

Dr. Mario Núñez, Presidente
Decano Asociado Interino
Avalúo y Tecnologías de Aprendizaje (AvaTecA)
Facultad de Artes y Ciencias
Universidad de Puerto Rico-Mayagüez

1 de abril de 2014

Estimado Dr. Núñez:

En cumplimiento con la encomienda solicitada a través del Comité de Avalúo de la Facultad de Artes y Ciencias, el Programa de Biotecnología Industrial del RUM desea someter el siguiente Plan de Avalúo de Objetivos Educativos para su consideración.

Este plan ha sido discutido con varios sectores constituyentes del programa incluyendo la facultad, estudiantes activos, egresados y personal administrativo cuyos insumos han sido recopilados en el documento que se incluye aquí.

Para que así conste, certificamos hoy, 1 de abril de 2014:



Carlos Ríos Velázquez, Coordinador



Patricia Ortiz-Bermúdez, Coordinadora Asociada y de Avalúo

**University of Puerto Rico at Mayagüez
Industrial Biotechnology Program**

PLAN FOR THE ASSESSMENT OF STUDENT LEARNING

Introduction

The Industrial Biotechnology Program (IBP) was established in 1994 as an undergraduate bachelor degree with an interdisciplinary curriculum between sciences and engineering. Until the year 1999, the program direction occurred at the Department of Biology and the Office of Research at the College of Arts & Sciences. In 2000 a coordinator for the program was appointed and an office space was assigned. An executive committee by faculty from Biology, Chemistry and Engineering was established and a strategic plan was prepared. In 2001, an Industry Advisory Board (IAB) was created with meetings once a year. Since 2013, the IAB, with representation of industry and government, have met twice a year to revise the strategic plan and advise with regard to its implementations. In 2010 the Industrial Biotechnology Alumni Advisory Board (IBAAB) was created. The IBAAB have provided insight into the development of graduates and have assisted in the creation of career development opportunities for our enrolled students, particularly those in the industry of bio-manufacture. During 2011, a staff was assembled strategically to include a professor from each department representing the stem areas of the IBP curriculum, namely, Biology, Chemistry and Chemical Engineering.

Purpose of the Plan

The IBP implemented its strategic plan in the year 2000. As part of the meetings the IAB holds annually, the strategic plan has been revised and amended, in order to improve the services offered to and for students. The last meeting with the IAB was held on November 2013 and the current plan reflects their comments. This assessment plan will provide guidelines for determining achievement of program objectives.

Applicability

This plan applies to students, coordinators, faculty, and support staff of the Industrial Biotechnology Program (IBP).

Constituencies

The main constituencies of the IBP are active students, faculty, alumni and members of the IAB. As an interdisciplinary degree the faculty in the program is appointed independently at the Departments of Biology, Chemistry and Chemical Engineering. The IAB has representation from academia, industry and government sectors of the island and outside of Puerto Rico as well.

Industrial Biotechnology Program Vision

To prepare professionals capable of developing and advancing biotechnology to contribute to the socio-economic development of the island of Puerto Rico.

Industrial Biotechnology Program Mission

To prepare students with the knowledge, skills and attitudes required in the fundamental areas that integrate Industrial Biotechnology for effective performance in industry, government and graduate school.

The Industrial Biotechnology Program has developed a brochure, and two road maps (one for first to second year students; and one from third to fifth year students) since 2011 which contains the program's vision and mission.

UPRM Vision

Transform UPRM into a leader institution of higher education in Puerto Rico and the American hemisphere, responding to the needs of a modern society, in a dynamic and global environment, in the continuous search for truth, knowledge, justice and peace.

UPRM Mission

Within the philosophical framework established by the University of Puerto Rico Act, the Mayagüez campus directs its efforts towards the development of educated, cultured citizens, capable of critical thinking, and professionally qualified in the fields of agricultural, social, and natural sciences, engineering, humanities and business administration. They should be able to contribute in an efficient manner to the cultural,

social, and economic development of the Puerto Rican and international community. This process is aimed at endowing our alumni with a strong technical and professional background and to instill a strong commitment to Puerto Rico and our hemisphere. Our alumni should have the necessary skills and knowledge to participate effectively in the search for solutions to the problem facing us, to promote the enrichment of the arts and culture, the development and transfer of technology as well as to uphold the essential attitudes and values of a democratic society.

INDUSTRIAL BIOTECHNOLOGY STUDENT PROFILE

Educational Objectives

The students from this program will integrate biology, chemistry and chemical engineering knowledge, applications and skills with an interdisciplinary vision of industrial biotechnology.

After completing the Bachelor of Science Degree in Industrial Biotechnology, the student must be able to:

Overall

- Be proficient in written and oral communication.
- Have computer literacy.
- Become aware of ethical issues and responsibilities.
- Lifelong learning skills.
- Critical thinking, scientific methodology and exposure to research in biotechnology.
- Awareness of contemporary biotechnology issues.
- Ability to conduct laboratory experiments and to analyze and interpret data.
- Ability to work in multidisciplinary teams to solve problems.
- Understand the impact of biotechnology in the solution to issues in health, general welfare, safety, environmental quality and economy on a global and a societal context.
- Exposure to industrial environment and practice.

Biology

- Understanding of fundamentals of genetic, molecular biology and its applications in genetic engineering.
- Knowledge of cell structure, physiology and metabolism.
- Ability to apply microbiology techniques and concepts to work in controlled environments
- General understanding of biological systems.

Chemistry

- Understanding of general chemistry concepts and its application to biology.
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- Identification, synthesis and experimental techniques of organic and biological compounds.
 - Acquire knowledge and practical skills in techniques for acquisition and interpretation of experimental data.
 - Theory of current instrumental methods for analytical tasks.
 - Understanding of chemical characterization of biomolecules.

Chemical Engineering

- Understanding of the laws of conservation of mass and energy and their applications to industrial biotechnology processes.
- Understanding of thermodynamic concepts and their applications to biological systems.
- Knowledge of the principles of statistics and its tools for use in research and applied problems.
- Understanding of fundamentals concepts in unit operations applied to industrial biotechnology processes.

The Industrial Biotechnology Program has developed two road maps (one for first to second year students; and one from third to fifth year students) since 2011 which contains the program's educational objectives.

Assessment of Strategies and Timetable

Due to the nature of the Industrial Biotechnology Program, the courses are assessed in each department, by the professor offering the courses. The capstone courses of the IB curriculum are Unit Operations, project in Biotechnology, practicum in Biotechnology, and Industrial Microbiology. The assessment tools used in these courses are the following:

Table I. Use of Course Assessment Tools

TOOL	TIMING
Exams, homework, special projects	Throughout semester
Written reports	Required for special projects, especially in project and practicum, also in some courses midterm and a final reports.
Oral presentations	Near the end of the semester, in some courses three time in the semester
Students evaluation of teaching	After the first 10 weeks of the semester
Portfolio	At the end of the semester, 3 rd year
Case studies/newspaper summaries/magazines	Throughout semester
Hands-on experience	At least once per semester

Table II. Use of Program Assessment Tools

TOOL	TIMING
Freshman questionnaire	First year
Focal group meeting	Second year
Internship questionnaire	Fifth year
Exit interview	Fifth year
Alumni questionnaire	After graduation

Assessment of Educational Objectives

Table III. Assessment of Learning Outcomes

LEARNING OUTCOME	ASSESSMENT STRATEGY
1. Be proficient in written and oral communication.	Exams, homework, special projects, oral presentations and video tapes of presentations, registration in undergraduate research courses, project in Biotechnology (BIND 5005), practicum (BIND 4905)
2. Have computer literacy.	Written reports, oral presentations in courses such as Bind 5005 and undergraduate research.
3. Become aware of ethical issues and responsibilities.	Newspaper readings, participation in courses case studies and workshops
4. Lifelong learning skills.	Attendance to activities, symposia, conferences and congresses, questionnaires of alumni that attended, alumni that have come to give presentations, professional memberships, magazine subscriptions, alumni questionnaire
5. Critical thinking, scientific methodology and exposure to research in biotechnology.	Newspaper readings, case studies, registration in undergraduate research courses, BIND 5005, BIND 4905
6. Awareness of contemporary biotechnology issues.	Attendance to symposia, congresses, conferences and short courses, newspaper readings, field trips, Capstone course (BIND 5006)
7. Ability to conduct laboratory experiments and to analyze and interpret data.	Homework, especial presentations in undergraduate research, BIND 5005, BIND 5006, Bioprocess laboratory (INQU 5029)
8. Ability to work in multidisciplinary teams to solve problems.	Questionnaire at the end of research experience and report of joint project in Bind 5005, BIND 5006 and INQU 5029
9. Understand the impact of biotechnology in the solution to issues in health, general welfare, safety, environmental quality and economy on a global and a societal context.	Newspaper and journal article readings in INQU 4207 and BIND 5006, and participation in Biotechnology Symposia, congresses, conferences and short courses.
10. Exposure to industrial environment and practice.	Questionnaire at completion of Industrial Internship experience (BIND 4905) and Capstone (BIND 5006) courses

Correlation of UPRM Learning Outcomes and the IB Educational Objectives

Table IV. Correlation of Institutional Outcomes with IB Program Educational Objectives

INSTITUTIONAL LEARNING OUTCOMES	IB PROGRAM LEARNING OUTCOMES									
	1	2	3	4	5	6	7	8	9	10
a. Communicate effectively	*							*		
b. Identify and solve problems, think critically, and synthesize knowledge appropriate to their discipline				*	*	*	*	*	*	
c. Apply mathematical reasoning skills, scientific inquiry methods, and tools of information technology		*			*		*			*
d. Apply ethical standards			*						*	
e. Recognize the Puerto Rican heritage and interpret contemporary issues				*		*			*	
f. Appraise the essential values of a democratic society								*		
g. Operate in a global context, relate to a societal context, and demonstrate respect for other cultures	*		*					*	*	
h. Develop an appreciation for the arts and humanities									*	
i. Recognize the need to engage in life-long learning				*						*

Table IV. Explanation of each Correlation

CORRELATION OF EDUCATIONAL OBJECTIVE AND OUTCOME	ASSESSMENT STRATEGY
1a:	Oral presentation videos, written reports
1g:	High school visits by students, short courses that provide exposure to other cultures
2c:	Laboratory activities, oral presentations
3d:	Case studies, attendance to symposia, seminars and conferences
3g:	Short courses by visitor and local professors
4b:	Subscription to magazines, attendance to symposia, seminars and forums
4e:	Symposium, seminars and conferences attendance, newspaper

4i:	Memberships, subscriptions, presentation offerings newspapers
5b:	Biotechnology Project and Practicum courses and undergraduate research presentations
5c:	Bioseparation Engineering and Bioprocess Laboratory coursework
6b:	Biotechnology Project and Practicum coursework, symposia, newspaper, case studies
6e:	Attendance to symposia, seminars and conferences, Casa Pueblo
7b:	Bioseparations Engineering, Biotechnology Project and Practicum coursework
7c:	Bioseparations Engineering, Biotechnology Project and Practicum coursework
8a:	Bioseparation Engineering, Capstone, and Bioprocess Laboratory coursework
8b:	Bioseparations, Capstone and Biotechnology Practicum coursework
8g:	Short courses by visitor professors, Capstone, Bioseparations Engineering, Bioprocess Laboratory, and presentations outside PR
9b:	Symposia seminars and forums attendance, case studies, newspapers, field trips
9c:	Casa pueblo, Symposia, seminars and forums case studies, Biotechnology Project and Practicum coursework
9g:	Symposia attendance, Biotechnology Project and Practicum coursework
10c:	Biotechnology Practicum coursework and field trips
10i:	Field trips, alumni presentations to students and Biotechnology Practicum coursework