



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

1.	<b>Course Title</b>	<b>Insect Behavior</b>
2.	<b>Course Number</b>	(606714)
3.	<b>Credit Hours (Theory, Practical)</b>	3
	<b>Contact Hours (Theory, Practical)</b>	3
4.	<b>Prerequisites/Corequisites</b>	
5.	<b>Program Title</b>	Master in Plant Protection
6.	<b>Program Code</b>	
7.	<b>School/ Center</b>	The University of Jordan
8.	<b>Department</b>	Agriculture
9.	<b>Course Level</b>	Plant Protection
10.	<b>Year of Study and Semester (s)</b>	Master
11.	<b>Other Department(s) Involved in Teaching the Course</b>	/
12.	<b>Main Learning Language</b>	English
13.	<b>Learning Types</b>	<input type="checkbox"/> Face to face learning <input type="checkbox"/> Blended <input checked="" type="checkbox"/> Fully online
14.	<b>Online Platforms(s)</b>	<input checked="" type="checkbox"/> Moodle <input checked="" type="checkbox"/> Microsoft Teams
15.	<b>Issuing Date</b>	
16.	<b>Revision Date</b>	

**17. Course Coordinator:**

Name: Prof. Salah Araj	Contact hours:
Office number:	Phone number: +962 6 5355000 Ext. 22520
Email: s.alaraj@ju.edu.jo	



### 18. Other Instructors:

Name:

Office number:

Phone number:

Email:

Contact hours:

Name:

Office number:

Phone number:

Email:

Contact hours:

### 19. Course Description:

Insect behavior is a current approach about how and why insects do the things they do, and the biological significance of their behavior in the context of nature. The main objective of this graduate-level course is to introduce students to the breadth of behaviors found in insects. Understanding the concepts of insect behavior is just as vital to the understanding of the success of insects as is the understanding of their physical structure.

### 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. Understand how a number of major behavioral systems function.
2. Gain insights into accessible ways in which behavioral research can be conducted.
3. Awareness of students with the key issues related to insects behavior
4. Develop a knowledge and understanding of the behaviors 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	ILO (1)	ILO (2)	ILO (3)	ILO (4)	ILO (5)
Course ILOs					
1	×				
2			×		
3			×		
4					×
5	×				
6		×			
7			×		
8				×	



### 23. Topic Outline and Schedule:

Week	Lecture	Topic	ILO/s Linked to the Topic	Learning Times
1		<b>1.The History and Scope of Insect Behavior</b>		
	1.1	<ul style="list-style-type: none"> <li>1.1.1 What Is Insect Behavior?</li> <li>1.1.2 Insect Behavior's Biological Context</li> <li>1.1.3 Historical Foundations</li> <li>1.1.4 The Watershed Years</li> </ul>		Full
	1.2	<ul style="list-style-type: none"> <li>1.1.5 The Rise of Ethology</li> <li>1.2 Conceptual Frameworks</li> <li>1.2.1 Evolution by Natural Selection</li> <li>1.2.2 Genetics and Behavior . 1.2.3 The Comparative Approach 1.2.4 Conceptual Pitfalls</li> <li>1.3 Phylogeny's Role .</li> </ul>		Full
	1.3	<ul style="list-style-type: none"> <li>1.3.1 Microevolution and Macroevolution</li> <li>1.3.2 Phylogenetic Systematics and Cladistics</li> <li>1.3.3 Behavior and Speciation . . .</li> <li>1.4 Questions and Perspectives . . 1.4.1 Proximate and Ultimate Analyses</li> </ul> <p>1.4.2 Types of Approach</p>		Full
2		<b>2 Programming and Integrating Behavior .</b>		
	2.1	<ul style="list-style-type: none"> <li>2.2 Nerve-Based Coordination . . . .</li> <li>2.2.1 The Insect Nervous System . .</li> <li>2.2.2 Simple Reflexes and Repeated Motor Patterns</li> <li>2.2.3 Ethological Explanations . . . .</li> </ul>		Full
	2.2	<ul style="list-style-type: none"> <li>2.3 Life in a Stimulus-RichWorld .</li> <li>2.3.1 Sensory Tuning and Filtering</li> <li>2.3.2 Memory and Learning . . . . .</li> </ul>		Full
	2.3	<ul style="list-style-type: none"> <li>2.3.3 Insect Intelligence . . . . .</li> <li>2.4 Hormone-Based Coordination .</li> <li>2.4.1 Clocks and Reiterative Rhythms .</li> </ul> <p>2.4.2 Gated Rhythms</p>		Full



3	3.1	<b>3 Spatial Adjustment</b> <ul style="list-style-type: none"> <li>3.1 Introduction . .</li> <li>3.2 Locomotion .</li> <li>3.2.1 Terrestrial and Aquatic Locomotion . .</li> <li>3.2.2 Aerial Locomotion . . .</li> <li>3.3 Orientation . . .</li> </ul>		Full
	3.2	<ul style="list-style-type: none"> <li>3.3.1 Locomotory Responses . . . . .</li> <li>3.3.2 Posture and Position . . . . .</li> <li>3.3.3 Orientation to Radiant Energy</li> <li>3.3.4 Magnetic Field Orientation . . 3.3.5 Orientation to the Evidence of Others' Presence . .</li> </ul>		Full
	3.3	<ul style="list-style-type: none"> <li>3.4 Thermoregulation . . . . . 3.4.1 Dormancy and Thermo tolerance . . . . .</li> <li>3.4.2 Regulation of Heat Gain . . . . .</li> <li>3.4.3 Heat Production . . . . . 3.5 Migration . .</li> <li>3.5.1 Seasonal Migration . .</li> <li>3.5.2 Migration Under Ephemeral Conditions . . . . .</li> <li>3.5.3 Dispersal and Navigation</li> </ul>		Full
4	4.1	<b>4 Foraging and Feeding</b> <ul style="list-style-type: none"> <li>4.1 Introduction . . . . .</li> <li>4.1.1 Food Recognition and Acceptance . . . . .</li> <li>4.1.2 Regulation of Feeding . . . . .</li> <li>4.2 Foraging Strategies . . . . .</li> <li>4.2.1 Herbivory . . . . .</li> <li>4.2.2 Active Search . . . . .</li> </ul>		Full
	4.2	<ul style="list-style-type: none"> <li>4.2.3 Trapping and Ambush . . . . .</li> <li>4.2.4 Parasites and Parasitoids . . . . .</li> <li>4.2.5 Theft and Kleptoparasitism . .</li> <li>4.2.6 Insect Agriculture . . . . .</li> <li>4.2.7 Nest Symbionts: Becoming a House Pet . . . . .</li> <li>4.3 Coevolution and the Arms Race</li> <li>4.3.1 Attack, Defense, and Counterattack . . . . .</li> </ul>		Full
	4.3	<ul style="list-style-type: none"> <li>4.3.2 Employing Mercenaries for Protection . .</li> <li>4.3.3 The Tommy Tucker Syndrome: Food in Return</li> </ul>		Full



		<ul style="list-style-type: none"> <li>For Services . . .</li> <li>4.4 Feeding as a Communal Activity . . .</li> <li>4.4.1 Simple Groups and Feeding Aggregations . . . .</li> <li>4.4.2 Social Feeding Behaviors</li> </ul>		
5	5.1	<b>5 Defense: A Survival Catalogue</b> <ul style="list-style-type: none"> <li>5.1 Introduction . . . . .</li> <li>5.2 Defense Messages . . . . .</li> <li>5.3 Passive Messages . . . . .</li> <li>5.3.1 Crypsis: 'I'm Not Here!' . . . . .</li> </ul>		Full
	5.2	<ul style="list-style-type: none"> <li>5.3.2 Systemic Defenses: 'I'm Noxious!'</li> <li>5.3.3 Mimicry: 'I'm Someone Else!' . . .</li> <li>5.3.4 Aposematic Defenses: 'I'm Dangerous!' . .</li> <li>5.4 Active Messages . . . . .</li> </ul>		Full
	5.3	<ul style="list-style-type: none"> <li>5.4.1 Attack: 'I'm Turning the Tables!'</li> <li>5.4.2 Startle: 'I'm Not What You Thought!'</li> <li>5.4.3 Group Actions: 'We're in This Together!'</li> </ul>		Full
6	6.1	<b>6 Chemical Communication . . . .</b> <ul style="list-style-type: none"> <li>6.1 Introduction . . . . .</li> <li>6.2 Mechanisms of Chemical Communication . . . . .</li> <li>6.2.1 Odor Creation and Reception 6.2.2 Communication Through Chemistry . . .</li> </ul>		Full
	6.2	<ul style="list-style-type: none"> <li>6.3 The Functions of Chemical Communication . . . .</li> <li>6.3.1 Finding and Choosing Mates .</li> <li>6.3.2 Assembly, Aggregation, and Recruitment . . . .</li> </ul>		Full
	6.3	<ul style="list-style-type: none"> <li>6.3.3 Alarm and Alert . . .</li> <li>6.3.4 Host-Marking . . . . .</li> <li>6.3.5 Recognition . . . . .</li> <li>6.4 The Information Content of Pheromones . . . . .</li> </ul>		Full
7	7.1	<ul style="list-style-type: none"> <li>6.4.1 Physiological Adjustments: The <i>Q/K Ratio</i> . . . . .</li> <li>6.4.2 Pheromones as Language: Syntax and Lexicon . . . .</li> <li>6.4.3 Exploitation and Code-Breaking . . . . .</li> </ul>		Full



	7.2	<ul style="list-style-type: none"> <li>6.4.4 The Chemical Channel and Other Signal Modes</li> </ul> <p>6.5 Chemical Communication and Insect Control . .</p>		Full
	7.3	<p><b>7 Visual Communication</b></p> <p>7.1 Introduction. . . . .</p> <p>7.2 Bioluminescence . . . . .</p> <ul style="list-style-type: none"> <li>7.2.1 The Physiology of Insect Light Production .</li> <li>7.2.2 Bioluminescence as a Communication Method . .</li> </ul>		Full
8	8.1	<ul style="list-style-type: none"> <li>7.3 Light Reception . . . . .</li> <li>7.3.1 Receptors and Form Perception . . . .</li> <li>7.3.2 Visual Acuity and Flicker Vision . .</li> </ul>		Full
	8.2	<ul style="list-style-type: none"> <li>7.3.3 Polarized Light Perception . .</li> <li>7.3.4 Color Vision . . . . .</li> </ul> <p>7.4 Functions of Visual Communication .</p>		Full
	8.3	<ul style="list-style-type: none"> <li>7.4.1 Aggregation and Dispersion .</li> <li>7.4.2 Alarm . . . .</li> <li>7.4.3 Sexual Signals . . . . .</li> <li>7.4.4 Multimodal Signaling . . . . .</li> </ul>		Full
9	9.1	<p><b>8 Mechano communication . . . . .</b></p> <ul style="list-style-type: none"> <li>8.1 Introduction . . . . .</li> <li>8.2 Producing and Sending Signals</li> <li>8.2.1 Sound Creation . . . . .</li> </ul>		Full
	9.2	<ul style="list-style-type: none"> <li>8.2.2 Distance and Substrate . . . . .</li> <li>8.3 Receiving Signals . . . . .</li> <li>8.3.1 Vibration . . . . .</li> </ul>		Full
	9.3	<ul style="list-style-type: none"> <li>8.3.2 Hearing . . . . .</li> <li>8.3.3 Communication by Touch . . .</li> <li>8.4 The Acoustic Channel . . . . .</li> </ul>		Full



10	10.1	<ul style="list-style-type: none"> <li>8.4.1 Parameters of Insect Song . . .</li> <li>8.4.2 Song Synchronies . . . . .</li> <li>8.4.3 Active Acoustics . . . . .</li> </ul>		Full
	10.2	<ul style="list-style-type: none"> <li>8.4.4 Sound as a Communication Method . . . .</li> <li>8.5 Functions of Insect Communicative Sounds . . . . .</li> </ul>		Full
	10.3	<ul style="list-style-type: none"> <li>8.5.1 Protest, Alarm, and Aggression .</li> <li>8.5.2 Aposematic Sounds and Acoustic Mimicry . . .</li> <li>8.5.3 Sexual Signals</li> <li>8.5.4 Social Sounds . . . . . 327</li> </ul>		Full
11	11.1	<b>9 Reproductive Behavior . . . . .</b> <ul style="list-style-type: none"> <li>9.1 Introduction . . . .</li> <li>9.2 Courtship and Mating . . .</li> <li>9.2.1 The Physiology of Mating Behavior . .</li> </ul>		Full
	11.2	<ul style="list-style-type: none"> <li>9.2.2 Reproduction Modes . . . .</li> <li>9.2.3 Complexity and Plasticity . . .</li> <li>9.2.4 Pollination and Male Reproductive Behavior .</li> </ul>		Full
	11.3	<ul style="list-style-type: none"> <li>9.3 Courtship and Conflict . . . . .</li> <li>9.3.1 Dimorphism, Sexual Selection, and Mate Choice .</li> <li>9.3.2 Intersexual Competition . . . .</li> </ul>		Full
12	12.1	<ul style="list-style-type: none"> <li>9.3.3 Territoriality and Dominance</li> <li>9.3.4 Nuptial Gifts . . . . .</li> <li>9.4 Mating Systems and Parental Investment .</li> </ul>		Full
	12.2	<ul style="list-style-type: none"> <li>9.5 Oviposition Behavior . . . .</li> <li>9.5.1 Selecting a Site or Host . .</li> <li>9.5.2 Reproductive Rates and Energy Allocation</li> </ul>		Full
	12.3	<b>10 Parental Behaviors and Social Life . .</b> <ul style="list-style-type: none"> <li>10.1 Introduction . . . . .</li> <li>10.2 Social Organization . . . . .</li> <li>10.2.1 Aggregations and Simple Groups . .</li> </ul>		Full





13	13.1	<ul style="list-style-type: none"> <li>• 10.2.2 Parent-Offspring Interactions . .</li> <li>• 10.2.3 Solitary and Communal Nesters . .</li> <li>• 10.3 The Insect Social Register . .</li> </ul>		Full
	13.2	<ul style="list-style-type: none"> <li>• 10.3.1 The Ants . . .</li> <li>• 10.3.2 The Eusocial Wasps .</li> <li>• 10.3.3 The Bees . . . . .</li> <li>• 10.3.4 The Termites . .</li> </ul>		Full
	13.3	<ul style="list-style-type: none"> <li>• 10.3.5 Lesser Known Candidates .</li> <li>• 10.4 Implications and Correlates of Social Life .</li> <li>• 10.4.1 The Ecology of Parental Care .</li> <li>• 10.4.2 Paradoxes of Insect Sociality .</li> <li>10.4.3 Interspecific Social Interactions</li> </ul>		Full

## 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:
1. Atkins, M. D. 1980 . Introduction to Insect Behavior. MacMillan Publishing Co., Inc., New York. 237pp.
  2. Matthews, R. W. and J. R. Matthews. 2010. Insect Behavior. (2nd ed.) Springer, New York, 519pp.
- B- Recommended books, materials, and media:
3. Wilson, E.O. 1971. The Insect Societies. Cambridge, MA. Harvard Univ. Press. 548pp

## 28. Additional information:

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