Form: Course Syllabus		
	Form Number	EXC-01-02-02A
	Issue Number and Date	2963/2022/24/3/2 5/12/2022
	Number and Date of Revision or Modification	2/(10/12/2023)
	Deans Council Approval Decision Number	50/2023
	The Date of the Deans Council Approval Decision	26/12/2023
	Number of Pages	06

1.	**Course Title**	**Ecology of Insect Population**
2.	**Course Number**	(606953)
3.	**Credit Hours (Theory, Practical)**	3
	Contact Hours (Theory, Practical)	3
4.	**Prerequisites/ Corequisites**	
5.	**Program Title**	PhD in Plant Protection
6.	**Program Code**	
7.	**School/ Center**	The University of Jordan
8.	**Department**	Agriculture
9.	**Course Level**	Plant Protection
10.	**Year of Study and Semester (s)**	Master
11.	**Other Department(s) Involved in Teaching the Course**	/
12.	**Main Learning Language**	English
13.	**Learning Types**	☐Face to face learning ☐Blended ☒ Fully online
14.	**Online Platforms(s)**	☒ Moodle ☒ Microsoft Teams
15.	**Issuing Date**	
16.	**Revision Date**	

17. Course Coordinator:

Name: Prof. Salah Araj	Contact hours:
Office number:	Phone number: +962 6 5355000 Ext. 22520
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18. Other Instructors:

Name:
Office number:
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Contact hours:
Name:
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19. Course Description:

This course deals with sampling methods to measure changes in the abundance and distribution of insect populations, use of different strategies and developing methods for predicting insects outbreaks, as well as analytical models and systems to assess the losses in the output and the efficiency of different control methods.

20. Program Intended Learning Outcomes: (To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

1. Implement the advanced concepts and processes in various disciplines in Plant Protection.
2. Extract information and findings of science from literature in Plant Protection.
3. Plan, conduct and analyze the results of scientific research.
4. Communicate effectively with his supervisors and colleagues orally and in writing.
5. Employ expertise and skills gained in the development production, research, and extension on different levels in the public and private sectors in Jordan and worldwide.
6. Engage efficiently in a scientific team work.
7. Publish research in the field of Plant Protection in peer-reviewed scientific journals.
8. Commit to ethics and compliance responsibilities for being an agricultural engineer, especially with regard to agricultural sector, environment and society.

21. Course Intended Learning Outcomes: (Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

1. Develop a knowledge and understanding of ecological principles at the individual (physiological & behavioral), and population levels.
2. Gain insights into accessible ways in which population ecology research can be conducted.
3. Awareness of students with the factors related to insects distribution and what factors affect their abundance
4. Develop a knowledge and understanding of the mechanisms that mediate interactions of insects with their biotic and abiotic environments
5. Think ingenuity how to control insect pests with minimum disturbance to the environment.

22. The matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program:

~~Program ILOs~~ / ~~Course ILOs~~	ILO (1)	ILO (2)	ILO (3)	ILO (4)	ILO (5)
1	√				
2			√		
3		√			
4	√				
5				√	
6		√			
7					√
8			√		

23. Topic Outline and Schedule:

Week	Lecture	Topic	ILO/s Linked to the Topic	Learning Types (Face to Face/ Blended/ Fully Online)	Platform Used	Synchronous / Asynchronous Lecturing	Evaluation Methods	Learning Resources
1	1.1	Introduction • Definition • Ecology as a science • Nutrients cycles • Feeding relationships		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	Ch 20 Begon et al (Denno et al. 1995, Denno et al. 2000)
	1.2	Life cycles and vital rates • Construct a model of intergeneration change • Develop a sampling program and estimate number of individuals passing through each stage in life cycle		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Gotelli 2001): Life Tables Ch 3
	1.3	• Construct a life table, calculate and interpret l_x, m_x, r_m, R_o, λ • Compare k-factor analysis and Life Table Response Experiments (LTREs) as ways to discover factors causing population change • Distinguish major mortality factors,		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Gotelli 2001): Life Tables C

		key factors, density-regulating factors						
	2.1	• Distinguish direct density dependence (over-compensating, perfectly compensating, or under-compensating), inverse density dependence, delayed density dependence, density independence • Critically evaluate methods for assessing role of density-dependent and density-independent factors in population dynamics		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Gotelli 2001): Life Tables Ch 3
2	2.2	Vitals rates and population dynamics • Need to perturb system. Most direct way of detecting population regulation • Regulation in predator-prey interaction – manipulative experiment involving enhanced, diminished, and control prey populations compounded with enhanced, diminished, and control predator populations		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Caswell 2001): Matrix model Ch 2,3
	2.3	Food Webs • Agricultural intensification during the past decades has been identified as the major cause of the loss of biodiversity		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	Ch 20 Begon et al Albrecht et al 2007
3	3.1	• In simplified, intensively managed ecosystems, biotic interactions can become disrupted as a consequence of		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	Ch 20 Begon et al Albrecht et al 2007

		biodiversity loss • Ecosystem services such as natural pest control and pollination of crops will be at risk						
	3.2	• How does the loss of biodiversity affect the functioning of whole food webs in human-influenced ecosystems? • How effective are 'agri-environment schemes' (AES) for mitigation, i.e. restoring biological diversity in part of the agricultural landscape?		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	Ch 20 Begon et al Albrecht et al 2007
	3.3	•Root-feeding Insects •The nature of the root resource •Effects of plants on insects –Nutritional ecology of root-feeders		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Root and Cappuccino 1992): goldenrod insects article; (Schoonhoven et al. 2005) Ch 2-4
4	4.1	•Effects of insects on plants –Ecophysiology of photosynthesis, water and nutrient use –Source-sink dynamics, resource allocation patterns –Life histories (e.g. annual, biennial, perennial) –Population and Community Dynamics		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Root and Cappuccino 1992): goldenrod insects article; (Schoonhoven et al. 2005) Ch 2-4

	4.2	•Well-studied cases –Ecological studies - Periodic cicadas on trees –Agricultural systems •corn rootworm (Diabrotica spp.) feeding on maize roots •root fly (Delia spp.) feeding on Brassica crops		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Root and Cappuccino 1992): goldenrod insects article; (Schoonhoven et al. 2005) Ch 2-4
	4.3	•Sitona weevils feeding on legumes –Biological control systems •Flea beetle Longitarsus on ragwort •Root weevil Hylobius on purple loosestrife		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Root and Cappuccino 1992): goldenrod insects article; (Schoonhoven et al. 2005) Ch 2-4
5	5.1	Herbivore-Plant Interactions 2: Seed-Slayers, Gall-Formers •The nature of seed slaying –Characteristics of seeds –Taxa engaged in attack seeds •Species packing among fig bugs •Impact of seed slayers –On plant communities –On plant populations		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Nathan and Casagrandi 2004, Rose et al. 2005): seed slayers
	5.2	The nature of seed slaying –Characteristics of seeds		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Nathan and Casagrandi 2004, Rose et al. 2005): seed slay

		–Taxa engaged in attack seeds						
	5.3	. Species packing among fig bugs •Impact of seed slayers –On plant communities –On plant populations		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Nathan and Casagrandi 2004, Rose et al. 2005): seed slay
6	6.1	Competition and Mutualism •Define and classify mutualisms •Review social and political factors underlying history of field		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Denno et al. 1995, Denno et al. 2000): competition article & review (Pierce et al. 2002): mutualism review
	6.2	•Difficulties mutualism presents to ecologists •Follow a single research program by Pierce		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Denno et al. 1995, Denno et al. 2000): competition article & review (Pierce et al. 2002): mutualism review
	6.3	•Strengths and weaknesses of (1) story telling in science, (2) focusing on "model systems" •Competition and Coexistence		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Denno et al. 1995, Denno et al. 2000): competition article & review (Pierce et al. 2002): mutualism review
7	7.1	•Character displacement •Resource partitioning •Exploitation vs Interference •Coevolution of competitors		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Denno et al. 1995, Denno et al. 2000): competition article & review

		– interaction a prerequisite •Null hypothesis: unsaturated, non-interactive communities						(Pierce et al. 2002): mutualism review
	7.2	Coevolution of competitors – interaction a prerequisite •Null hypothesis: unsaturated, non-interactive communities		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Denno et al. 1995, Denno et al. 2000): competition article & review (Pierce et al. 2002): mutualism review
	7.3	Predator-Prey Interactions		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Snyder and Ives 2001): predator article
8	8.1	Why is predation important? •Who are the predators (taxa, functional groups)?		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Snyder and Ives 2001): predator article
	8.2	•How do predators differ from parasitoids? •The "lab view" of predator-prey interactions		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Snyder and Ives 2001): predator article
	8.3	•The "field view" of predator-prey •Appropriate ways to model the functional response		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Snyder and Ives 2001): predator article
9	9.1	. Parasitoid-Host Interactions •Parasitoid Natural History		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	Hassell 2000, Vet 2001): parasitoids
	9.2	Importance of parasitoids in population		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	Hassell 2000, Vet 2001):

		dynamics of their hosts •Field studies of the role of parasitism under natural conditions						parasitoids
	9.3	Pitfalls in measuring parasitism rates •Key components of parasitoid-host dynamics		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	Hassell 2000, Vet 2001): parasitoids
10	10.1	•Aphytis and Red Scale A test of parasitoid-host theory Parasitoids of sawflies studied by Price		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	Hassell 2000, Vet 2001): parasitoids
	10.2	Pathogen-host Interactions •The majority of insect pathogens are microparasites although many species are also attacked by macroparasites, including nematodes, nematomorphs, and mites		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Dwyer et al. 2005): pathogens article
	10.3	Microparasites include viruses, bacteria, fungi, and protozoans •Insects do not possess acquired immunity, their		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Dwyer et al. 2005): pathogens article

		risk to succumbing to a pathogen is the same at a second infection as it was at the first						
11	11.1	. Pathogens are used in biological control of insect pests •		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Dwyer et al. 2005): pathogens article
	11.2	Entomopathogen-insect interactions can be described using simple disease models (Anderson and May 1981; Briggs et al. 1995; Dwyer et al. 2000, 2004; Dusholff and Dwyer 2001; McCallum et al. 2001)		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Dwyer et al. 2005): pathogens article
	11.3	What are the relevant details that must be included? How do we weigh the costs and benefits of increasing model complexity? How can we get beyond personal preferences of the modeler?		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Dwyer et al. 2005): pathogens article
12	12.1	Biological		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Luck 1990, Waage and Mills 1992) :

		Control of Arthropods •Manipulating natural enemies for pest control by introducing, augmenting, or conserving control organisms						biocontrol insects reviews
	12.2	•Essentially empirical with ample scope for improvement through research on the ecology, of interactions between natural enemies and pests		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Luck 1990, Waage and Mills 1992) : biocontrol insects revie
	12.3	. • Draw theory and practice together, indicating where improvements in understanding may contribute to improvements in management		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	(Luck 1990, Waage and Mills 1992) : biocontrol insects revie
13	13.1	Insect Conservation and Biodiversity •Insect Diversity		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	Samways 2007): insect conservation review
	13.2	•Estimating Biodiversity		Fully Online	MS Teams	Synchronous	Homework, Quiz,	Samways 2007):

		•How global warming threatens conservation Ecosystem Services					Presentations	insect conservation review
	13.3	•Estimating Biodiversity •How global warming threatens conservation Ecosystem Services		Fully Online	MS Teams	Synchronous	Homework, Quiz, Presentations	Samways 2007): insect conservation review

24. Evaluation Methods:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	ILO/s Linked to the Evaluation activity	Period (Week)	Platform
First midterm exam	30	According to lecturing schedule	1 to 5	To be agreed upon	Face to Face
Presentations	30	According to lecturing schedule	1 to 5	To be agreed upon	MS Teams
Final Exam	40	According to lecturing schedule	1 to 5	To be agreed upon	Face to Face

25. Course Requirements:

Students should have a computer, internet connection, webcam, account on a specific software/platform MS Teams)

26. Course Policies:

A- Attendance policies:

B- Absences from exams and submitting assignments on time:

C- Health and safety procedures:

D- Honesty policy regarding cheating, plagiarism, misbehavior:

E- Grading policy:

F- Available university services that support achievement in the course:

27. References:

A- Required book(s), assigned reading and audio-visuals:

Sharaf, N. S. 2012. Insect Ecology: Individuals, Populations, Communities and Ecosystems. .Jordan University Publications. Amman. P 611

:References

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Luck, R. F. 1990. Evaluation of natural enemies for biological control: a behavioral .199-approach. Trends in Ecology and Evolution 5:196

dispersal, Nathan, R., and R. Casagrandi. 2004. A simple mechanistic model of seed -Connell and beyond. Journal of Ecology 92:733-predation and plant establishment: Janzen .746

Parmesan, C. 2006. Ecological and Evolutionary Responses to Recent Climate Change. .669-Annual Review of Ecology, Evolution, and Systematics 37:637

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28. Additional information:

Name of the Instructor or the Course Coordinator:	Signature:	Date:
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Name of the Head of Quality Assurance Committee/ Department	Signature:	Date:
…….	……...……	……..……
Name of the Head of Department	Signature:	Date:
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Name of the Head of Quality Assurance Committee/ School or Center	Signature:	Date:
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Name of the Dean or the Director	Signature:	Date:
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