

Many years of experience in teaching Enzymology, Basic Biotechnology, Biotechnology, Pharmaceutical Biotechnology courses in Polish and in English;

Post-doctoral intership and Research Associate position at Utah State University and Loyola University Chicago in United States (4 years).

Postdoctoral international industrial training; Germany, Duisburg, Rütgers Kureha Solvents GmbH

13. Other information:

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