

Program Procedures for Obtaining Approval of a New Area of Specialization or a Change in an Area of Specialization in a Graduate Degree

(Check one)



Request for New Specialization

The following describes the material which should be included in a proposal for a new area of specialization in an existing graduate degree or for a change in an existing area of specialization. Areas of specialization are recognized on a student's permanent record (transcript). Approval is required by the department or program curriculum committee, the College Curriculum Committee, the GCCC, Graduate Council, and by the Graduate Dean. The proposal should be sent to the Graduate Curriculum and Catalog Committee (GCCC) with documentation of approvals by the department and college:

Graduate Curriculum and Catalog Committee
1137 Pearson Hall
Iowa State University
Ames, IA 50011-2206

1. Name of the area of specialization. **PREDICTIVE PHENOMICS OF PLANTS (P3)**
2. Name of the major. **Plant Biology**
3. Graduate degrees to which it applies. **Ph.D.**
4. Name of the department(s) or program.
INTERDEPARTMENTAL Plant Biology
5. What is the change you are requesting? (Answer only if you checked the Change box)
N/A
6. Other existing areas of specialization for the same major and same degree.
N/A
7. Are areas of specialization optional or required? (Can a student choose the major without selecting an area of specialization?)
OPTIONAL
8. Reasons for proposing the new area of specialization or change in the area of specialization.

In October of 2015, the Interdepartmental Plant Biology (IPB) faculty voted in favor of establishing a specialization within this IPB major at the Ph.D. level entitled, "Predictive Phenomics of Plants" (also known as P3).

Faculty at Iowa State University received NSF NRT Research Traineeship Funding for this area of specialization. Students within this specialization will be trained in Engineering, Plant Sciences and Data Sciences, www.predictivephenomicsinplants.iastate.edu. The NSF NRT P3 Trainees will be predominantly majoring in Agricultural and Biosystems Engineering, Electrical and Computer Engineering, Bioinformatics and Computational Biology, Mechanical Engineering, Genetics and Genomics, and Plant Biology.

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Value to the Ph.D. student: Recognition of intensive and innovative program on their transcript.

Value to the program: Recruitment of students who will be trained to address major agronomic challenges of the 21st century.

Value to Iowa State University: This specialization is designed to encourage the development and implementation of bold, new, potentially transformative, and scalable models for STEM graduate education training including one NSF priority interdisciplinary research theme—Data-Enabled Science and Engineering (DESE).” (2015, Patrick S. Schnable, Agronomy).

Value to the world: Broaden the thinking on how to solve growing populations and climate change; and adapt agriculture to meet global needs (i.e. food security).

9. Requirements for the area of specialization (how are the requirements different for this area of specialization compared to other areas of specialization or to the major without an area of specialization). (For new specialization only.)

Courses required to complete a Ph.D. in Interdepartmental Plant Biology (IPB)

1. **Basic Core Courses.** IPB PhD students complete the following core courses:

- *[STAT 401](#) (Statistical Methods for Research Workers), Cr. 4. F., S., SS.
- *(i) [BBMB 316](#) (Principles of Biochemistry) (3-0) Cr. 3. F. S. or *(ii) [BBMB 404](#) (Biochemistry I), Cr. 3. F. and [BBMB 405](#) (Biochemistry II), Cr. 3. S.
- [PLBIO/GDCB 513](#) (Plant Metabolism), Cr. 2. Alt. F.
- [PLBIO/GDCB 545](#) (Plant Molecular, Cell & Developmental Biol.), Cr. 3. Alt. F.
- [GR ST 565](#) (Responsible Conduct of Research in Science and Engr.) Cr. 1.0. F., S.
- Make four seminar presentations and enroll each term in the Interdepartmental Plant Biology seminar [PLBIO 696](#). The first seminar must be during the student's first year and is a 20 minutes seminar. The last presentation must be an exit seminar. Up to five seminars are counted for Ph.D. (5 Credits.)

*[STAT 401](#) and [BBMB 316/404](#) can be waived if similar courses were taken elsewhere.

2. **Optional Core Courses.** Take one course from the following courses:

- [GDCB 510](#) (Transmission Genetics), Cr. 3. S.
- [GDCB 511](#) (Molecular Genetics), Cr. 3. S.
- [EEOB 551](#) (Plant Evolution & Phylogeny), Cr. 4, F.
- [EEOB 566](#) (Molecular Evolution), Cr. 3. Alt. F.

3. **Optional Courses** – Plant Biology students take 1-2 additional courses in areas such as Agronomy, BBMB, GDCB, etc.

This is a description of what is required to complete a specialization in Predictive Phenomics of Plants within the Interdepartmental Plant Biology (IPB) graduate major

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Predictive Phenomics of Plants Specialization:

31 credits to complete the P3 specialization. Coursework includes:

- STAT 430 Empirical Methods for the Computational Sciences (3 credits)
- ME/BCB/GDCB 585X Fundamentals of Predictive Plant Phenomics (4 credits)
- BR C/BRT 507 Technology Led Entrepreneurship in Biorenewables (1 credit)
- GR ST 565 Responsible Conduct of Research in Science and Engineering (1 credit)
- Three electives from two areas: Engineering Technical and Data Sciences Technical (total 9 credits) in addition to the three electives within the IPB program (the P3 Program student's discipline of focus). Possible electives are listed here:
<http://www.predictivephenomicsinplants.iastate.edu/curriculum.html>
- Students enroll in P3C (Collaborative) Graduate Seminar (ME 600 sec P3) (1 credit each semester)

How does this specialization requirements fit in with other core classes:

With the additional coursework to meet the P3 specialization, students would be able to complete both the IPB core courses (18-23 credits) and the P3 core (13 credits) and electives (18 credits) in two years. Students would take a mix of IPB core and P3 courses throughout the first two years of training. It is important to note that most of the IPB Core Courses are also P3 Program technical electives.

SAMPLE Curriculum for this specialization for first two years of training for PhD students in Interdepartmental Plant Biology (IPB) that would complete the IPB course core and [P3 course core \(5 courses\)](#) and [electives \(6 courses\)](#).

Fall I

GDCB 585X Fundamentals Predictive Plant Phenomics (P3 core)	4 credits
STAT 430 Empirical Methods Computational Sciences (P3 core)	3 credits
BBMB 404 (IPB core I) Biochemistry I	3 credits
ME 600 (sec P3) P3C Graduate Seminar (P3 core)	1 credit
PLBIO 696 Interdepartmental Plant Biology Seminar	1 credit

Spring I

BBMB 405 (IPB core II) Biochemistry II	3 credits
GDCB 511 (IPB core III) Molecular Genetics	3 credits
GR ST 565 Responsible Conduct of Research (IPB core III & P3 core)	1 credit
AGRON 516 (IPB course option) Crop Physiology	3 credits
ME 600 (sec P3) P3C Graduate Seminar (P3 core)	1 credit
PLBIO 696 Interdepartmental Plant Biology Seminar	1 credit

Fall II

BCB 567 (P3 Tech Elective) Fundamentals of Genome Informatics	3 credits
PLBIO/GDCB 545 (IPB core V) Plant Molecular, Cell & Dev. Biology	3 credits
BBMB 607 (IPB course option) Plant Biochemistry	2 credits
ME 600 (sec P3) P3C Graduate Seminar (P3 core)	1 credit
PLBIO 696 Interdepartmental Plant Biology Seminar	1 credit

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Spring II

BR C/BRT 507 Technology-Led Entrepreneurship (P3 core)	1 credit
B M E 450X Biosensing (P3 Tech Elective)	3 credits
BCB 570 (P3 Tech Elective) Comp. Func. Genomics & Systems Biology	3 credits
AGRON 504 Global Change	3 credits
ME 600 (sec P3) P3C Graduate Seminar (P3 core)	1 credit
PLBIO 696 Interdepartmental Plant Biology Seminar	1 credit

10. Estimate the number of students who will graduate with this major and degree each year and the number who will graduate with this area of specialization. (For new specialization only.)

INTERDEPARTMENTAL PLANT BIOLOGY Ph.D: 7 PREDICTIVE PHENOMICS OF PLANTS SPECIALIZATION: 2

11. What resources (faculty, courses, research facilities, library facilities, etc) are available to support the area of specialization? (For new specialization only.)

NSF NRT Ph.D. TRAINEESHIP AWARD #1545453 AUGUST 13, 2015
http://www.nsf.gov/awardsearch/showAward?AWD_ID=1545453 \$2,866,938.00

Grant PI's and team members are dedicated to the success of this specialization through several different majors at Iowa State University:

<http://www.predictivephenomicsinplants.iastate.edu/team.html>
<http://www.predictivephenomicsinplants.iastate.edu/details.html>

Courses: Most coursework already exists. P3 Core Course (ME/BCB/GDCB 585X Fundamentals of Predictive Plant Phenomics - approved with first offering Fall 2016).

12. What future financial support will be needed? (For new specialization only.)

After NSF NRT grant ends, funding would likely be necessary to provide for the introductory course which includes lab elements (P3 Core Course with Lab for T-Base Common Core - ME/BCB/GDCB 585X Fundamentals of Predictive Plant Phenomics - approved with first offering Fall 2016). Funding could be provided by the program or passed onto graduate students as course lab fees. This course would be available to students not enrolled in the specialization and depending upon yearly enrollment, offered in alternate Fall semesters.

All other courses exist and will serve students inside and outside of the specialization.