PROFESSIONAL DIPLOMA

IN

PLANT CLINIC AND PHYTOSANITARY TECHNOLOGIES

(PRO-DPCP)

Program specification

Work Package and Outcome **Ref. No 4.3.**			
	Title	**Workshop to specify the new modules, pedagogical method and design structure for the new DPCP diploma program**	
	Type	☐ Teaching material ☒ Learning material ☐ Training material	☐ Event ☒ Report ☐ Service/Product
	Description	**Description of task:** The lead partner will compose a meeting and 2-day agenda with a questionnaire for collection of information at partner institutions. **This diploma is designed to be completed in 12 months + 3 months for internship. The suggested structure will consist of 60 ECTS (45 credits + Internship credits and thesis 15 ECTS). required to complete the diploma:** 12 courses in 2 (winter and spring) semesters. The courses are selected from obligatory and elective 20 courses including: • core courses • course in the area of specialization • various elective courses • internship Based on the above WP**4.2.** activity; Two days workshop for discussion, and brainstorming among partners and academic staff to draft a proposal, senior staff will develop new courses focused mainly on disease symptoms recognition. It comprises **15 -20** modules that will be developed heading '**How to Become a Plant Doctor'**. The examples of topics that will be addressed are: ● Module 1: Basic course: field diagnosis, how to run a Plant Clinic ● Module 2: Field diagnosis of plant disease caused by fungi ● Module 3: Field diagnosis of plant disease caused by viruses ● Module 4: Field diagnosis of disease caused by bacteria ● Module 5: Field diagnosis of disease caused by nematodes ● Module 6: IPM control, decision-making, quality of service ● Module 7: Field diagnosis of Insects damage ● Module 8: Laboratory methods for diagnosis and identification of plant diseases and pests ● Module 9: Laboratory methods for soil analysis ● Module 10: Seed health testing and treatment ● Module 11: How to design extension messages and write Fact Sheets/follow-up programs for selected crops. ● Module 12: Monitoring Progress- Quality of Plant Health Clinics. at each partner country concerning each country's needs and comparable to EU standards. **INPUTS**: 2 senior academic staff from each partner university + 6 EU acad. Staff from IT and HU **Venue**: (UNIDEB-DE MEK, HU) Meeting/3days	
	Due date	2nd week of M9	

INTRODUCTION

Management of crop diseases and pests caused by various phytopathogens needs proper detection and diagnosis of the causal agents. Adequate crop management strategies could be sorted out only when the actual causal agent is correctly established. The course is designed to discuss the approaches used for plant disease detection and diagnosis. Both conventional, as well as advanced molecular diagnostic techniques currently being used for plant disease diagnosis, will be discussed. Additional emphasis will also be given to discuss the recent advancements in plant disease diagnostics and special applications of diagnostic tools for the diagnosis of specific plant pathogens. In short, the course is designed to present a clear picture of the concepts of disease detection and diagnosis; tools and techniques used for disease detection and diagnosis; special applications of plant disease and pests diagnostic tools; diagnostic challenges; forensics of plants and microbes; and diagnostics in plant disease management.

Therefore, the curriculum for this plant clinic diploma postgraduate program is a combination of coursework and practicum. The course aims to mediate basic knowledge, methods and techniques to enable students to diagnose and quantify plant diseases and other stresses in crop plants, using an array of diagnostic methods and assessment techniques.

The diploma courses will introduce common plant diseases and pests in crop plants. It is based on short introductory sessions followed by practical exercises, in which students will diagnose plant diseases under laboratory conditions as well as in the field. The exercises include traditional diagnosis based on macroscopic symptoms as well as advanced microscopy, ELISA and PCR methods and quantitative disease assessment under natural conditions. The influence of post-harvest storage conditions and abiotic stresses on symptoms is considered as well.

Most exercises are done in small groups under the supervision of specialized staff and technicians. This will allow students to study specific subjects in more detail, as a basis for analyses, data processing and reporting. Lectures and exercises are offered by specialized staff and researchers in the different diseases and techniques.

PROGRAM SPECIFICATION

A. BASIC INFORMATION

Program Title:	Professional Diploma in Plant Clinic and Phytosanitary Technologies
Program type:	Single postgraduate
Department responsible:	
Faculty responsible	
University	
Joint program with other universities	
Program Coordinator:	Prof. Dr.----
Internal evaluator	Prof. Dr.----
External evaluator(s)	Prof. Dr.----
Approval date by faculty	--/---/2021
Approval date by university	--/---/2021

B. PROGRAM PROFESSIONAL INFORMATION

1- OVERALL PROGRAM AIMS

Program vision

- To provide top-quality, distinguished education locally & internationally. To engage in professional training and field activities which serve the agriculture community in Egypt.
- To provide post-graduates with international scientific capacity and distinguished technical skills in the field of phytosanitary and pest diagnosis

Program Mission

- To achieve high academic excellence and a top-quality educational and technical training environment capable of attracting distinguished graduates.
- To have a post-graduate "Plant Doctor" who is highly competitive academically, professionally & ethically, and is also capable of performing scientific & applied plant disease and pest diagnosis. This Plant Doctor should be capable of improving his skills, increasing his knowledge and technical information, and performing continuous learning, in line with international innovations in phytosanitary discipline and the related fields, and capable of making effective and real contributions to sustainable development of the agriculture sector in Egypt.

Program aims

- The program aims to develop and enhance the scientific capabilities and practical and professional skills of its post-graduate students in agricultural and applied specialized fields which involve all types of plant diseases and pests that damage all crops.
- The program aims to develop and create distinguished aspects or characteristics of its post-graduate students by providing them with a top-quality advanced education, sufficient practical & application-oriented training and great self-learning experience in the fields of plant clinic tools all in plant protection.
- The program aims also to assist and continuously follow up with post-graduates to get advanced training, find distinguished jobs related to plant health and plant protection fields and pursue M.Sc. and PhD studies, as well as to enhance their technical and social potentialities to perform their roles in the society.

2- GRADUATE ATTRIBUTES

By the completion of this Diploma, the graduate will be able to:

1. Apply gained knowledge for diagnosis of plant diseases, pests and disorders in the field and any laboratory procedures for analysis, detection and identification of the plant infection.
2. Master an appropriate domain (Fungi, Bacteria, Viruses, Nematodes, Insects and Mites)
3. Use appropriate techniques in plant disease and pest diagnosis.
4. To use his/her professional skills to select proper new technologies for various plant health problems.
5. Decide on different professional situations.
6. Use of the available resources efficiently through solving assignments to suggest the reasonable, efficient, most economical, and effective-optimum solutions for those problems.
7. Be aware of the ongoing problems and modern concepts in the area of specialization.
8. To manage work, transfer knowledge, communicate in written reports and oral forms, both in Arabic & English, work in a group on a specific task, manipulate and sort data, use IT and evolutionary technological tools, and think logically.
9. Communicate effectively and work effectively within multi-disciplinary teams.
10. Display professional and ethical responsibilities and contextual understanding.
11. Consider the impacts of biological solutions on society & environment.
12. Perform basic laboratory techniques (e.g., pipetting, calculations for solutions and dilutions, microscopy including dark field, staining techniques, use of hemacytometer, lab notebooks, lab safety).
13. Develop a plan to complete Koch's Postulates.

14. Make use of keys and references.
15. Contrast bacterial disease symptoms and signs, name the diagnostic tests and expected results, discuss potential pathogen spread, and discuss cultural/environmental factors conducive to bacterial disease development.
16. Contrast viral disease symptoms and signs, name the diagnostic tests and expected results, vectors, identify vectors/means of spread, and discuss cultural/environmental factors conducive to viral disease development.
17. Contrast fungal disease symptoms and signs, name the diagnostic tests and expected results, discuss cultural/environmental factors conducive to fungal disease development, and define means of pathogen movement/spread.
18. Recognize symptoms/signs of common abiotic and arthropod/other agent damage and identify the lab/agent who can identify each type of plant problem.
19. Identify the information needed and samples required for submission to a lab and interpret lab results.
20. Explain sanitation in a greenhouse, field, or nursery setting; describe general and pathogen-specific cultural management tools.
21. Identify diagnostic test component costs (labour, product, costs/benefits).
22. Begin triage and characterization of unknown samples.
23. Understand important points in instrument calibration.
24. Describe ethical issues that must be considered in selecting tests and interpreting results.
25. Perform culturing/enzymatic techniques (e.g., semi-selective solid media; oxidase, urease, etc.; Biolog).
26. Perform serological techniques (e.g., serology, ELISA, immunostrips).
27. Perform molecular techniques (e.g., primer use, ordering, aliquoting, storage; PCR (including multiplex and nested); qPCR; qPCR; multiplex and nested PCR; Sequencing/Sequence Analysis).
28. Think critically to assess a sample, develop a working hypothesis, run diagnostic techniques to test the hypothesis, develop a diagnosis, and recommend management actions.

Job opportunities:

Upon completion of this Diploma program, the post-graduate should be capable of working in all types of plant protection and crop production and can be employed by:

- Phytopathology diagnostic laboratories
- Colleges and universities (research, teaching, and extension)
- Agricultural consulting companies
- Agrichemical companies
- Seed and plant production companies
- Tissue culture laboratories
- International agricultural research centres
- Biotechnology firms
- Biological control companies
- Private practice
- Nurseries and garden centres
- Public policy organizations
- Lawn and landscape maintenance firms

3- INTENDED LEARNING OUTCOMES (ILOs)

A. KNOWLEDGE AND UNDERSTANDING

By the end of this program, the graduate should be able to:

A.1. Understand the basics of plant pathology, entomology, and other related sciences.
A.2. Discuss the host-parasite relationship and their immune response.
A.3. Realize with modern applied methodologies in the field of plant pathology, and entomology.
A.4. Recognize the legal and ethical basics in the field of laboratory safety.
A.6. Identify the principles and basics of quality assurance in the area of practical phytopathology.
A.7. Recognize the basics and ethics of research on animal models in phytopathology.

B. INTELLECTUAL SKILLS

By the end of this program the student should be able to:

B.1. Demonstrate fluency in communication and clinical reasoning during the diagnosis of plant samples from different crop categories.
B.2. Recognize the educational needs and demonstrate fluency in practising self-directed learning.
B.3. Demonstrate interest in Evidence-Based Practice.
B.4. Realize limitations and cope with uncertainty in infected samples diagnosis.
B.5. Demonstrate an understanding of the environmental and legal frameworks in which plant samples are given.
B.6. Demonstrate interest in practising self-directed learning.
B.7. Recognize the need to perform self-appraisal.

C. PROFESSIONAL AND PRACTICAL SKILLS

By the end of this program the student should be able to:

C.1. Conduct successful consultation using appropriate consultation skills.
C.2. Conduct counselling successfully for different plant health categories in plant clinic Practice.
C.3. Make use of different tools of consultation efficiently.
C.4. Make use of the clinical reasoning skills appropriately.
C.5. Manage the common plant health problems {pathogenic (chronic/serious /not serious) nonpathogenic disorder, interaction with vectors)} using evidence-based guidelines.
C.6. Conduct evidence-based screening activities for different disease/pest categories.
C.7. Interpret results of all diagnostic procedures required for diseased or infected plants.
C.8. Perform auditing of the provided diagnosis/conduct practice activity analysis (Report in plant clinic)
C.9. Conduct the required procedures required in the course specification.

D. GENERAL AND TRANSFERABLE SKILL

By the end of this program the student should be able to:

D.1. Work effectively within a team.
D.2. Use information technology tools successfully.
D.3. Exchange and present information clearly in written, electronic and oral forms
D.4. Apply the principles of ethics appropriately
D.5. Communicate ideas and arguments effectively.
D.6. Apply the principles of scientific evidence in daily practice
D.7. Recognize and cope with uncertainty.
D.8. Collect information and data search from different sources.
D.9. Assess the collected data to enhance professional competencies.
D.10. Apply effective mathematical and statistical methods.
D.11. Implement self-learning to develop the profession continuously.

D.12. Follow ethical and legal guidelines.
D.13. Apply safety measures in practice.
D.14. Build up financial, sales and market management abilities.
D.15. Express creativity and innovation.

4- ACADEMIC REFERENCE STANDARDS (ARS)

4.1. External References for Standards (Benchmarking)

The Faculty is adapting to the National Academic References Standards for graduate studies (March 2009).

4.2. Comparison of provision to external references. (attached)

5- PROGRAM STRUCTURE & CONTENT

5.1. Study period: one academic year (2 semesters)

5.2. Program structure: it's a course-based program continued for 12 months and consisting of 2 semesters.

The total needed credit points for getting a diploma degree are 60 ECTS (European Credit Transfer System): The program consists of the First semester (23 ECTS), the Second semester (22 ECTS) plus 15 ECTS for Internship and graduation diploma report (Thesis).

ONE YEAR DIPLOMA						
SEMESTER	**COURSES**				**Total**	
	Compulsory		**Elective**			
	No.	**ECTS**	**No.**	**ECTS**	**Course No.**	**ECTS**
Semester 1	3	15	3	8	**6**	**23**
Semester 2	2	10	4	12	**6**	**22**
	Internship		**Final thesis report**			
Internship & Graduation diploma report (Thesis)	**5 (ECTS)**		**10 (ECTS)**			**15**
Total						**60**

No. of hours per week: 2 ECTS / week which are equivalent to 50 – 60 hours/ week, including lectures, tutorials, self-learning and hands-on training.

Example: Workload per day for one course equals 3 ECTS credit hours per semester*

Category of workload hours per day	**No. hours**	**No. days**	**Total hours**
Class hours	3	12	36
Lab Practice or Fieldwork	2	10	20
Reading (outside class) Library + INTERNET	2	7	14
Assignments	2	3	6
Preparation for examinations	2	4	8
Examinations (Oral+Practice+Theoretical)	2	3	6
Total			**90**
ECTS Total:	**90 hrs /30 = 3 ECTS****		

*****Semester of 14 week = (12 weeks + 2 weeks exam and evaluation)

******1 ECTS = 25-30 work hours

Calculating ECTS per course

- 60 credits = student workload during 1 academic year
- 1500-1800 hours per year
- 1 ECTS = 25 – 30 student working hours

Total No. of ECTS hours	Theoretical	24	Practical	36	Total	60
Distribution of credit hours	Compulsory	25	Elective	20	Total	45
No. credit hours basic science	15	Per cent	25%			
No. credit hours speciality courses	30	Per cent	50 %			
Practical/ Field Training	15	Per cent	25%			

5.3. PROGRAM COURSES

Compulsory courses (1st and 2nd semesters)

Code	Module	Subject title	Semester 1St or 2nd	No. of Units	No. of hours/ week	
					Lect.	Lab.
PC01	**Plant pathology**	Aetiology of plant pathogens	1st	5	2	3
PC02		Diagnosis of plant diseases, pests and disorders	1st	5	2	3
PC03		Plant clinic operating system	2nd	5	2	3
PC04		Plant disease and pest control	2nd	5	2	3
PC05	**Entomology**	Applied Entomology-and Acarology	1st	5	2	3
PC06		Internship & Graduation diploma report (Thesis)	**summer**	15	Field & clinic	

Elective courses (1st and 2nd semesters)

Code	Module	Subject title	Semester 1st or 2nd	No. of ECTS Units	No. of hours/ week	
					Lect.	Lab.
PC07	**Plant pathology**	Field diagnosis of plant disease caused by fungi	1st	3	1	2
PC08		Field diagnosis of plant disease caused by viruses	1st	3	1	2
PC09		Field diagnosis of disease caused by bacteria	1st	3	1	2
PC10		Field diagnosis of disease caused by nematodes	1st	3	1	2
PC11		Field diagnosis of Insects damage	2nd	3	1	2
PC12		Seed health testing methods	1st	4	2	2
PC13		Greenhouse diseases and pests	1st	2	1	1
PC14		Weed biology and control	2nd	2	1	1
PC15		Plant diseases and pests in organic farming	2nd	3	2	1
PC16	**Plant Pathology & Entomology**	Postharvest, storage diseases and pests	2nd	3	2	1
PC17		Herbarium self-training	2nd	3	2	1

PC18	**Pesticides**	Pesticides action and application techniques	2nd	3	2	1
PC19	**Quarantine & legalization**	Quarantine and biosecurity	2nd	3	2	1
Special courses of topics for each Agricultural region مقررات اخرى تناسب كل جامعه						
PC20						

5.4. COURSES CONTENT & SPECIFICATION

For all details, refer to the individual course specifications.

Code	Title	Content
PC01	Aetiology of plant pathogens	Studies on the causal of plant diseases; Koch's postulates; factors that affect plant pathogens, source of plant pathogens, mono- poly-disease cycles; primary, secondary and complex infection. Pathogen inoculum dissemination and infection. Pathogenicity and Virulence. Stages of Pathogenesis. Primary Pathogens versus Opportunistic Pathogens. Genetic diversity and recombination in the Plant Pathogen. **Practice** How to isolate fungi, bacteria and nematodes in the laboratory
PC02	Diagnosis of plant diseases, pests and disorders	The course aims to mediate basic knowledge, methods and techniques to enable students to diagnose and quantify plant diseases and other stresses in crop plants, using an array of diagnostic methods and assessment techniques. Common plant diseases in crop plants are based on short introductory sessions followed by practical exercises, in which students diagnose plant diseases under field conditions as well as in the laboratory. The exercises include diagnosis based on macroscopic symptoms as well as microscopy, ELISA and PCR methods and quantitative disease assessment under natural conditions. Also; the influence of abiotic stresses and leaf senescence on macroscopic symptoms is considered as well. Most exercises are done in small groups under the supervision of teachers. This will allow the student to study specific subjects in more detail, as a basis for analyses, data processing and reporting. **After the course, the student should be able to:** Diagnose and describe typical plant pathogens infecting crop plants.

		Distinguish between symptoms caused by biotic and abiotic stresses. Account for basic principles for diagnosis and quantification of plant diseases in crop plants. Apply practical diagnostic methods ranging from quantitative field assessments and microscopy to molecular and serological methods. Critical evaluation of problems related to disease diagnosis and assessment.
PC03	Plant clinic operating system	Plant clinic service delivery Plant clinic workforce Plant clinic data and information Plant clinic performance Quality of plant clinic Farmer-centric plant clinic On wheels – the mobile plant clinic Networking of plant health clinic Online plant health clinic Improving clinics communication
PC04	Plant disease and pest control	Course objectives: - To list and discuss common disease and pest control methods including mode of action, types of diseases - controlled, when they should be applied, how well they work and whether are they safe and sustainable. To explore new control practices. - To construct disease control strategies for different types of agricultural operations including the home, home garden and landscaping, small farm, greenhouse and large farm. Content: 1) Breaking down plant disease development into components that are useful for designing and implementing disease control. a) The six principles of plant disease control. b) Forecasting disease 2) Cost: benefit ratio. 3) Physical methods: a) Quarantines b) Eradication campaigns c) Tort laws d) Selection of planting sites. e) Field preparation. f) Crop planting g) Irrigation method and timing h) Fertilization

		i) Specific cultural practices i) Training methods ii) Pruning, rogueing. iii) Harvest methods and timing iv) Postharvest handling and storage 4) The use of biological agents for disease control. 5) The use of host resistance to control diseases including genetics, mode of action, stability and management of pathogen races. 6) The use of a genetic modification of plants to control diseases 7) The use of chemicals to control diseases including safety, following regulations, mode of action, selection of appropriate chemicals, application methods, and management of chemical resistances in pathogen populations. 8) Time permitting: Creating effective strategies for the control of specific types of diseases. Practical: 1. Visit to plant quarantine unit 2. Detection of plant pathogens from seeds, food grains and other imported fruits and vegetables. 3. Sample and sampling techniques 4. Preparation of a checklist for phytosanitary measures adopted by the farmers. 5. Different treatment methods for quarantine.
PC05	Applied Entomology and Acarology	**Objective:** To acquaint the students with the external morphology of different groups of insects and mites, train them in the identification of commonly occurring families of plant-associated insects and mites, provide information about important pests of crops and their management. This course, Applied Entomology, is designed to help students gain an introductory understanding of insect biology and taxonomy; understand the importance of insects as pests and beneficial species in a variety of habitats; recognize the benefits and drawbacks of a range of insect management practices and understand the components of integrated pest management; learn how to identify the most important insects and related organisms that are pests in key groups of crops and other habitats. **Contents:** Introduction, insect distribution, insect life cycle, benefits and injuries, Natural Balance, biotic factors, resistance and environmental disturbance

		Insects infesting field crops, orchards, vegetables, ornamental plants, important pests of forest trees and stored products, Locusts, grasshoppers and termites, Pests of farm animals, cattle, infestation symptoms, injury and natural enemies, Medical and Veterinary entomology concerning important vector and their control, Threshold for insect management and allied terminology, Phenology and its application in pest prediction. **Practical:** Collection and extraction of insects and mites from plants, soil and store products; preparation of mounting media and slide mounts; external morphology; identification up to family level using keys; studying different rearing techniques.
PC06	Internship & Graduation diploma report (Thesis)	**Objective**: Students will be taught critical thinking skills needed to: assess the problem, develop a working hypothesis, test hypotheses, synthesize a diagnosis, and prescribe management/therapeutic actions. Throughout the internship, students will synthesize knowledge of organismal biology, and epidemiology, with methods and techniques to develop strategies for disease diagnosis. **Practical**: As this is a professional internship, students will be starting hands-on duties the first week of 2nd semester. Students will work alongside diagnosticians, first observing techniques, and then performing them later in the semester, as the need arises for that skill during the diagnosis of real plant disease samples. Each technique is listed in a sheet to be completed by the end of the semester. The final exam is a hands-on diagnosis of an unknown sample (provided by the instructor). An oral presentation to the class and laboratory staff, detailing the process of diagnosis of the unknown, is required in the last two weeks of the semester. The diploma thesis should deal with a specific problem from the field of Plant Clinic and Phytosanitary, and, if possible, relate to the topic of the student's practical placement. The topic is selected upon prior agreement with the mentor and prior approval of the department and faculty boards. The Diploma Thesis is the result of the independent work of the student, with guidelines, monitoring and advice provided by the mentor. The application and approval of the topic of the Diploma thesis, its submission, defence and assessment, as well as the publication of its findings comply with the University of regulations concerning the procedure on how to apply and

		defend a diploma or master thesis (available at http://www……./).
PC07	Field diagnosis of plant disease caused by fungi	**Objective** To study the nomenclature, classification and characters of fungi. Theory. Introduction, definition of different terms, basic concepts. Importance of mycology in agriculture, relation of fungi to human affairs, history of mycology. Fungal biodiversity, reproduction in fungi, Concepts of nomenclature and classification. The comparative morphology, ultrastructure, and characters of different groups of fungi up to generic level: i) Chytridiomycota ii) Zygomycota, iii) Ascomycota, iv) Basidiomycota, v) Deuteromycota. vi) Oomycota. Lichens types and importance, Mycorrhiza, types and importance. **Practical:** Detailed comparative study of different groups of fungi; collection, identification and preservation of specimens. Identification of plant pathogenic fungi.
PC08	Field diagnosis of plant disease caused by viruses	**Objective:** To acquaint with the structure, virus-vector relationship, biology and management of plant viruses. **Theory** History of plant viruses, shape, size, composition, structure and physical properties of viruses. Symptomatology of important plant viral diseases, transmission, virus vector relationship. Virus nomenclature and classification, genome organization, replication and movement of viruses. Isolation and purification, electron microscopy, protein and nucleic acid-based diagnostics. Mycoviruses, phytoplasma arbo and baculoviruses, satellite viruses, satellite RNAs, phages, viroids, and prions. Mechanism of resistance, genetic engineering and management of plant viruses. **Practical** Study of symptoms caused by viruses, transmission, assay of viruses, physical properties, purification, serological tests
PC09	Field diagnosis of disease caused by bacteria	**Objective** To acquaint with plant pathogenic prokaryote (procarya) and their structure, nutritional requirements, survival and dissemination. Theory.

		History and introduction to phytopathogenic prokaryotes, viz., bacteria, MLOs, spiroplasmas and other fastidious prokaryotes. Importance of phytopathogenic bacteria Bacterial cell structure, shape, size, flagellation, etc Classification and nomenclature of phytopathogenic prokaryotes. Growth, nutrition requirements, reproduction, preservation of bacterial cultures and variability among phytopathogenic bacteria. UNIT V General biology of bacteriophages, L form bacteria, plasmids and bdellovibrios. Prokaryotic inhibitors and their mode of action against phytopathogenic bacteria. Survival and dissemination of phytopathogenic bacteria. **Practical:** Isolation, purification, identification and host inoculation of phytopathogenic bacteria, staining methods, biochemical characterization, and use of antibacterial chemicals/antibiotics.
PC10	Field diagnosis of disease caused by nematodes	**Objective:** Develop an appreciation for the role of nematodes in the environment in general, and in agricultural crop production in particular. **Expected Learning Outcomes:** Upon completion of this course, students will be able to: 1) Demonstrate familiarity with economically important groups of nematodes 2) Recognize common nematode diseases of plants, their symptoms, importance, and management. 3) Develop control methods for pest species. 4) Implement basic laboratory techniques for extraction, identification, culturing, and manipulation of common nematode species. 5) Implement nematode threshold levels for different crop species. 6) Plant-parasitic nematodes occur in soil Surveying, collecting, fixing and mounting nematodes **Practical:** Methods of survey – sampling methods, collection of soil and plant samples; Extraction of nematodes from soil and plant tissues following combined Cobb's decanting – sieving and Baermann funnel technique, counting and estimation of plant parasitic nematodes; Preparation of temporary and permanent mounts; Study and identification of most important plant parasitic nematodes with special reference to their characteristics and

		symptomatology–Meloidogyne, Pratylenchus; Heterodera, Ditylenchus, Globodera, Tylenchulus, Xiphinema, Radopholus, Rotylenchulus, and Helicotylenchus. Experimental techniques used in pathogenicity studies with root-knot nematode. Note: Students should submit pressed, well-mounted diseased specimens (at least 5) during the semester-end practical examination
PC11	Insect-vectors of plant pathogens & their relationships	**Objectives:** To teach the students about the different groups of insects that are vectors of plant pathogens, vector-plant pathogen interaction, and management of vectors for controlling diseases. **Theory:** History of developments in the area of insects as vectors of plant pathogens. Important insect vectors and their characteristics; mouthparts and feeding processes of important insect vectors. Efficiency of transmission. Transmission of plant viruses and fungal pathogens. Relation between viruses and their vectors. Transmission of plant viruses by aphids, whiteflies, mealy bugs and thrips. Transmission of mycoplasma and bacteria by leaf hoppers and plant hoppers. Transmission of plant viruses by psyllids, beetles and mites. Epidemiology and management of insect-transmitted diseases through vector management. **Practical:** Identification of common vectors of plant pathogens- aphids, leafhoppers, whiteflies, thrips, beetles, culturing and handling of vectors; demonstration of virus transmission through vectors- aphids, leafhoppers and whiteflies
PC12	Seed health testing methods	**Objective** To acquaint with seed-borne diseases, their nature, detection, transmission, epidemiology, impacts/losses and management. **Theory** History and economic importance of seed pathology in seed industry, plant quarantine and SPS under WTO. Morphology and anatomy of typical monocotyledonous and dicotyledonous infected seeds. Recent advances in the establishment and subsequent cause of disease development in seeds and seedlings. Localization and mechanism of seed transmission concerning seed infection, seed-to-plant transmission of pathogens. Seed certification and tolerance limits, types of losses caused by seed-borne diseases in true

		and vegetative propagated seeds, and evolutionary adaptations of crop plants to defend against seed invasion by seed-borne pathogens. Epidemiological factors influencing the transmission of seed-borne diseases, forecasting of epidemics through seed-borne infection. Production of toxic metabolites affecting seed quality and its impact on human, animal and plant health, management of seed-borne pathogen/diseases and procedure for healthy seed production, seed health testing, and methods for detecting microorganisms. **Practical** Conventional and advanced techniques in the detection and identification of seed-borne fungi, bacteria and viruses. Relationship between seed-borne infection and expression of the disease in the field.
PC13	Greenhouse diseases and pest management.	This course focuses on pest and disease management in vegetables, greenhouse crops and flowers. **Objectives:** 1. Develop a working knowledge of the identification, biology, economic impact, sampling and management methods for the major diseases or pests and beneficial arthropod species found in greenhouse crop production. 2. Become knowledgeable of the laws and regulations governing worker protection and safety in greenhouse settings. Theory: Introduction and general description of the greenhouse industry. Sanitation - greenhouse clean-up methods. Crop monitoring techniques from seedlings to fruits through ongoing surveillance to detect the presence of a pest or disease at the very early stages of development of the disease or pest population. Cultural control methods against pests and diseases. Resistant cultivars or tolerance to diseases. Biological control uses beneficial organisms, primarily predators and parasites, to control pest populations below economically important levels. Pesticides application used and regulations as a component of an integrated pest management program. Common fungal diseases of greenhouse crops Common bacterial diseases of greenhouse crops Common viral diseases of greenhouse crops

PC14	Weed biology and control	**Objective:** Weed Biology, Ecology Management aims to familiarize students with fundamental aspects of weed biology and ecology that affect population and community dynamics and guide management principles. **Theory** Weed Identification and Life Cycles Biennial and Perennial Weeds Introduction to Weed Community Ecology WEED MANAGEMENT Integrated Weed Management Interfaces pesticides; absorption and transport through soil and foliage. Weed management in major field and horticultural crops, shift of weed flora in cropping systems, Problematic weeds and their control. **Practical:** Identification of weeds, Survey of weeds in crop fields and other habitats, Preparation of herbarium of weeds, Calculation of weed control efficiency and weed index, Herbicide label information, Computation of herbicide doses, Study of herbicide application equipment and calibration, Demonstration of methods of herbicide application, Preparation of listing of commonly available herbicides, Study of phytotoxicity symptoms of herbicides in different crops, Biology of Nut sedge, Bermuda grass, Parthenium and Celosia, Economics of weed control practices, Tours and visits of problem areas.
PC15	Principles of Organic and Sustainable Crop Production	**Objective**: This course encompasses biological, social, and economic components of organic farming systems and sustainable agriculture. This course discusses organic agriculture policy and regulation and emphasizes principles, concepts, cultural practices, techniques, and marketing of organic crop production and sustainable farming systems. **Theory:** • Analyze how a farm functions as an agroecosystem. • Evaluate the sustainability of farming operations including organic production. • The regulatory procedures and requirements of certified organic production. • Soil and nutrient management plans for organic and sustainable crop production that optimize nutrient cycling and minimize environmental degradation.

		• Pest management plans that emphasize a proactive systems approach and minimize curative control measures. • Holistic management of farming system establishment and development that targets long-term sustainability. **Practical** A case study visits for a commercial farm as an agroecosystem. Study soil fertility and quality in sustainable and organic farming Case studies of management practices used for organic production including the G.A.P. audit system.
PC16	Postharvest, storage diseases and pests	**Objective** To profound detailed scientific knowledge and understanding of the (bio)chemical processes in biological raw materials during postharvest storage and their transformation into food products. Has profound and detailed scientific knowledge and understanding of ecology, physiology, detection, use and combat microorganisms in food systems. **Theory** 1. Introduction Post-harvest losses From pest and disease control to pest and disease management 2. Animal pests, small mammals, rodents Ecology, habitat Control methods: physical/chemical 3. Fungi and bacteria Classification: description of important groups of postharvest fungi and bacteria Diagnostical methods Ecological growth conditions: O_2/CO_2/scrubbed air systems, temperature, humidity requirements Control methods: preventive and curative; cultural, biotechnological and chemical Possibilities of modified atmosphere in controlling fungi and bacteria Case study: CO app. 4. Applied entomology Mites and insects in stored products Biology: mites, insects: special attention to orders of Coleoptera/ Lepidoptera/ Diptera Control methods 5. Conclusion: Postharvest integrated pest and disease management **Practical**

		Study of the structure of fruits, vegetables and cut flowers concerning post-harvest physiology; Estimation of PLW, TSS, titratable acidity, ascorbic acid; Post-harvest treatment of horticulture produce Observations of disease symptoms, identification of causal organisms and host-parasite relationship of important diseases. Examination of scrapings and cultures of important pathogens of fruits, plantation, medicinal and aromatic crops. Field visit for acquaintance with diseases. Study of symptoms of damage, collection, identification, preservation, assessment of damage and population of important insect – pests affecting fruits, plantation, medicinal and aromatic crops in field and storage.
PC17	Herbarium self-training	**Objectives:** Studying different living organisms. Storing of specimens for future studies. Provides aid in systematic studies. **Theory** Plant disease symptoms herbarium Technique; Collection, Drying, Poisoning, Mounting, Stitching and Labelling, Deposition. Functions of Herbarium, Storing specimens, The key pieces of information to record, Writing a description, Photography, Methods of microbial preservation Cryopreservation and lyophilization methods of bacteria cells, virus and fungi spore. Making a spore print> Uses of Herbarium and culture collections and associated label data as: - reference material for accurate identification. - basic biological material for taxonomists and other researchers to study. - the core material upon which the application of scientific names is based (Type specimens). - a permanent record of a species at a particular time and location. - reliable distribution maps and habitat information. - vouchers for scientific research, including taxonomic, ecological and biochemical analyses and DNA sequences. - information for the production of fungal inventories for your local area. - information for monitoring changes in composition and behaviour over time.

		- reference material for recognition of those fungi species which are most appropriate for use in localized revegetation programs. - data for monitoring programs which document the introduction and spread of invasive alien species. **Practical** Students with an interest in fungi are encouraged to submit good-quality collections accompanied by useful field notes, descriptions, and photographs. Submitted specimens are assessed according to the amount and condition of material and the quality of associated notes and photographs.
PC18	Pesticides action and application techniques	**Objectives:** To study the pesticides - their application and mode of action in plants Course Contents: **Theory** Introduction and history of pesticides; major groups of pesticides and their classification; Formulation and mode of action; Residues, resistance and phytotoxicity problems of pesticides (fungicides, bactericides, and nematicides, etc.); Equipment and different methods of application; FAO code of conduct for pesticide use and handling; Pesticide regulation in Egypt; Major hazards of pesticides and their safety measures. **Practical** Demonstration of different groups of pesticides used for control of plant diseases; Preparation and formulation; Use of various equipment and their calibration; In vitro comparison of systemic and protectant pesticides; Visits of pesticides testing labs and warehouses; Protective measures and first aid.
PC19	Quarantine and biosecurity	**Objective** To acquaint the learners with the principles and the role of Plant Quarantine in containment of pests and diseases, plant quarantine regulations and set-up. **Theory** Definition of pest, pesticides and transgenics as per Govt. notification; relative importance; quarantine - domestic and international. Quarantine restrictions in the movement of agricultural produce, seeds and planting material; case histories of exotic pests/diseases and their status. Plant protection organization in Egypt. Acts related to registration of pesticides and transgenics. History of

		quarantine legislations, PQ Order 2003. Environmental Acts, Industrial registration; Import and Export of bio-control agents. Identification of pest/disease-free areas; contamination of food with toxins, microorganisms and their elimination; Symptomatic diagnosis and other techniques to detect pest/pathogen infestations; VHT and other safer techniques of disinfestation/salvaging of infected material. WTO regulations; non-tariff barriers; Pest risk analysis. Sanitary and Phytosanitary measures
PC20	Techniques and Protocols of Plant Pathology	**Objectives:** To acquaint students with different plant pathological research techniques Course Contents: **Theory** Problem identification; hypothesizing; defining objectives; Collection, handling, transport, processing and preservation of disease specimens; Protocols and procedures used for the isolation, identification, purification, multiplication and preservation of plant pathogens; Demonstration of Koch‘s postulates; Microscopic, histo-pathological, serological and molecular techniques; Experimental layout, data collection, statistical analysis interpretation and report writing. **Practical** Methods of collection and preservation of plant disease specimens; Media Preparation; Isolation and identification of different plant pathogens; preparation of temporary and permanent slides; microphotography and micrometry of plant pathogens; Maintenance and preservation of cultures; Histo-pathological, serological and molecular methods; Experimental layout, data collection, statistical analysis interpretation.
PC21	Introductory molecular plant pathology	**Objectives:** To acquaint the students with basic concepts and techniques of molecular plant pathology Course Contents: **Theory** Introduction to molecular techniques and their application; Molecular mechanisms of pathogenesis with a focus on plant diseases; Molecular biology of host-parasite interaction and biochemical mechanisms of pathogenesis; Molecular approaches to control pathogens. **Practical**

		Methods in molecular plant pathology including the use of molecular approaches to investigate plant diseases; Familiarization with common molecular techniques used in plant pathology including DNA/ RNA isolation, hybridization, sequence analysis, various PCR reactions, library construction and screening, protein isolation and plant transformation.

6. PROGRAM ADMISSION REQUIREMENTS

The program accepts candidates with a Bachelor's degree in Agriculture with a minimum pass grade. The minimum number of students with passing grades is controlled only by the demand of students to join the program. The priority is given to students from plant protection undergraduate BSc programs with higher grades of good, very good and excellent.

Registration for the program opens two times/year, according to the internal bylaws for postgraduate studies of the Faculty of Agriculture, Mansoura University.

7. REGULATIONS OF PROGRAM PROGRESSION AND COMPLETION

- According to the faculty by-laws

First semester: Passing level 60% of total marks of the exam

At least 50% passing level of the total written exam marks

Second part: Passing level 60% of total marks of the exam

Thesis: Passing the thesis defence is a prerequisite for getting a Diploma Degree.

8. METHODS OF STUDENT ASSESSMENT

Assessments are course-oriented.

The general outline for measuring the intended learning outcomes in each course and their relative weights are as follows:

	Student Assessment			
Methods	Intended Learning Outcomes Covered			
	KU*	IS	PPS	GTS
Written exams	√	√		

Practical exams	√	√	√	√
Oral exams	√	√		√
Student Activities		√	√	√
Thesis	√	√		√

KU = Knowledge and understanding
IS = Intellectual skills
PPS = Professional and Practical Skills
GTS = General and Transferable Skills

Weight of Student Assessment Methods

Exams and activities	Weight (%)
Semester work	15
Student Activities	10
Final written exam	50
Final Practical exam	20
Final oral exam	5
Total	100

9. PROGRAM EVALUATION

Responsibility	Method	Sample
Quality Assurance Unit	Questionnaires Meetings	final year students
Quality Assurance Unit	Questionnaires Meetings	A representative sample of graduates
Quality Assurance Unit	Questionnaires Meetings	A representative sample of stakeholders
External evaluators	Yearly reports	Two expert staff members from outside the university.
Internal auditing	Yearly reports	The faculty members of the committee of internal auditing.
Curriculum Committee	Workshops	Members of the committee (vice dean of student affairs, head of departments, and representative staff of each course)

Program Coordinator	**Signature**	**Date**
Prof. Dr./		

ANNEXES

الملاحق :

ملحق ١: program Academic standard المعايير الاكاديمية للبرنامج

ملحق ٢:المعايير القياسية العامة للدراسات العليا الصادرة عن الهيئة.

ملحق ٣: مصفوفة المعايير الأكاديمية للبرنامج مع المعايير القياسية للدراسات العليا الصادرة عن الهيئة.

ملحق ٤: مصفوفة البرنامج مع المعايير الأكاديمية للبرنامج.

ملحق ٥: مصفوفة اهداف ونواتج تعلم البرنامج

ملحق ٦: مصفوفة المقررات مع نواتج تعلم البرنامج Program-Courses ILOs Matrix

ملحق ٧: توصيف المقررات

Program Matrix

First level/ first semester

	Course code	Course title	Intended Learning Outcomes			
			K & U	I. S.	P & P S	G & P S
1		1	1	1	1	1
2		2				
3						
4						
5						