

Applied Microbiology

Calendar: 5th semester

Contact Hours: T:30,0; PL:22,5; O:7,5

Intended learning outcomes of the curricular unit:

It is expected that students acquire a deep knowledge about the application of microorganisms in various areas with socio-economic benefit to man, particularly in the agricultural, food, pharmaceutical and environmental. The theoretical component is associated with a strong laboratory component, allowing students to contact with current areas of industrial application of microorganisms. At the end of the course is expected that students are able to: 1. Identify the applications of microorganisms in different industries; 2. Understand the biotechnological potential of microorganisms applied to areas of health, environmental, agricultural and alimentary industry; 3. Explain the potentially beneficial microbial interactions in biotechnology; 4. Knowing the human microbiota and its role in health; 5. Meet specific biotechnological applications of health; 6. Understanding mechanisms underlying the adaptability and the proliferation of microorganisms in habitats such as soil, water and food; 7. Understand the main biotechnological applications of microorganisms, as well as their limitations and risks to health; 8. Training the use of current laboratory techniques in the field of microbiology applied to biotechnology

Syllabus:

1. Microbial Ecology: Microbial diversity and ecology. The physical environment; 2. Microorganisms in marine and freshwater environments: Microbial adaptations. Examples of microorganisms in these environments; 3. Microorganisms in Terrestrial environments: Soils as an environment for microorganisms. Examples of microorganisms in these environments; 4. Microbial Interactions: Microbial diversity. Human-microbe, Vascular plants – microbe, Animals-microbe, Atmosphere – microbe interactions. Soils - microbe interactions. Water - microbe interactions. Microbial interactions relevant for Human Health; 5. Clinical microbiology and immunology: Identification of microorganisms from specimens. Clinical immunology: importance of serotyping. Susceptibility testing. Vaccines, interferons and antimicrobial drugs; 6. Microbiology of Food: Microorganisms growth in food. Controlling food spoilage. Food-borne diseases. Microbiology of fermented food; 7. Industrial Microbiology. Wastewater treatment. Industrial microbiology: microorganisms and major products. Biodegradation. Impacts of microbial biotechnology
Practical classes: 1. Identifications of soil microorganisms; 2. Wastewater treatment; 3. Microbial lactic fermentation analysis; 4. Biotransformation of steroids by filamentous fungi; 5. Quantification assays of antibiotics; 6. Antimicrobial susceptibility (TSA) test; 7. Application of restriction enzymes.

Teaching methodologies (including evaluation):

The course has one theoretical component and another practical, both integrated. The theoretical classes follow a participatory-expository teaching methodology; also debates within the group of students will be used. In the laboratory classes students will be asked to perform experiments covering syllabus aimed on providing students with skills for hands-on for biotechnology. Will be used the e-learning Moodle platform to support teaching, as repository of information, forum, delivery of work and testing of self-assessment and summative evaluation. The evaluation of the theoretical component consists of making a summative test in the Moodle platform. Laboratory evaluation includes reports from each experience, realized in small groups of students. In addition to direct contact in the classroom, students will communicate with teachers of the curriculum unit through e-learning Moodle platform. To obtain approval, the students must obtain in the theoretical evaluation by test a grade higher than 9.5. The component weight of the test for the final grade will be 40% and the average of all the Laboratory reports will account for 60%. The final grade (FG) will be given by the formula: $FG = 40\% \text{ Test} + 60\% \text{ (average of classification for Laboratory reports)}$