Teaching guide

IDENTIFICATION DETAILS

Degree:	Biotechnology
Field of Knowledge:	Science
Faculty/School:	Experimental Science
Course:	INDUSTRIAL MICROBIOLOGY I
Type:	Compulsory
ECTS credits:	3
Year:	3
Code:	2049
Teaching period:	Sixth semester
Area:	Applied Biotechnology
Module:	Biotechnological Processes and Products
Teaching type:	Classroom-based
Language:	English
Total number of student study hours:	75

SUBJECT DESCRIPTION

Industrial Microbiology focuses on obtaining microbial products for societal benefits, aligning it with applied sciences. The Industrial Microbiology course starts with a historical perspective on the utilization and domestication of microorganisms, emphasizing those significant to the biotechnology industry. It examines the potential applications of specific microorganisms and the methods to enhance industrial productivity. The course covers all facets from small-scale to large-scale microbial fermentation and explores industrial processes that produce everyday consumer goods. This field uses microorganisms grown on a large scale to produce commercially valuable products and perform significant chemical transformations. Louis Pasteur's discovery of fermentation was a major milestone, leading to the exploration of both fermentative and non-fermentative processes that generate industrially important products, laying the groundwork for Industrial Biotechnology. Initially, fermentation processes for beer and wine production were developed, followed by processes for pharmaceuticals (antibiotics), food additives (amino acids), enzymes, and chemicals like butanol and citric acid. Previously, microbiologists used

classical genetic methods to modify microorganisms for better process efficiency and higher product yields. The advent of recombinant DNA technologies introduced new genetic manipulation techniques, allowing to produce novel microbial products not naturally synthesized by microorganisms. In Industrial Microbiology course we will focuses on microorganisms of industrial interest, their characteristics, and methods to enhance their productivity. The course includes both traditional and modern genetic improvement techniques for creating genetically modified microorganisms. It also covers how to manage and adjust the parameters of microbial fermentations to ensure optimal system performance. Detailed studies of contemporary industrial fermentation processes are included and emphasizes with multiscale and integrative approaches used in strain optimization to enhance microbial metabolic pathways for increased production. The primary aim is to equip students with the skills to be able to analyse results and to propose an optimisation approach based on experimental data for the best possible outcomes. Additionally, the course addresses the intellectual properties protection alternative for the protection new microbial variants. Indeed, the course delves into the protection of intellectual property related to the creation of new microbial variants and emphasizes the importance of strains and process patent protection. It also focuses on the methods for managing and fine-tuning microbial fermentation parameters to ensure optimal system performance. The curriculum includes in-depth studies of microorganism strains optimization and production processes. The primary goal is to equip students with the ability to analyse experimental data and optimize industrial processes to achieve the best possible results.

SKILLS

Basic Skills

Students must have demonstrated knowledge and understanding in an area of study that is founded on general secondary education. Moreover, the area of study is typically at a level that includes certain aspects implying knowledge at the forefront of its field of study, albeit supported by advanced textbooks

Students must be able to apply their knowledge to their work or vocation in a professional manner and possess skills that can typically be demonstrated by coming up with and sustaining arguments and solving problems within their field of study

Students must have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflections on pertinent social, scientific or ethical issues

Students must be able to convey information, ideas, problems and solutions to both an expert and non-expert audience

Students must have developed the learning skills needed to undertake further study with a high degree of independence

General Skills

To be familiar with the applications of biotechnology in the healthcare, food, agrobiotechnological, environmental and chemical fields.

Capacity for teamwork and group management.

To develop an ability to search for, take in, analyse, sum up and relate information.

Specific skills

To identify the influence and contributions of new technologies on molecular and cellular biology in the pharmaceutical sector.

To be able to approach a subject by means of rigorous, profound and comprehensive thought.

To be able to work in a team in an efficient and coordinated manner.

To develop criteria for problem-solving and decision-making both professionally and personally.

To nurture an attitude of intellectual curiosity and a quest for truth in all areas of life.

DISTRIBUTION OF WORK TIME

CLASSROOM-BASED ACTIVITY	INDEPENDENT STUDY/OUT-OF-CLASSROOM ACTIVITY
30 hours	45 hours