

## SUBJECT/COURSE SYLLABUS

1.	Course name in Polish and English <b>Bioengineering</b> Bioinżynieria
2.	Scientific discipline <b>Medical sciences</b> <b>Biotechnology</b>
3.	Language of instruction <b>English</b>
4.	Unit conducting the course <b>Faculty of Biotechnology</b>
5.	Type of course <b>elective - choice limited to Bioengineering and Biotechnology of pharmaceuticals</b>
6.	Field of study <b>Biotechnology</b>
7.	Level of study <b>first-cycle</b>
8.	Year of study <b>3rd</b>
9.	Semester <b>summer</b>
10.	Course form and number of hours <b>Laboratory, 15 h</b>
11.	Prerequisites in terms of knowledge, skills and social competences for the course: <ul style="list-style-type: none"> <li>• knowledge of basic <b>principles of health and safety</b> in a biochemical and microbiological laboratory.</li> <li>• knowledge of basic <b>techniques and methods used in biochemistry and microbiology.</b></li> </ul>
12.	Learning objectives for the course: Familiarizing students with <b>techniques applicable to the design of a biotechnological process involving a microbial cultivation stage in a bioreactor.</b>
13.	Curriculum content:

	<ul style="list-style-type: none"> <li>• familiarization with the <b>construction and operation of bench-top laboratory bioreactor</b>;</li> <li>• <b>carrying out and monitoring the process of <i>S. cerevisiae</i> yeast culture</b> in a molasses-based medium under aerobic conditions using a laboratory bioreactor (measured parameters: number of yeast cells counted under a microscope, amount of dry cell biomass, concentration of sugars and alcohol in the culture medium using HPLC technique, concentration of ammonium nitrogen using the colorimetric ninhydrin method);</li> <li>• <b>determination of selected process parameters</b> (yeast cell doubling time in the logarithmic growth phase, sugar-to-biomass conversion factor) based on the measurements performed.</li> </ul>	
14.	<p>Description of learning outcomes</p> <p>Student:</p> <ul style="list-style-type: none"> <li>• describes the construction and operating principles of a bench-top laboratory bioreactor;</li> <li>• quantitatively describes the processes occurring in the bioreactor based on performed measurements and obtained results;</li> <li>• explains the principles of <i>S. cerevisiae</i> yeast cultivation under aerobic conditions and the role of molasses medium components in the biosynthesis process;</li> <li>• lists and characterizes the parameters used to monitor the cultivation process;</li> <li>• performs quantitative analysis of medium components using research equipment and chemical methods;</li> <li>• defines and calculates microbial growth parameters, such as doubling time, sugar to biomass conversion ratio;</li> <li>• knows and applies terminology related to the subject of the course;</li> <li>• knows and complies with the principles of occupational health and safety and ergonomics in a microbiological laboratory; performs laboratory activities in accordance with those rules, taking into account the specifics of working with laboratory equipment (bioreactor) and biological material.</li> </ul>	<p>Symbols for relevant directional learning outcomes:</p> <p><b>K1_W01, K1_W09, K1_W10</b></p> <p><b>K1_U01, K1_U05, K1_U06, K1_U08</b></p> <p><b>K1_K06</b></p>

15.	Mandatory literature: <ul style="list-style-type: none"> <li>• <b>laboratory manual provided by the teacher</b></li> </ul> Recommended literature: <ul style="list-style-type: none"> <li>• <b>Scientific publications regarding the production of yeast biomass:</b>  10.1590/S1517-83822013000200035  10.1002/bit.260280620  10.1021/ie50527a051</li> </ul>	
16.	Methods of verification of the assumed learning outcomes: <ul style="list-style-type: none"> <li>• <b>assessment of work and laboratory performance during classes</b> (practical credit; mandatory attendance);</li> <li>• <b>preparation and analysis of results in the form of a written report.</b></li> </ul>	
17.	Conditions and form of credit for individual components of the course: <ul style="list-style-type: none"> <li>• <b>obtaining a passing grade for the report.</b></li> </ul>	
18.	Student workload expressed in teaching hours and ECTS credits	number of hours allocated for the course of a given type of classes
	classes (according to the study plan) with the instructor: <ul style="list-style-type: none"> <li>• <b>laboratory classes</b></li> </ul>	<b>15 h</b>
	student's own work (including participation in group work) e.g.: <ul style="list-style-type: none"> <li>• preparation for classes;</li> <li>• data analysis;</li> <li>• preparation of the report.</li> </ul>	<b>15 h</b>
	Total number of class hour	<b>30 h</b>
	Number of ECTS credits:	<b>1 ECTS</b>