



Universidad de Puerto Rico  
Recinto Universitario de Mayagüez  
**SENADO ACADEMICO**



### **CERTIFICACIÓN NÚMERO 12-70**

La que suscribe, Secretaria del Senado Académico del Recinto Universitario de Mayagüez de la Universidad de Puerto Rico, **CERTIFICA** que en la reunión ordinaria celebrada en la sesión del martes, 27 de noviembre de 2012, este organismo **APROBÓ LA SECUENCIA CURRICULAR EN BIOSEGURIDAD DE PLANTAS ADSCRITA AL DEPARTAMENTO DE CULTIVOS Y CIENCIAS AGROAMBIENTALES.**

La secuencia curricular se hace formar parte de esta certificación.

Y para que así conste expido y remito la presente certificación a las autoridades universitarias correspondientes, bajo el Sello de la Universidad de Puerto Rico a los veintinueve días del mes de noviembre de dos mil doce, en Mayagüez, Puerto Rico.

*Judith Ramirez Valentin*  
Judith Ramirez Valentin  
Secretaria



LPM

University of Puerto Rico-Mayagüez  
College of Agricultural Sciences  
Department of Crops and Agro-Environmental Sciences

PROPOSAL FOR A CURRICULAR CERTIFICATE IN PLANT BIOSECURITY

I. Title of the Certificate

This curricular sequence will be called Curricular Certificate in Plant Biosecurity. It is recommended under Category IV of the Board of Trustees Certification Number 27 (2003-2004) and its amendments under Certification Num. 47 (2004-2005).

II. Academic Unit That Will Offer the Certificate

The program of a Curricular Certificate in Plant Biosecurity will be administered within the Department of Crops and Agro-Environmental Sciences, College of Agricultural Sciences, University of Puerto Rico-Mayagüez. The Program will be administered by a coordinator who will: collaboratively administer the activities with APHIS-PPQ (Animal and Plant Health Inspection Service-Plant Protection and Quarantine) contact person, promote the Program among agricultural sciences students, and evaluate and prepare progress reports in coordination with APHIS-PPQ. It is expected that the APHIS-PPQ collaborator will have an Ad Honorem appointment in the Department of Crops and Environmental Sciences.

III. Justification

Production and importation of plant-derived provisions are of primary importance for the economy and food security of the people of Puerto Rico and the Caribbean. Many crops are produced or imported to the Island to satisfy the increased demand for these agricultural goods. The international commerce of plant products poses phytosanitary menaces to our economy and food security. To prevent and reduce these phytosanitary threats, it is mandatory to impose laws, regulations and inspection procedures at established ports of entry. Furthermore, many exotic plant pests and diseases are introduced as a result of the continued international exchanges of agricultural goods, tourism, and people who travel through our ports of entry.

Officials from the State Department of Agriculture and the United State Department of Agriculture, through its Animal and Plant Health Inspection Service (APHIS)-Plant Protection and Quarantine (PPQ) unit, are responsible for safeguarding our agriculture and natural resources against the entrance, establishment and dissemination of noxious arthropods, diseases, weeds, and other pests. The APHIS-PPQ unit works to achieve legitimate interstate and international commerce of plants and plant products such as ornamentals, fresh

fruits and vegetables, while preventing the introduction of exotic weeds and plant pests and diseases. For new plant pest introductions, PPQ works to eradicate, suppress, or contain pests in a joint effort with state departments of agriculture, other government agencies and/or industries. This work requires an in-depth knowledge of the biology of exotic weeds and plant pests and diseases, control methods, and applicable regulations.

To address these objectives, APHIS-PPQ looks to begin collaborative agreements with Land Grant institutions to offer a Plant Biosecurity Curriculum (PBC). This PBC is designed to educate undergraduate and graduate students in the fundamentals of the biology and the management of arthropod pests, diseases and invasive weeds, and the basis of biosecurity regulations. With this in mind, we propose a 20-credit PBC in the form of a curricular certificate.

#### IV. Objectives

1. To educate students about the scientific and regulatory basis of biosecurity of crop plants.
2. To provide students with skills and techniques in crop pest management to optimize yields in a sustainable context.
3. To provide internship opportunities in APHIS-PPQ facilities for students to learn via hands on experiences with trained professionals in plant biosecurity.
4. To facilitate students' transition to the work environment.

#### V. Skills of Graduates

After completing this certificate graduates will be able to

1. identify arthropod pests, diseases and invasive weeds of phytosanitary importance;
2. apply biosecurity regulations to prevent the entrance and to eradicate, control or contain invasive species of phytosanitary importance; and
3. apply control methods for the eradication, control or containment of invasive species of phytosanitary importance.

#### VI. Curriculum

Students will complete a minimum of 20 credit hours to obtain the Certificate in Plant Biosecurity. According to Certification Number 27 (2003-2004) of the University of Puerto Rico Board of Trustees, students can take 15 additional elective credit hours to those required as degree-granting credits. Most of the courses proposed for this certificate are currently required in several of the academic programs of the Faculty of Agricultural Sciences. At present, students in the undergraduate program of Crop Protection take 12 of the credits (core) required and many of the electives in this certificate. Students in other undergraduate programs of the Faculty of Agricultural Sciences may participate

in this certificate, with the appropriate academic counseling, without jeopardizing their academic progress. The undergraduate programs of General Agriculture, Agronomy, Soil Science, Horticulture Agricultural Education, and Agricultural Extension require students to have six to nine credits of those recommended in this certificate.

A. Core Courses (14 credits)

Course Code	Title	Credits
PROC 4006	Tropical Phytopathology	3
PROC 4008	Agricultural Entomology	3
PROC 4017	Weed Control	3
AGRO 4990/HORT4996-97 <sup>1</sup>	Selected Topics I, II	1
PROC 4999 <sup>2</sup>	Supervised Professional Occupational Experience for COOP Students	3
or PROC 4025 <sup>2</sup>	Crop Protection Practicum	
PROC 4xxx <sup>3</sup>	Plant Biosecurity Seminar	1
Subtotal required		14

B. Elective Courses (6 credits)

PROC 4xxx <sup>4</sup>	Introduction to Integrated Pest Management	3
PROC 4016	Agricultural Bacteriology	3
PROC 4018	Introduction to Agronematology	3
PROC 4019	Pesticides and Their Use in Agriculture	3
PROC 5005	Phytopathogenic Fungi	3
PROC 5006	Insects of Tropical Crops	3
CFIT 4007	Plant Breeding	3
Subtotal Electives		6
Total		20

<sup>1</sup>This course will be offered through video conference by North Carolina State University with the title Fundamentals of Risk Analysis (in the future this course may be offered in UPRM).

<sup>2</sup>Students will have a work experience in APHIS- PPQ facilities; other course codes (HORT, AGRO, TMAG, others) of COOP Plan or Summer Practicum are also valid.

<sup>3</sup>Integrating course to discuss topics in plant biosecurity (e.g., Tools and Methods for Plant Protection and Safeguarding; The Safeguarding Continuum and Trade Education; Outreach, and Careers in the Biosecurity Continuum; and Risk Analysis).

<sup>4</sup>This course will include, among other topics that will be studied and discussed, modules in plant biosecurity developed by APHIS-PPQ (e.g., Introduction to Plant Protection and Quarantine; Legislation and Organizations that Support PPQ activities; Identification and Diagnostic Methods and Technologies; Risk Analysis; and Biology and Taxonomy of Exotic Species).

## VII. Course Description

PROC 4006 Tropical Phytopathology- 3 credit hours  
Two hours of lecture and one three-hour laboratory per week.

Study of diseases of the main tropical plants, including the host range, symptoms and signs, etiology, cycles, epiphytology, distribution, economic importance and control.

PROC 4008 Agricultural Entomology- 3 credit hours  
Two hours of lecture and one three-hour laboratory per week.

Entomological study from the agricultural viewpoint, including insect taxonomy, economic importance, control, methods of collecting, mounting and preserving insects. A collection of insects of economic importance is required.

PROC 4016 Agricultural Bacteriology- 3 credit hours  
Two hours of lecture and one three-hour laboratory per week.

The study of the chemical, physical and biological characteristics of bacteria associated with agricultural crops, with emphasis on the basic techniques employed for isolation, culturing, identification and control.

PROC 4017 Weed Control- 3 credit hours  
Two hours of lecture and one three-hour laboratory per week.

Classification and identification of weeds of economic importance, discussion of physiological principles related to weed control, and eradication, commercial herbicide usage and other control methods.

PROC 4018 Introduction to Agronematology - 3 credit hours  
Two hours of lecture and one three-hour laboratory per week.

History, morphology, classification, and life cycles of nematodes, with emphasis on phytoparasitic nematodes; laboratory methods of extraction from soil and plant tissue and methods of identification will be utilized.

PROC 4019 Pesticides and Their Use in Agriculture- 3 credit hours  
Two hours of lecture and one three-hour laboratory per week.

Study of pesticides, including their chemical composition, their effects as environmental contaminants, their mode of action, toxicity and determination of their residues. Orientation will be given on management and disposal, methods of protecting personnel, and on pertinent federal and state legislation regarding pesticide usage.

PROC 4997 Supervised Professional Occupational Experience for COOP Students - 3-6 credit hours.

A summer and a semester are required, up to six credits. A minimum of two practice periods is required, one of them in a semester.

Practical experience in Crop Protection, in cooperation with the private sector or government. The student must be jointly supervised by the academic department, the COOP program coordinator, and an official from the cooperating entity. A written report will be required upon completion of each work period.

PROC 4025 Crop Protection Practicum- 3 credit hours.

Thirty hours per week for six weeks.

Practical work experience in Crop Protection is carried out under the supervision of the Department in collaboration with public and private entities.

PROC 5006 Insects of Tropical Crops- 3 credit hours

Two hours of lecture and one three-hour laboratory per week.

Study of the major insects affecting tropical crops: their biology and taxonomy; identification of damage in the field as well as in the laboratory; and appropriate measures of control.

PROC 5005 Plant Phytopathogenic Fungi - 3 credit hours

Two hours of lecture and one three-hour laboratory per week.

Examination of the most interesting groups of fungi from the phytopathogenic point of view: their taxonomy, nomenclature, morphology, genetics, host-parasite relationship, physiology, and ecology. Distinctive characteristics of specific pathogens will be discussed. Field trips for the collection of specimens and observation of symptoms and damage are required.

AGRO 4990/HORT 4996-4997 Selected Topics I and II- 1-3 credit hours

One to three hours of lecture per week.

Study of selected topics in agronomy, soils, horticulture or related areas.

PROC 4XXX Introduction to Integrated Pest Management- 3 credit hours

Two hours of lecture and one hour of discussion per week.

Study of the principles of integrated pest management as it applies to insects, pathogens, weeds and other minor pests of

phytosanitary importance. Methods of prevention, eradication, control and containment of invasive pests will be discussed.

PROC 4XXX Plant Biosecurity Seminar- 1 credit hour  
One hour of lecture, discussion or seminar per week.

Discussion of topics in plant biosecurity. An oral seminar and a written report are required.

CFIT 4007 Plant Breeding- 3 credit hours  
Three hours of lectures per week.

The improvement of crop plants by hybridization, selection and induced mutations; methods and techniques applicable to sexually and asexually reproduced plants.

#### VIII. Minimum Requirements to Qualify

To apply for the Certification in Plant Biosecurity the student has to be admitted in one of the academic programs of the Faculty of Agricultural Sciences and must have completed at least 48 credit hours with a minimum grade point average of 2.50. Students from other programs could also be considered for admission to the sequence after an interview with the Coordinator.

The student must complete the form "Solicitud de Admisión a Secuencia Curricular" and have it signed by the Director of the Department of Crops and Agro-environmental Sciences or Coordinator of the Curricular Sequence, and the Associate Dean. Once approved, this form will be sent to the Registrar's Office by the deadline established in the Academic Calendar for the appropriate annotation in the student's academic record. If the student does not belong to the host department, a written notice will be sent to the student's department director indicating his/her acceptance and a copy of the approved sequence.

#### IX. Requirements for Approval and Annotation in Academic Record

The Approval of the Certificate in Plant Biosecurity will be annotated in the student's academic record once all required courses are approved with a minimum grade point average of 2.50 (0.0- 4.0 scale) and once the student has completed the Bachelor degree. The minimum grade for approval of any course in the Sequence is C.

## X. Assessment Plan

Assessment of the student's learning will be coordinated with the Department assessment Committee. Both direct and indirect methods of assessment will be used to measure students learning outcomes and certificate's proposed objectives. Results will be used to revise Certificate courses and to determine their pertinence.

Table 1. Direct methods to assess learning

Assessment method	Who is responsible	Learning objective	Frequency of administration	Sample
Course embedded assessment	Certificate Coordinator/ Professor/ academic departments	1-4	Continuously, in semesters, and summer courses are offered	Participants in Certification
Rubrics for Seminar and Introduction to Integrated Pest Management courses	Certificate Coordinator/ Host Department / Assessment Committee	1-3	Every time courses are offered	Students registered in courses
Rubric for APHIS-PPQ internship	Certificate Coordinator/ APHIS-PPQ/ Assessment Committee	1-4	Every time internship is offered	Students in internship
Exit interview and diagnosis post test	Coordinator	1-4	Every Graduating cohort	Graduating cohort

Table 2. Indirect methods for assessing learning

Assessment method	Who is responsible	Learning objective	Frequency of administration	Sample
Student Opinion Questionnaire	Certificate Coordinator/ Assessment Committee	1-4	Annually	Participants in Certification
Employer Opinion Questionnaire	Certificate Coordinator/ APHIS-PPQ/ Assessment Committee	1-4	Every three years	Various divisions of APHIS-PPQ and related USDA offices employing graduates