

# IOWA STATE UNIVERSITY

## GRADUATE COLLEGE

### Establishing a Graduate Certificate Program

The first step in establishing a new graduate certificate is the preparation of a proposal by qualified group of faculty. If the proposed program will be focused in an existing department, program or college, the proposal should be routed through the corresponding curriculum committees. College curriculum committees will forward the appropriately amended proposal to the Graduate College Catalog and Curriculum Committee. Proposals for interdisciplinary programs with no obvious departmental or college focus shall be submitted directly to the Graduate College Catalog and Curriculum Committee.

The proposal will be reviewed by the Graduate Curriculum and Catalog Committee, by the Graduate Council, by the Graduate Dean, and by the Provost.

#### The following information should be included in the proposal:

1. Name of the proposed graduate certificate.

Breeding for Organic Crops

2. Name of the departments and/or programs involved.

Agronomy Department/MS Distance Plant Breeding

3. Name of the contact person.

Thomas Lübberstedt

4. Need for the graduate certificate.

Breeding for Organic Crops Graduate Certificate

5. Objective of the graduate certificate.

To develop fundamental knowledge and skills of plant breeding principles and methods as they relate to informed decision making in the functioning of an organic plant breeding program/system with unique sociological needs, and the connected pieces of conventional and organic agriculture in on-going programs or programs just starting.

6. General description of the graduate certificate.

The curriculum will consist of four 3-credit courses that cover:

- the fundamentals and provide understanding of the historical origins and ecological theories underpinning the practices involved in organic agriculture.
- interdisciplinary examination of crop and livestock production and socio-economic processes and policies in organic agriculture from the researcher and producer perspectives.
- transmission genetics
- principles and methods of Breeding for Organic Crops which rely on less or no external resource inputs for sustained maximum yield, and therefore require that evaluation/testing environments/conditions be different from those of conventional breeding, with emphasis being on modest improvements of populations and sustainable production by creating varieties that are more resilient and more appropriate for the future, in essence adapting seed to changing climates, resource availability, and environmental conditions that will help mitigate farming risks.
- The courses will be delivered online through the ISU learning management system, currently Canvas™. Content will consist of study materials, books/book chapters, relevant peer reviewed manuscripts, and video recordings of in-class PowerPoint presentations and discussion sessions. Distance and on-campus students complete the same assignments and exams, with distance students communicating with instructors and other students using discussion groups, chat rooms, email, voice, and separated weekly online Zoom™ sessions.

7. Graduate certificate requirements including:

- a. Admission standards and prerequisites for the certificate program.

A bachelor's degree from an accredited institution, a GPA of approximately 2.8 or higher on a 4.0 scale, and successful completion of the following ISU courses or their equivalent at another institution:

AGRON 181: Introduction to Crop Science (3 credits)

MATH 140: College Algebra (3 credits)

STAT 104: Introduction to Statistics (3 credits)

AGRON 320: Genetics, Agriculture and Biotechnology (3 credits)

AGRON 421: Introduction to Plant Breeding (3 credits)

- b. Courses and seminars.

All students completing the certificate will be required to take the same courses, except those able to transfer credits from a comparable graduate-level course taken at another institution. Courses for the program are offered annually except AGRON 584 which is offered every other year. It is anticipated that students participating in the certificate program would be able to complete all requirements in two years, but some will take longer than two years to complete.

AGRON 584. Organic Agricultural Theory and Practice

Dual/Cross-listed with HORT and SUSAG

Prereq: 3 cr. in biological or physical sciences

Understanding of the historical origins and ecological theories underpinning the practices involved in organic agriculture. Interdisciplinary examination of crop and livestock production and socio-economic processes and policies in organic agriculture from researcher and producer perspectives.

**AGRON 506. Crop Genetics (Cross-listed with HORT)**

3 cr. Introduction to genetics of reproductive systems, recombination, segregation and linkage analysis, inbreeding, quantitative inheritance, fertility regulation, and polyploidy to prepare students for subsequent courses in crop improvement. Enrollment is restricted to off-campus MS Distance Plant Breeding Program and Certificate Program students.

**AGRON 520. Plant Breeding Methods**

3 cr Prereq. AGRON 506.

Breeding methods used in the genetic improvement of self-pollinated, cross-pollinated and crops.

**AGRON 542. Breeding for Organic Crops**

3 cr. Prereq: AGRON 506/HORT 506 or AGRON 421

Strategies for organic breeding programs with an emphasis on objectives, opportunities and challenges, historical, legal, and economic aspects of agronomy and organic breeding from national and international perspectives.

8. General description of the resources currently available and future resource needs:
- a. A list of supporting faculty members including a brief description of their expertise relating to the graduate certificate.

**Assibi Mahama**, Assistant Teaching Professor. Area of expertise is plant breeding. Currently teaches AGRON 537 and will teach AGRON 542.

**Arti Singh**, Adjunct Assistant Professor. Area of expertise is plant breeding. Currently teaches AGRON 544 and will teach AGRON 520.

**Shuizhang Fei**, Professor. Area of expertise is plant breeding. Currently teaches AGRON 506/HORT 551.

**Kathleen Delate**, Professor. Area of expertise is organic agriculture. Currently teaches triple listed AGRON/HORT/SUSAG 584.

**Paul Scott**, Affiliate Professor, USDA-ARS. Conducts research on genetics and breeding that supports organic production systems, including molecular characterization of pollen exclusion systems and breeding for improved nutritional quality. He is participating in developing content for AGRON 542 and will instruct sessions of the program that are relevant to his research area.

**William Tracy**, Professor of Plant Breeding and Genetics/Endowed Chair of Plant Breeding for Organic Crops, University of Wisconsin. Area of expertise is sweet-corn breeding and breeding for organic crops, is a resource for instruction of relevant sessions in the program.

- b. The effects of any new courses on faculty workload.

Enrollment in the 3 courses that are already being taught (i.e., AGRON 506, AGRON 520, and AGRON 584) often averages below the capped number of 20, so there is room for increased enrollment in these courses. These courses are taught once a year (except AGRON 584 which is offered every other year), but additional sections could be added if need arises

- c. Other resources required for the program including graduate assistants, laboratories and other facilities, supplies, etc.

The MS Distance Plant Breeding program works in collaboration with the Brenton Center to deliver course content and video recording of class sessions, as well as assist students to navigate the system. Not currently needed but if the need arises, graduate students are willing to assist, and laboratories, greenhouses, growth chambers and other facilities and supplies are available for use.

- 9. Relationship of the proposed graduate certificate to the strategic plans of the department, college, and the university.

As part of a Land Grant University, CALS and the Department of Agronomy are committed to the mission of creating, sharing, and applying knowledge to make Iowa and the world a better place, while providing practical and relevant learning opportunities for working people. The current CALS strategic plan envisions “the College of Agriculture and Life Sciences will lead the world in ‘science with practice’ that provides a better, sustainable future for the people of Iowa and the world.” Providing “accessible residential and distance educational programs that build on Iowa State’s strengths and excellence in science and technology” is a priority in the university’s strategic plan, and thus supports the mission of sharing knowledge beyond the campus borders. The Iowa Board of Regents lists providing “high-quality accessible education to students” as a “fundamental purpose” in their strategic plan under the heading of mission. Offering a graduate certificate program in Breeding for Organic Crops that is relevant and accessible to students is clearly consistent with the goals of the department, college, university and Board of Regents.

- 10. Plan for periodic review of the certificate program.

This certificate program will be strongly linked to the MS Distance Plant Breeding program and will be subject to ongoing assessment and improvement to ensure that emerging technologies are added, and student needs are addressed. Courses in the MS

Distance Plant Breeding program will be reviewed continuously and updated. Student feedback both at the end of each semester and after the program is completed will be compiled. There are also plans to have a focus group consisting of students who completed the program and industry stake holders with employees who completed the program. Linkages between learning expectations and learning objectives/outcomes of the curriculum will be evaluated and updated as needed. The curriculum will also be evaluated by an independent advisory board consisting of representatives that employ our graduates.

## Academic Program Approval Voting Record

This document is to be appended as the last page of the proposal for any new or revised academic program to record the successive votes of approval as the proposal moves through its required review and approval steps. Consult Faculty Handbook Section 10.8 or the Faculty Senate Curriculum Committee website for information regarding Committee review and voting requirements for each action.

Curricular Action: (check appropriate boxes below)

1.  New Program     Name Change         Discontinuation     Concurrent Degree for:
2.  Undergraduate Major    Graduate Major     Undergraduate Minor    Graduate Minor  
 Undergraduate Certificate     Graduate Certificate         Other: \_\_\_\_\_
3. Name of Proposed Change: Breeding for Organic Crops
4. Name of Contact Person: Thomas Lubberstedt    e-mail address: thomasl@iastate.edu
5. Primary College: Agriculture and Life Sciences    Secondary College: n/a
6. Involved Department(s): Agronomy

### Voting record for this curricular action:

Voting Body	Votes			Date of Vote
	For	Against	Abstain	
Dept. or Program Committee				
Agronomy Curriculum Committee	5	1	0	9/20/2019
Faculty, Agronomy Department	27	0	3*	11/8/2019
College Curriculum Committee	14	0	0	12/6/2019
College Approval Vote	91	2	2	1/27/2020
Graduate Council	13	0	0	3/25/2020
Faculty Senate Curriculum Committee	6	0	0	4/10/2020
Faculty Senate Academic Affairs Council	5	0	0	4/22/2020
Faculty Senate				

\* Non-voting USDA-ARS affiliates

[FSCC – November 2013]