Institute of Zoology
Faculty of Life Sciences
University of the Punjab, Lahore

Course Outline

Programme	BS Zoology	Course Code	ZOOL-411	Credit Hours	1
Course Title	Lab. Industrial Biotechnology				

Course Introduction

Industrial Biotechnology is the field of study that involves the adaptation and modification of biological organisms and systems found in nature. This course will expose students to both basic and industrial aspects of producing a wide range of products from bio-based raw materials. Industrial Biotechnology provides access to a wide range of professions in global endeavors. Graduates can work as clinical researchers, food scientists and more. The most well-liked industries for students to pursue lucrative careers include agricultural & environment control, and beverage industries.

Learning Outcomes

On the completion of the course, the students will be able:
1. To appreciate the need for sustainable innovation and how biotechnology and biobased production can contribute to this.
2. To describe the global context of biobased production.
3. To map the biobased economy, from research to application and from raw materials to products.
4. To solve basic level calculations in bioprocess engineering.
5. To develop and assess the conditions for efficient and sustainable design of bioprocesses.
6. To solve undergraduate engineering level calculations in bioprocess engineering.
7. Verified learners will have the added benefit of being able to integrated scientific and technological knowledge on the use of bioprocesses for industrial products on the cell and process level.

Course Content		Assignments/Readings
Week 1	Preparation of microbial cultivation media	Assignments + Readings
Week 2	Isolation of food spoiling bacteria	Assignments + Readings
Week 3	Bacterial examination of fresh foods	Assignments + Readings
Week 4	Food preservation techniques	Assignments + Readings
Week 5	Isolation of leather deteriorating fungi	Assignments + Readings
Week 6	Isolation of microalgae	Assignments + Readings
Week 7	Mass cultivation of microalgae	Assignments + Readings
Week 8	Isolation of lactic acid producing bacteria	Assignments + Readings
Week 9	Isolation of amino acid producing bacteria	Assignments + Readings
Week 10	Characterization of hydrocarbon degrading bacteria	Assignments + Readings
Week 11	Bacteriological examination of fresh water	Assignments + Readings
Week 12	Bacteriological examination of wastewater	Assignments + Readings
Week 13	Isolation of wood rotting fungi	Assignments + Readings
Week 14	Microbial deterioration preventing strategies	Assignments + Readings
Week 15	Isolation of citric acid producing bacteria	Assignments + Readings

Week 16	Microbial cultivations under solid-state and submerged fermentations	Assignments + Readings

Textbooks and Reading Material

1. Microbiology: An Introduction, 12th ed. (2018) by Gerard J. Tortora, Berdell R. Funke, Christine L. Case.
2. Prescott's Microbiology,10th ed. (2017) by Joanne Willey, Linda Sherwood and Christopher J. Woolverton.
3. Modern Industrial Microbiology and Biotechnology ByNduka Okafor
4. Food Biotechnology by Kalidas Shetty, Gopinadhan Paliyath, Anthony Pometto and Robert E. Levin.
5. In introduction to Industrial Microbiology by K. Sukesh
6. Modern Industrial Microbiology and Biotechnology - CRC Press Book

Teaching Learning Strategies

The basic learning strategies for this course will be:

- Lectures
- Presentations
- Group discussions
- Assignments
- Quiz

Assignments: Types and Number with Calendar

Each student will be assigned a separate topic as his/her assignment related to the subject matter for his/her better understanding and having grip on the subject.

Assessment

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.