AUTONOMOUS UNIVERSITY OF AGUASCALIENTES

MASTER OF SCIENCE:
PLANT BIOTECHNOLOGY OR TOXICOLOGY AREA

PROGRAM[1]

I. PROGRAM OVERVIEW

Center: Basic Sciences
Department: Physiology and Pharmacology Department of Chemistry
Delivery: In-person
Enrollment: Full time
Level: Master's Degree
Emphasis: Training program for conducting scientific research
Educational program: Institutional
Duration: Two years
Credits: 171
Approved by HCU: 2018

II. ACKNOWLEDGEMENT

National: National Quality Graduate Program: Consolidation
International: Iberoamerican Postgraduate University Association

III. PROGRAM OBJECTIVES

General objectives:

I. Train professionals, teachers and researchers with a high academic level in the areas of Plant Biotechnology or Toxicology.
II. Train graduates to search, acquire and integrate with scientific criteria the knowledge of their specialty and related areas.
III. Promote the rigorous analysis of information science, stimulating an ability to maintain and enrich one's knowledge, and to identify problems and propose solutions.
IV. Train graduates in the use of research techniques and methods applicable to their specialty, so that they participate in the generation of knowledge.
V. Promote an ability to adapt or develop methodologies as well as to solve practical problems in their area of expertise.

[1] (Web version)
[2] Honorable University Council

Specific objectives of the Plant Biotechnology area:

I. Describe biochemical, physiological, and molecular principles which apply to plants.
II. Efficiently handle techniques and methods related to plant biotechnology.
III. Design and develop research and technological development projects in the area of plant biotechnology.
IV. Develop methods and strategies aimed at solving problems related to agricultural productivity and obtaining plant products through the use of biotechnology.

Specific objectives of the Toxicology area:

I. Analyze the actions and harmful effects produced by toxic substances in living beings.
II. Efficiently handle analytical techniques and methods related to toxicology.
III. Participate in the identification and evaluation of toxicity risks from environmental exposure or occupational to the xenobiotics, as well as develop measures preventive and corrective actions to problems of environmental pollution and toxicity in the workplace.
IV. Collaborate in the generation of knowledge in the toxicological area through the development of research projects.
V. Promote the formation of a social conscience for the rational use of natural resources and the adequate management of toxic substances in agricultural, industrial, and domestic activities.

IV. AREAS OF RESEARCH

Plant Biotechnology: The objective is to generate knowledge about the genome of different species of plants of importance in the region, or on other aspects such as their phylogeny, by using biotechnological tools. Regarding the application of knowledge, work is being done to develop methodologies that allow the conservation and rational use of plant biodiversity as well as the improvement of cultivated species, all within the field of biotechnology. The study and production of important chemical compounds in *in vitro* systems are also of interest within this line. While most of the projects have been made in plant systems, more work still needs to be done with fungi which includes algae.

Toxicology: The objective is to generate knowledge about the effect of toxic compounds on live organisms as well as strategies and mechanisms that can be used to reverse these effects. It also studies the presence of these compounds in the environment and their effect on various ecosystems. Regarding the application of knowledge, it seeks to propose alternatives to reduce the damage caused by toxins in living organisms, or to minimize the toxic effect of compounds used with various purposes. As it relates to the environment, it seeks to propose methodologies that can be applied to reduce the presence and harmful effect of toxics in the environment.

V. PROFILE OF INCOMING STUDENTS AND GRADUATES

<table>
<tr><th>ENTERING STUDENTS</th><th>GRADUATES</th></tr>
<tr><td>Knowledge:
1. Basic in the disciplinary area (graduated from careers in the chemical-biological, health, agronomic or related areas).
2. Understanding of the English language.</td><td>Knowledge in:
The graduate will know the fundamentals as well as the most recent advances in the areas of plant biotechnology or toxicology. Also, you will learn how to design and carry out a scientific research project and will know how to identify and use sources of supportive information.
Area: Plant Biotechnology
1. Of the foundations and recent advances in the area of plant biotechnology.
2. From design to develop scientific research projects. You will identify and use the sources of information that can support you for this purpose.
3. Of the biochemical, physiological, and molecular principles and foundations that govern plants as well as the most recent advances in the areas of plant biotechnology.
Area: Toxicology
1. The most recent foundations and advances in the area of toxicology.
2. From design to the development of scientific research projects.
3. Identification and use of various sources of information that serve to support the learning process.
4. Identifying the impact, its management, and prevention as well as the analytical methods used in the area of toxicology.</td></tr>
<tr><td>Abilities
1. Ability to understand scientific information.
2. Laboratory work.
3. Bibliographic search and management of databases.
4. Management of equipment of computation.</td><td>Skills for:
The graduate will have the necessary ability to select or design models to guide the experimental development of plant biotechnology or of the poison to the solution of practical problems related to these fields of study. You will be able to apply the appropriate instrumental and methodological techniques to obtain the required information and you will have the ability to interpret the results generated and to draw conclusions from them.
Area: Plant Biotechnology
1. He will be able to apply the appropriate instrumental and methodological techniques to obtain the required information.
2. Interpret the generated results and draw conclusions from them.
3. Develop research and technological development projects in the area of plant biotechnology.
4. Develop methods and strategies aimed at solving problems related to agricultural productivity and obtaining products vegetables through the use of biotechnology.</td></tr>
</table>

	5. Select or design models that allow guiding the experimental development of plant biotechnology or toxicology to the solution of practical problems. ***Area: Toxicology*** 1. Analyze the actions and harmful effects produced by toxic substances on living beings. 2. Efficiently handle analytical techniques and methods related to toxicology. 3. Participate in the identification and assessment of risks of toxicity environmental or occupational exposure to xenobiotics and develop preventive and corrective measures to environment problems related to pollution and of toxicity in the workplace. 4. Collaborate in the generation of knowledge in the toxicological area through the development of research projects. 5. Manifests a social conscience for the rational use of natural resources and the adequate management of toxic substances in agricultural, industrial, and domestic activities.
Attitudes 1. Initiative 2. Responsibility 3. Social commitment 4. Discipline 5. Loyalty 6. Tolerance	*Attitudes in:* The graduate will develop an open attitude towards new knowledge, but at the same time will be able to analyze it with scientific rigor. You will know that the goal of your knowledge is to solve practical problems that can be treated by applying the knowledge in the area of plant biotechnology or toxicology. ***Area: Plant Biotechnology*** 1. Willingness to learn. 2. Scientific rigor. 3. Interdisciplinary work. 4. Critical thinking for solving practical problems. 5. A social sensitivity to the good use of resources. ***Area: Toxicology*** 1. Willingness to learn. 2. Scientific rigor. 3. Interdisciplinary work. 4. Critical thinking for solving practical problems. 5. A social sensitivity to the good use of resources.

Values Students entering the master's degree must demonstrate an ethical and moral perspective characterized by behavior consistent with the values of the institution, indicated by the *Ideario*.	*Values* Students will develop an ethical and moral perspective characterized by sensible behaviors and consistent reasoning regarding the values as outlined in the institutional educational standards in the *Ideario*.

VI. ADMISSIONS

The institutional entrance requirements according to the General Teaching Regulations are to 1) demonstrate a degree according to the postgraduate degree program, 2) achieve a minimum of 1000 points in the admissions exam, 3) achieve a minimum average of eight (8.0) in prior courses; 4) submit all administrative documents requested by the admissions department, and 5) enter the graduate program oriented to conducting research. Moreover, the General Teaching Regulations dictate a minimum TOEFL score requirement of 400 to enter the program to ensure a maximum of one year is enough to achieve a minimum score of 450 required to complete the program.

For this program, the selection process will be subject to the provisions stated within General Teaching Regulations. The process includes the following:

1. The UAA will publish a call for academic admissions on its website. The preparation of this call will be made in coordination with the Academic Council of the Master's Degree and the Department of Postgraduate Studies. The latter will be responsible for its publication.
2. Candidates must apply for admission as required by institutional standards, including the of accreditation of an English language proficiency requirement.
3. Candidates must complete the institutional exam for graduate admission.
4. Candidates must complete a specific knowledge exam for the master's degree program of choice.
5. Candidates must complete an interview with the Academic Council of the Master's Degree.

Stages four and five will be coordinated by the Academic Council of the Master's Degree. This same collegiate body will decide and prepare the list of selected students, which will be published on the UAA website.

VII. PROGRAM STRUCTURE AND ORGANIZATION

Organization of the program

Developmental Axes	No. of subjects	% of subjects	Credits	% in credits
Basic	3	30%	44	27.33%
Core / Professional	3	30%	37	22.98%
Integral	4	40%	67	41.61%
Electives	-	-	10	6.21%
Complementary Activities	-	-	3	1.86%
Subtotal	**10**	**100**	**161**	**100**

Structure of the program

Subjects		Seriation	HT	HP	Cr	Center	Dept.	Academic area
First semester								
1. Advanced Biochemistry			5	7	17	CCB	Chemistry	Common stuff
2. Instrumental Analysis			3	4	10	CCB	Chemistry	Common stuff
3. Introduction to Biological Research			5	7	17	CCB	Statistics	Advanced statistics
4. Research Seminar I			4	4	12	CCB	Physiology and Pharmacology / Chemistry	Plant biotechnology / Toxicology
Subtotal			**17**	**22**	**56**			
Second semester Plant Biotechnology								
5. Biotechnology Vegetable			5	5	15	CCB	Chemistry	Vegetal biotechnology
6. Plant Physiology			4	4	12	CCB	Chemistry	Vegetal biotechnology
7. Plant Interactions - pathogen			4	2	10	CCB	Chemistry	Vegetal biotechnology
8. Research Seminar II			0	14	14	CCB	Physiology and Pharmacology /Chemistry	Plant biotechnology / Toxicology
Subtotal			**13**	**25**	**51**			
Second semester Toxicology								
5. General Toxicology			4	2	10	CCB	Physiology and Pharmacology	Toxicology
6. Environmental Toxicology			5	5	15	CCB	Physiology and Pharmacology	Toxicology
7. Toxicology of Devices and Systems			4	4	12	CCB	Physiology and Pharmacology	Toxicology
8. Research Seminar II			0	14	14	CCB	Physiology and Pharmacology /Chemistry	Plant biotechnology / Toxicology
Subtotal			**13**	**25**	**51**			
Third semester								
9. Research Seminar III			2	16	20	CCB	Physiology and Pharmacology / Chemistry	Plant biotechnology / Toxicology
Subtotal			**2**	**16**	**20**			
Fourth semester								
10. Research Seminar IV			2	17	21	CCB	Physiology and Pharmacology / Chemistry	Plant biotechnology / Toxicology
Subtotal			**2**	**17**	**21**			
Final subtotal			**3. 4**	**80**	**148**			
Thesis Defense					10			
Electives*					10			

Complementary Activities **					3	
Grand total			**34**	**80**	**171**	

Curricular map

Pillars of Development	1st semester	2nd semester	3rd semester	4th semester
Basic 44 credits	**Advanced biochemistry** TH: 5, PH: 7 Credits: 17			
	Instrumental analysis TH: 3, PH: 4 Credits: 10			
	Introduction to biological research TH: 5, PH: 7 Credits: 17			
Core 37 Credits	**Plant Biotechnology Area**			
		Plant biotechnology TH: 5, PH: 5 Credits: 15		
		Plant physiology TH: 4, PH: 4 Credits: 12		
		Plant-pathogen interaction TH: 4, PH: 2 Credits: 10		
	Toxicology Area			
		General toxicology TH: 4, PH: 2 Credits: 10		
		Environmental Toxicology TH: 5, PH: 5 Credits: 15		
		Apparatus and System Toxicology TH: 4, PH: 4 Credits: 12		
Integral 67 Credits	**Research seminar I** TH: 4, PH: 4 Credits: 12	**Research Seminar II** TH: 0, PH: 14 Credits: 14	**Research Seminar III** TH: 2, PH: 16 Credits: 20	**Research seminar IV** TH: 2, PH: 17 Credits: 21
Electives 10 Credits			subjects and / or workshops from third to four semesters	

Complementary Activities 3 Credits			Participation in national and international conferences; National and / or international mobility
TH: Theoretical hours per week, PH: Practical hours per week			

VIII. PROGRAM REQUIREMENTS

To remain in the program, the student must adhere to the following:

1. Maintain an overall minimum average of eight (8.0) as well as pass all subjects.
2. Accredit the mastery of a language other than Spanish (minimum 450 TOEFL points or its equivalency in another language, preferably English) for postgraduate programs aimed at scientific training.
3. Comply with the provisions of the General Teaching Regulations of the Autonomous University of Aguascalientes.

IX. REQUIREMENTS FOR OBTAINING A DEGREE

To achieve the Master of Science degree, the following must be met:

1. Comply with the standards of the General Teaching Regulations.
2. Pass all the subjects, seminars, and activities as indicated in the curriculum.
3. Obtain a minimum overall grade point average of eight (8.0).
4. Present and defend a thesis to one test audience for grade approval in accordance with the provisions of the *Manual of Guidelines and Procedures for Preparing a Master's Thesis or Practical Work* and in according to the *General Teaching Regulations.*

X. CORE ACADEMIC FACULTY

Degree	Name	Institution of the last degree	Academic body	SNI	LGAC
Dr	Avelar González, Francisco Javier	Research and Research Center Advanced Studies / IPN	Bioengineering and toxicology environmental	I	Toxicology
Dr	ez Aguirre, Yenny Adriana	Biotic Products Development Center / IPN		NA	Plant biotechnology
Dr	Alba Guerrero, Raquel	Potosino Institute for Scientific Research and Technological AC IPICYT		I	Toxicology
P.S.	Guerrero Barrera, Alma Lilian	Institute of Biotechnology / UNAM	Bioengineering and toxicology environmental	I	Toxicology
Dr	Jáuregui Rincón, Juan	UNAM	Chemistry and bioremediation	I	Plant biotechnology
Dr	Marichal Cancino, Bruno Antonio	Research and Research Center Advanced Studies / IPN		I	Toxicology
Dr	Medina Ramírez, Iliana Ernestina	Tulane University / USA	Chemistry and Bioremediation	II	Toxicology

Dr	Morales Domínguez. José Francisco	University of Colima	Vegetal biotechnology	I	Plant biotechnology
Dr	Ocampo Acosta *, Gilberto Alejandro	Claremont Graduate University California, United States	Conservation of biodiversity	I	Plant biotechnology
Dr	Pérez Molphe Balch, Eugenio Martín	Research and Research Center Advanced studies / IPN	Vegetal biotechnology	II	Plant biotechnology
Dr	Quintanar Stephano, Andrés	UNAM	Protein study in biological systems	III	Toxicology
Dr	Quintanar Stephano, Jose Luis	University of Alicante / Spain	Protein study in biological systems	II	Toxicology
Dr	Ramírez López, Elsa Marcela	University of Poitier-École des Mines of Nantes / France	Bioengineering and toxicology environmental	NA	Toxicology
Dr	Rico Martínez, Roberto	Georgia institute of technology / U.S	Biochemistry	III	Toxicology
Dr	Salinas Miralles, Eva Maria	Miguel University Hernández / Spain	Protein study in biological systems	II	Toxicology
P.S.	Siqueiros Delgado, Maria Elena	University of Rennes1 / France	Integrated management of agrosystems	I	egetal biotechnology
Dr	Ventura Juárez, Javier	Research and Research Center Advanced studies of the IPN	Protein study in biological systems	II	Toxicology

XI. PROGRAM FLEXIBILITY

The graduate program offers course area of subjects and two areas of specialization. The educational experiences offered are not unique to the classroom. There is an important component of practical work in the laboratory and research and finding information individually on the part of the student. There are no serial subjects, except the research seminars, which are tutorial subjects.

The main educational experience of the postgraduate is the planning and realization of a thesis by the student. At this point, there is flexibility regarding the choice of the advisor and the research topic. The new plan includes complementary study electives and activities to cover ten and three credits respectively, which begin the third semester. The optional subjects must have prior authorization by CAM and for complementary activities, credits will be given according to the hours or credits by attending conferences, workshops, research stays, etc, which may occur both inside and outside the institution or even outside the state or country.