BIOCHEMICAL ENGINEER

OBJECTIVE

Train professionals with creativity, critical and humanistic thinking to develop, implement and optimize processes, products and services involving the rational and comprehensive utilization of biotic resources, and professionals that are able to function in the areas of engineering and processes, food, biotechnology, environment, helping to improve the standard of living in our country and the world.

PROGRAM EDUCATIONAL OBJECTIVES

The following educational objectives of the program of Biochemical Engineer refer to knowledge, abilities, attitudes, and values that the graduates have reached in a period of 2 to 3 years after their graduation from the program.

1. The graduate is a professional that develops in the field of biotechnology, food, environmental engineering and processes, in accordance with its emphasis of Specialization.
2. The graduate has reached a high level of technical expertise and critical thinking.
3. The graduate is able to work in multidisciplinary teams.
4. The Graduate recognizes, defines and proposes innovative solutions of design for the processes that require the integration of biochemistry, chemistry and physics considering economic and environmental restrictions.
5. The graduate is a leader of ethics, socially and culturally responsible in their profession and in their community.
6. The graduate has a culture of professional updating permanent.

STUDENTS OUTCOMES

The Program has adopted and is using the ABET Student Outcomes (a) through (k) as listed below:

a) an ability to apply knowledge of mathematics, science, and engineering
b) an ability to design and conduct experiments, as well as to analyze and interpret data
c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d) an ability to function on multidisciplinary teams
e) an ability to identify, formulate, and solve engineering problems
f) an understanding of professional and ethical responsibility
g) an ability to communicate effectively
h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) a recognition of the need for, and an ability to engage in life-long learning
j) a knowledge of contemporary issues
k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

PROSPECTIVE UNDERGRADUATE STUDENTS' PROFILE

The applicant to the Biochemical Engineer career must have the following characteristics:

- Preference for chemical and biological sciences.
- Ability to understand, resolve and infer laws and theories.
- Ability to interact with others.
- Dexterity to perform laboratory precision work.
- Innovation and creativity.
- Interest in research.

GRADUATE STUDENTS' PROFILE:

BASIC SCIENCES CENTER

BIOCHEMICAL ENGINEER

Skills:

- Design and develop conservation processes, reuse and production of high quality food with a wide vision to propose possibilities of transforming food resources with the least impact to the environment.
- Develop processes and innovate conventional technologies and clean technologies to reduce emissions.
- Redesign, create and propose new processes, bioprocesses, technologies and equipment that increase productivity applicable in various industrial fields.
- Design and develop new biotechnological processes to obtain high-value products.
- Quantify the various processing of materials to generate goods and services.
- Perform scaling of equipment and processes involving the use of different materials to generate high volume production at lower cost.
- Collaborate in the formulation and evaluation of technical and strategic industry projects to develop and optimize bioprocesses.
- Advise on the application of technology in the areas of production, quality control, research and development in the industry.
- Participate in the management of biotic resources processing units for efficient use.
- Develop, adapt, manage, select and optimize industrial processes for the comprehensive use of natural products and foods.
- Perform work reports and research in different areas of knowledge.

Knowledge of:

- Theoretical basis in exact and natural sciences.
- Engineering fundamentals that allow students to design, adapt, manage, scale and innovate processes and equipment involving the use of bio-chemical materials.
- Genetic engineering techniques applied to development research.
- Basis for statistical data analysis and implementation of quality system processes.
- Identification and characterization of microorganisms of industrial use and its application to the production of biomass and/or metabolites.
- Biotechnology principles related to biological processes used for the transformation of biological products and byproducts.
- Fundamentals of Biochemistry and Food Analysis, as well as standards and permissible methods to verify food quality and processes.
- Food technologies related to the processes of handling, storage and preservation of food and products.
- Principles of pharmaceutical technology and industrial processes in the production of medicines and cosmetics.
- Foundations for the development and evaluation of projects for new or established companies.
- Computational tools.
- English language, focusing on reading comprehension in students' area of competence.

Attitudes:

- Environment analysis and criticism.
- Respect and tolerance towards others.
- Negotiating and conciliatory spirit.
- Adaptation to changing contexts.
- Confronting conflict situations.
- Proactive.
- Disposition for teamwork.
- Ethics in professional performance.
- Commitment and social responsibility.

Values:

- Autonomy and social responsibilities.
- Pluralism.
- Humanism.
- Quality.

WORKING FIELD:

The contexts in which these professionals work are both the free exercise of the profession and as associates to public and private, national and international organizations and institutions of any type and size, and in working conditions both of dependence and cooperation of senior management in cutting-edge and difficult areas.

DURATION:

Nine semesters.

SYLLABUS

PLAN 2012
CARRER 60

	T	P	C	CENTER	DEPARTMENT
FIRST SEMESTER					
DIFFERENTIAL AND INTEGRAL CALCULUS	3	2	8	BASIC S.	MAT. AND PHY.
GENERAL CHEMISTRY	4	2	10	BASIC S.	CHEMISTRY
ORGANIC CHEMSITRY I	4	2	10	BASIC S.	CHEMISTRY
BIOCHEMISTRY ENGINEERING FUNDAMENTALS	4	0	8	BASIC S.	BCE
BIOTECHNOLOGICAL INVESTIGATION	4	0	8	BASIC S.	BCE
	T	**P**	**C**	**CENTER**	**DEPARTMENT**
SECOND SEMESTER					
VECTORIAL CALCULUS	2	2	6	BASIC S.	MAT. AND PHY.
ANALYTICAL CHEMISTRY	4	2	10	BASIC S.	CHEMISTRY
ORGANIC CHEMISTRY II	4	2	10	BASIC S.	CHEMISTRY
CELLULAR BIOLOGY	4	2	10	BASIC S.	BIOLOGY
MECHANICS	4	0	8	BASIC S.	MAT. AND PHY.
INTRODUCTION TO BUSINESS FUNCTION	0	4	4	ECO. AND ADM. S.	ADM.
	T	**P**	**C**	**CENTER**	**DEPARTMENT**
THIRD SEMESTER					
DIFFERENTIAL ECUATIONS	3	2	8	BASIC S.	MAT. AND PHY.
THERMODINAMICS	5	2	12	BASIC S.	BCE
BIOCHEMISTRY I	4	2	10	BASIC S.	CHEMISTRY
NUMERICAL METHODS	2	3	7	BASIC S.	MAT. AND PHY.
ELECTRICITY AND MAGNETISIM	4	1	9	BASIC S.	MAT. AND PHY.
ORGANIC CHEMISTRY III	3	2	8	BASIC S.	CHEMISTRY
	T	**P**	**C**	**CENTER**	**DEPARTMENT**
FOURTH SEMESTER					
STATISTICS I	3	2	8	BASIC S.	STATISTICS
PHYSICAL CHEMISTRY I	5	3	12	BASIC S.	BCE
BIOCHEMISTRY II	4	3	10		CHEMISTRY
MATTER AND ENERGY BALANCES	3	2	8	BASIC S.	BCE
INSTRUMENTAL ANALYSIS	4	3	11	BASIC S.	CHEMISTRY

PHARMACEUTICAL TECHNOLOGY I	2	2	7	BASIC S.	BCE
	T	**P**	**C**	**CENTER**	**DEPARTMENT**
FIFTH SEMESTER					
STATISTICS II	3	2	8	BASIC S.	STATISTICS
GENERAL MICROBIOLOGY	3	3	9	BASIC S.	MICROBIOLOGY
GENETIC ENGINEERING	3	3	9	BASIC S.	CHEMISTRY
UNIT OPERATIONS I	4	2	10	BASIC S.	BCE
PHARMACEUTICAL TECHNOLOGY II	2	3	7	BASIC S.	BCE
PHYSICAL CHEMISTRY II	4	2	10	BASIC S.	BCE
	T	**P**	**C**	**CENTER**	**DEPARTMENT**
SIXTH SEMESTER					
STATISTICAL QUALITY CONTROL	2	3	7	BASIC S.	STATISTICS
COMPONENTS AND PROPERTIES OF FOOD	4	3	11	BASIC S.	BCE
BIOTECHNOLOGY	4	3	11	BASIC S.	BCE
UNIT OPERATIONS II	4	2	10	BASIC S.	BCE
PROCESSES AND SYSTEMS ENGINEERING	3	2	8	BASIC S.	MAT. AND PHY.
PROJECTS EVALUATION	2	3	7	ECO. AND ADM. S.	FIN.
	T	**P**	**C**	**CENTER**	**DEPARTMENT**
SEVENTH SEMESTER					
ENVIRONMENTAL BIOTECHNOLOGY	3	2	8	BASIC S.	BCE
FOOD ANALYSIS I	4	3	11	BASIC S.	BCE
FERMENTATIONS ENGINEERING	3	3	9	BASIC S.	BCE
UNIT OPERATIONS III	4	2	10	BASIC S.	BCE
OPTIONAL PROFESSIONALIZING I EMPHASIS I OR II	3	2	8	BASIC S.	BCE
FOOD PRESERVATION METHODS I	3	2	8	AGR. S.	FOOD TEC.
	T	**P**	**C**	**CENTER**	**DEPARTMENT**
EIGHTH SEMESTER					
UNIT OPERATIONS IV	4	2	10	BASIC S.	BCE
OPTIONAL PROFESSIONALIZING II EMPHASIS I OR II	3	2	8	BASIC S.	BCE
FOOD PRESERVATION METHODS II	3	2	8	AGR. S.	FOOD TEC.
SERVICES ENGINEERING	0	4	4	BASIC S.	BCE
BIOPROCESSES	5	2	12	BASIC S.	BCE
BIOPROCESSES INSTRUMENTATION AND CONTROL	0	4	4	BASIC S.	BCE
FOOD ANALYSIS II	4	2	10	BASIC S.	BCE
	T	**P**	**C**	**CENTER**	**DEPARTMENT**
NINTH SEMESTER					
PROFESIONAL ETHICS	2	2	6	SOC. S. AND HUM.	PHILOSOPHY
OPTIONAL PROFESSIONALIZING III EMPHASIS I OR II	4	0	8	BASIC S.	BCE

Optional Professionalizing Subjects in Close Mode
Emphasis I. Food
Emphasis II. Environmental Biotechnology

INSTITUTIONAL PROGRAMS

- Professional Practices
- Social Service
- Tutorials
- Academic Exchange and Mobility

- Foreign Languages Development
- Humanist Training Program

DEGREE REQUIERMENTS

The graduate shall adhere to the provisions in Chapter XIV of the certification at technical, technical upper and bachelor's degree level, article 156 of the Teaching General Regulation that states the following:

"Once accredited all subjects and requirements identified in the syllabus of the careers at technical, technical upper and bachelor's degree level, the graduate may request the issuance of her/his Diploma at the School Control Department, after complying with the following elements:

I. Having complied with the requirements of Social Service, Humanist Training, Professional Practices and Foreign Languages, as defined in the institutional programs;
II. Verify there isn't any debt with the Autonomous University of Aguascalientes;
III. Have covered the fee established in the plan of excises to obtain the Diploma; and
IV. Have presented the graduation exam."

Approved by the Honorable University Council in ordinary session celebrated on December 15th, 2011.