Plant Science Department – Graduate Program
Jordan College of Agricultural Science and Technology

Student Outcomes Assessment Plan (SOAP)—May, 2011

I. Mission Statement

The mission of the Plant Science Graduate Program is to provide our students with the basic and applied knowledge necessary for advanced careers in agricultural sciences. The program builds upon the knowledge and experiences obtained by students in their baccalaureate study in Plant Science or related disciplines. The program provides mentoring by a graduate faculty from a wide range of disciplines, with access to modern research equipment and facilities, and an agricultural farm laboratory for field studies.

II. Goals and Student Learning Outcomes

Goal 1: Students will be provided fundamental knowledge in plant growth, development, and physiology. This knowledge will enable them to:

Outcome 1.1: describe the environment of plants and its influence on their growth and development

Goal 2: Students will formulate a scientific hypothesis and conduct research to verify the hypothesis using an appropriate experimental design and sampling scheme. In doing so they will be able to:

Outcome 2.1: formulate a research hypothesis and plan and design experiments to test that hypothesis.
Outcome 2.2: conduct statistical analyses, interpret the statistical output, and make valid conclusions

Goal 3: Students will have knowledge of and familiarity with advanced equipment and analytical techniques and be able to:

Outcome 3.1: evaluate appropriate methods for sampling, sample processing and analysis with knowledge of quality control procedures.
Outcome 3.2: select appropriate lab techniques for the thesis research project

Goal 4: Students will pursue in-depth knowledge in areas specific to their course of study and thesis research (e.g. entomology, pathology, agronomy, horticulture, soils and plant nutrition, weed science, and irrigation) and be able to:

Outcome 4:1: integrate theoretical concepts from basic sciences into crop production and agro-ecosystem management.
Outcome 4:2: conduct scholarly review of primary literature and develop competency in interpreting existing data from scientific papers

Goal 5: Students will enhance their communication skills and be able to:

Outcome 5.1: communicate experimental procedures, results, and their conclusions in written format
Outcome 5.2: present research findings in a scholarly manner through oral or poster presentation and be able to respond to questions integrating scholarly knowledge into the response.

III. Plant Science Graduate Curriculum Map (Matrix of Courses X Learning Outcomes)

I= Introduced, R= Reinforced, A = Advanced

	PL257	Agri 200	Agri 220	Agri 201	PS Electives	Proposal	Thesis	Thesis exit seminar	Alumni Survey
1:1: describe the environment of plants and its influence on their growth and development	A				R	R	R	R	
2:1: formulate a research hypothesis and plan and design experiments to test that hypothesis		A				R	R	R	
2:2: conduct statistical analyses, interpret the statistical output and make valid conclusions		A				R	R	R	
3:1: evaluate appropriate methods for sampling, sample processing and analysis with knowledge of quality control procedures				A	R	A	A		
3:2: select appropriate lab techniques for the thesis research project				I		A	A		
4:1: integrate theoretical concepts from basic sciences into crop production and agro-ecosystem management	I				R	A	A	A	
4:2: conduct scholarly review of primary literature and develop competency in interpreting existing data from scientific papers			I		R	A	A	A	
5.1: clearly communicate experimental procedures, results, and their outcomes in written format				I	R	A	A	A	
5:2: present research findings in a scholarly manner through oral and poster presentation and be able to respond to questions integrating scholarly knowledge into the response			I		R		A	A	

IV. Assessment Methods

The following methods will be used for assessment. All are direct methods with the exception of the alumni survey. Numbers indicate outcomes covered by these assignments

Course Materials

1) **PL257 journal article summaries: 1.1, 3.1, 4.2**
   Students read assigned papers from the primary literature on a range of physiological topics and prepare critical reviews each week for use in class discussions.

2) **Agri 200 Term Project: 2.2**
   Students find a data set, analyze it, and interpret the output

3) **Agri 201 Lab Reports: 3.1**
   Students prepare written lab reports for experiments conducted in the class.

4) **Agri 220 Literature Review for Proposed Thesis Topic: 2.1, 4.2**
   Students draft the Literature Review and Materials & Methods section of their proposals for thesis research in consultation with selected faculty thesis committee members.

5) **PL261 Literature Review assignment (~2500 words): 4.2**
   Scholarly review of primary literature on topic chosen by student related to pest management. Targets student's ability to read primary literature, integrate the literature based on concepts, and develop competency in interpreting existing data from scientific papers. Provides initial experience in writing a literature review to aid in the literature review required for their thesis proposal.

6) **PL252 Independent Project Report: 1.1, 3.1, 4.2**

Final report for semester-long project in which pairs of students investigate a plant nutrition topic. Typically involves a greenhouse experiment or targeted field sampling from which they conduct sample soil and/or tissue analysis and examine its correlation with growth measurements. Project is done in pairs, but final reports are done individually.

7) Exam Questions (Agri 200, PL251, 252)

- Agri 200: Students are provided a research hypothesis and a list of treatment comparisons in the form of an exam question. The students are assessed on their ability to choose an appropriate experimental design with proper replications and a randomization plan to test the research hypothesis. **2.1**
- PL252: students view a set of soil, tissue and water test reports and discuss actions that they would take (or not take) to improve soil fertility and/or the crop nutrition. **4.1**
- PL251: students view water quality reports and comment on its suitability for irrigation. **4.1**

8) Thesis proposal: 2.1, 3.1, 3.2, 4.2, 5.1

Students write a proposal for their thesis research consisting of an Introduction with literature review and statement of research hypothesis and a Materials & Methods section describing their experimental design, measurements and sampling, analytical procedures, and a timeline for these activities. Approx. 6 pages.

9) Thesis proposal defense: 1.1, 3.1, 3.2, 5.2

Students present their thesis proposal to the thesis committee and respond to questions related to the proposal and areas of Plant Science related to their thesis research. Students are given either a pass, conditional pass, or fail

10) Written thesis 1.1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, 5.1

Thesis consists of an abstract and chapters for the Introduction, Literature Review, Materials & Methods, Results, Discussion, and Conclusions

11) Thesis Exit Seminar: 4.1, 5.2

Students present their thesis research to the department (faculty, fellow graduate students, and outside visitors). 45 min. presentation covering the sections of the thesis listed above. An evaluation sheet is provided to faculty and any research scientists attending. Average scores will be tabulated

12) Alumni Survey: 1.1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, 5.1, 5.2

Written survey sent to alumni having graduated at least 3 years prior. Questions will address whether the listed learning outcomes were fulfilled and the degree of preparation for their agricultural career.

V. Student Learning Outcomes X Assessment Methods Matrix

Method	Out 1.1	Out 2.1	Out 2.2	Out 3.1	Out 3.2	Out 4.1	Out 4.2	Out 5.1	Out 5.2
1. PL257 journal article summaries	X			X			X		
2. Agri 200 Term Project			X						
3. Agri 201 Lab Reports				X					
4. Agri 220 Literature Review (Thesis Topic)		X					X		
5. PL261 Literature Review (class topics)							X		
6. PL252 Independent Project Report:	X			X			X		
7. Exam Questions (Agri 200, PL251, 252)		X (200)				X (251,252)			
8. Thesis proposal:		X		X	X		X	X	
9. Thesis proposal defense:	X			X	X				X
10. Written thesis	X	X	X	X	X	X	X	X	
11. Thesis Exit Seminar:						X			X
12. Alumni Survey	X	X	X	X	X	X	X	X	X

"X" indicates the objectives the assessment activity will measure

VI. Timeline for Implementation of Assessment Methods and Summary Evaluations

Year 2011 to 2016: Methods 1-7 (Course Materials-- minimum of one course material per year)

Year 2012 to 2013: Methods 8 and 9 (Thesis Proposals & Defense Evaluations)

Year 2013 to 2014: Method 10 (Written Thesis)

Year 2014 to 2015: Method 11 (Thesis Exit Seminars)

Year 2016: Method 12 (Alumni Surveys)

VII. Closing the Loop - Summary Evaluation, Curriculum Adjustment, and Reporting

The Department of Plant Science faculty will meet for a department retreat prior to the start of classes each Fall semester. Faculty will examine the data gathered from the assessment activities the previous academic year. The discussion will consist of two parts. The first part will address whether the data indicate that our graduate students are meeting our student learning outcome standards. If the answer is positive then no further action is required. If the answer is negative, then discussion will address the changes necessary to improve student performance.

Potential changes could include at least one of the following: adjustments of student learning outcome standards; modifications of syllabi or assignments in one or more courses; substantial revisions of existing courses and/or proposal of new courses; modifications of major requirements; or modifications in thesis research requirements. Depending on the tasks involved and the necessary actions, specific faculty members will be tasked with completing the agreed changes.

 # Data Points per Outcome

Outcome	# potential assessments
1.1	4-5
2.1	5
2.2	3
3.1	7
3.2	4
4.1	3-4
4.2	7
5.1	3
5.2	3