211D, CHEM 229Q, PHYS 145A, PHYS 145B, PHYS 145C, PHYS 212A, PHYS 212B

Comprehensive Examination
At the end of the first year, and no later than the end of the second year, students must pass a written comprehensive examination consisting of questions provided by the participating faculty, with topics taken from the core curriculum.

Qualifying Examination and Advancement to Candidacy
Doctoral students must pass a written qualifying examination that will consist of the preparation of a research proposal based on their dissertation work and taking the form of a grant application to the National Science Foundation or National Institutes of Health. Once the proposal is deemed satisfactory, the student must pass an oral examination that will consist of a defense of the written research proposal before the student's qualifying exam committee. Upon successful completion of all coursework and passing of the Qualifying Examination, the student will advance to candidacy.

Dissertation
Students are expected to complete laboratory rotations and select a dissertation advisor by the end of their first academic year. The dissertation advisor will chair a Ph.D. Dissertation Committee that will meet annually to assess progress and provide input to the research project. A written dissertation will be completed by each student in the program.

Final Defense
Doctoral candidates will defend their dissertations in a public oral presentation at a time announced to members of the University community. The Dissertation Committee will then make a recommendation to the Graduate Division as to whether the degree of Ph.D. be conferred.

Professional Development
Biophysics students must complete an annual research evaluation, complete a minimum of 2 quarters as a teaching assistant, and complete GDIV 403.

Normative Time to Degree
15 quarters

Master's Degree

The program offers the M.S. degree in Biophysics.

Students will normally be admitted to the Ph.D. program. Upon advancement to candidacy for the Ph.D. degree the student may petition the Graduate Division for conferral of the M.S. degree.

Students enrolling in the master's degree in Biophysics must meet the requirements for the Plan II of the UCR Graduate Council, take core courses as described above and pass a Comprehensive Examination.

Plan II (Comprehensive Exam)
Thirty-six (36) units of 100 or 200 series courses, of which at least eighteen (18) units must be in the graduate 200 series; includes the program's graduate core curriculum and courses from a list of approved electives. Students must enroll in BPHY 252 each quarter offered. Students must pass a three-hour Comprehensive Examination consisting of questions provided by the participating faculty, with topics taken from the core-curriculum.

Professional Development
Biophysics students must complete GDIV 403.

Normative Time to Degree
6 quarters

BOOK, ARCHIVE, AND MANUSCRIPT STUDIES DESIGNATED EMPHASIS

Subject abbreviation: BAM
College of Humanities, Arts, and Social Sciences

Heidi Brayman Hackel (English),
Director Office, 1202 HMNSS
heidi.braymanhackel@ucr.edu;
adriana.craciun@ucr.edu

Advisory Committee & Participating Faculty
Malcolm Baker (Art History)
Thomas Cogswell (History)
Andrea Denny-Brown (English)
Brian Geiger (Center for Bibliographic Studies & Research)
Catherine Gudis (History)
Randolph Head (History)
Robb Hernandez (English)
Kristoffer Neville (Art History)
Deborah Willis (English)

Designated Emphasis Requirements

The Designated Emphasis is a 14-unit interdisciplinary graduate course of study, requiring coursework across at least two departments. Two of the three required courses, if otherwise eligible, may count towards the student's Ph.D. requirements.

1. **Three (3) courses (12 units) selected from** AHS 274, CRWT 186A, CRWT 186B, ENGL 246, ENGL 273, ENGL 282, HIST 240 (E-Z), HIST 262, HIST 263, HISE 113, HISE 114. Students may ask to count another course with relevant content as approved by the Designated Emphasis Directors. Students must select courses from at least two different departments or programs, one of which may be their home department. Undergraduate courses taken to fulfill these requirements must be accompanied by a 292 course taken in the student's department with extra work mutually agreed upon by professor and student.
2. **MCS280 (2 units): Colloquium on Book, Archive, and Manuscript Studies.** Addresses current research topics pertaining to the program. Includes events conducted both on and off campus. Graded Satisfactory (S) or No Credit (NC).
3. **Significant Research Product: The Designated Emphasis requires that 4 credits reflect a "significant research product."** It is the committee's expectation that students will fulfill this component in at least one of the required courses, typically by writing a research paper appropriate to that discipline's journal publication or conference presentation conventions. In rare cases in which the research component has not otherwise been met, a student may undertake MCS 280 for 4 units in order to produce a research paper of approximately 25 pages.

All requirements for the Designated Emphasis must be satisfied before a student advances to candidacy in their Ph.D. field; a minimum GPA of 3.0 is required for the award of the Designated Emphasis.

BOTANY AND PLANT SCIENCES

Subject abbreviation: BPSC
College of Natural and Agricultural Sciences

Patricia S. Springer, Ph.D., Chair
Department Office, 2132 Batchelor Hall
Graduate Student Affairs (800) 735-0717 or (951) 827-5688
CNAS Undergraduate Advising Center (951) 827-7294 or (951) 827-3102

Professors
Julia N. Bailey-Serres, Ph.D. *Distinguished Professor of Genetics*
Xuemei Chen, Ph.D. *Distinguished Professor of Plant Cell and Molecular Biology*
Timothy J. Close, Ph.D. *Genetics*
Sean Cutler, Ph.D. *Distinguished Professor of Plant Cell Biology*
Katayoon Dehesh, Ph.D. *Molecular Biochemistry*
Norman C. Ellstrand, Ph.D. *Distinguished Professor of Genetics*
Thomas A. Eulgem, Ph.D. *Plant Cell Biology*
Exequiel Ezcurra, Ph.D. *Ecology*
Janet Franklin, Ph.D. *Distinguished Professor of Biogeography*
Thomas Girke, Ph.D. *Bioinformatics*
Venugopala R. Gonehal, Ph.D. *Plant Cell Biology*
Darrel Jenerette, Ph.D. *Landscape Ecology*
Bai-Lian "Larry" Li, Ph.D. *Plant Ecology*
Adam J. Lukaszewski, Ph.D. *Genetics*
Mikeal L. Roose, Ph.D. *Genetics*
Louis Santiago, Ph.D. *Physiological Ecosystems Ecology*
Patricia S. Springer, Ph.D. *Genetics*
Linda L. Walling, Ph.D. *Genetics*
Susan Wessler, Ph.D. *Distinguished Professor of Genetics*
Shizhong Xu, Ph.D. *Genetics*
Zhenbiao Yang, Ph.D. *Plant Cell Biology*

Professors Emeriti
Edith B. Allen, Ph.D. *Community/Restoration Ecology*
Charles W. Coggins, Jr., Ph.D. *Plant Physiology*
Darleen A. DeMason, Ph.D. *Botany*
Arturo Gómez-Pompa, Ph.D. *Botany*
Anthony E. Hall, Ph.D. *Plant Physiology*
Robert L. Heath, Ph.D. *Plant Physiology and Biophysics*
Jodie S. Holt, Ph.D. *Plant Physiology*
Anthony H. C. Huang, Ph.D. *Plant Physiology*
Elizabeth M. Lord, Ph.D. *Botany/Developmental Biology*
Carol J. Lovatt, Ph.D. *Plant Physiology*

Eugene A. Nothnagel, Ph.D. *Plant Physiology*
Natasha Raikhel, Ph.D. *Distinguished Professor of Plant Cell Biology*
William W. Thomson, Ph.D. *Botany*
Irwin P. Ting, Ph.D. *Plant Physiology*
J. Giles Waines, Ph.D. *Genetics*

Associate Professors

Meng Chen, Ph.D. *Cell Biology*
Amy Litt, Ph.D. *Plant Evolution and Development*
David Nelson, Ph.D. *Genetics*

Assistant Professors

Jeffrey Diez, Ph.D. *Community Ecology*
Juan Pablo Giraldo, Ph.D. *Plant Physiology*
Zhenyu Jia, Ph.D. *Quantitative Genetics*
Daniel Koenig, Ph.D. *Genetics*
Loralee Larios, Ph.D. *Plant Ecology*
Paul D. Nabity, Ph.D. *Plant Insect Ecology*
Dawn Nagel, Ph.D. *Genetics and Genomics*
Carolyn G. Rasmussen, Ph.D. *Plant Cell Biology*
Danelle Seymour, Ph.D. *Genetics*
Jaimie Van Norman, Ph.D. *Plant Cell and Developmental Biology*

Lecturers/Cooperative Extension Specialists

Mary Lu Arpaia, Ph.D. *Subtropical Horticulture*
James Baird, Ph.D. *Turfgrass Horticulture*
Travis M. Bean, Ph.D. *Weed Science*
Ashraf El-Kereamy, Ph.D. *Subtropical Horticulture*
Peggy A. Mauk, Ph.D. *Subtropical Horticulture*
Milton E. McGiffen, Jr., Ph.D. *Vegetable Crops/Plant Physiology*
Alan McHughen, Ph.D. *Plant Biotechnology*
Donald J. Merhaut, Ph.D. *Horticulture and Floriculture*
Philippe E. Rolshausen, Ph.D. *Subtropical Crops*

Cooperating Faculty

Hailing Jin, Ph.D. (Microbiology and Plant Pathology)
Robert Jinkerson, Ph.D. (Chemical and Environmental Engineering)
Isgouhi Kaloshian, Ph.D. (Nematology)
Yanran Li (Chemical and Environmental Engineering)
Winbo Ma (Microbiology and Plant Pathology)
Joel Sachs, Ph.D. (Evolution, Ecology and Organismal Biology)
Lauren Ponisio (Entomology)
Jason Stajich, Ph.D. (Microbiology and Plant Pathology)

Major

The mission of the interdepartmental Undergraduate Program in Plant Biology is to provide students with a solid background in modern principles and research practices of basic Plant Biology and in their area of specialization.

Courses prerequisite to the major, courses used to satisfy major requirements, and the 11 units (for B.S. degree) related to the major must be taken for letter grades. Students may elect to take other courses on a Satisfactory (S)/No Credit (NC) basis. Refer to the Academic Regulations section of this catalog for additional information on "S/NC" grading.

Information about this program is available on the CNAS UAAC website at **cnasstudent.ucr.edu**.

Transfer Students

Students planning to transfer to UCR with a major in Plant Biology must have a minimum GPA of 2.7 in transferable college courses and "C" or higher grades in a year sequence of general chemistry and in courses equivalent to our BIOL 005A, BIOL 005B. We also recommend that transfer students complete a year of college calculus before admission. Exceptions may be granted by the faculty advisor.

University Requirements

See Undergraduate Studies section.

College Requirements

See College of Natural and Agricultural Sciences, Colleges and Programs section.

Some of the following requirements for the major may also fulfill some of the college's breadth requirements. Consult with a department advisor for course planning.

Major Requirements

The major requirements for the B.S. and B.A. degrees in Plant Biology are as follows:

1. **Life Sciences core requirements (69-73 units)**

   Students must complete all required courses with a grade of "C-" or better and with a cumulative GPA in the core courses of at least 2.0. Grades of "D" or "F" in two core courses, either separate courses or repetitions of the same course, are grounds for discontinuation from the major.

   a) BIOL 005A, BIOL 05LA or BIOL 020, BIOL 005B, BIOL 005C

   b) CHEM 001A, CHEM 01LA, CHEM 001B, CHEM 01LB, CHEM 001C, CHEM 01LC

   c) CHEM 008A and CHEM 08LA or CHEM 008HA and CHEM 008HLA or CHEM 12A, CHEM 008B and CHEM08LB or CHEM 008HB and CHEM 008HLB or CHEM 12B, CHEM 008C and CHEM 08LC or CHEM 008HC and CHEM 08HLC or CHEM 12C

   d) MATH 007A or MATH 009A, MATH 007B or MATH 009B (MATH 009C recommended)

   e) PHYS 002A, PHYS 02LA, PHYS 002B, PHYS 02LB, PHYS 002C, PHYS 02LC

   f) STAT 100A

   g) BCH 100 or BCH 110A (BCH 110A is strongly recommended)

2. **Upper-division requirements (36 units for the B.S., 31 units for the B.A.)**

   A GPA of at least 2.0 in upper-division courses taken in the field of the major is a graduation requirement. A student is subject to discontinuation from the major whenever the GPA in upper-division course work is below 2.0. Students finding themselves in this circumstance must meet with an advisor.

   a) BIOL 102

   b) BPSC 104/BIOL 104

   c) BIOL 132/BPSC 132, BIOL 143/BPSC 143, BPSC 133

   d) For the B.S. only: Two (2) units of BPSC 195H, BPSC 197, BPSC 198I, or BPSC 199

   e) BPSC 193 with a grade of C- or better

   f) **For the B.S.** At least 11 additional units from one of the four areas of specialization (consult with a faculty advisor). Students may apply a maximum of 6 units of BPSC 190 and/or BPSC 195H and/or BPSC 197 and/or BPSC 198I and/or BPSC 199.

   For the B.A. At least 8 additional units from one of the four areas of specialization (consult with a faculty advisor).

   Note: Students planning a B.A. degree should schedule the required language courses in place of a series of electives.

Areas of Specialization

Individual student career goals may be achieved by selecting an area of specialization within the diverse disciplines of botany and plant sciences. Adjustments within these programs can be made to accommodate students' interests. Students must consult with a faculty advisor to clarify educational goals and to plan a program of study.

1. **Plant Cellular, Molecular, and Developmental Biology**

   a) BPSC 135

   b) Additional units from the following to meet either the B.S. or B.A. requirement: BCH 102,BCH 110B, BCH 110C or BIOL 107A, BCH 153/BIOL 153/BPSC 153, BCH 162, BCH 183/BPSC 183, BIOL 107B, BIOL 113, BIOL 114, BIOL 121/MCBL 121, BIOL 121L/MCBL 121L, BIOL 123/MCBL 123/PLPA 123, BIOL 155/BPSC 155, BIOL 168, BPSC 138/BIOL 138, BPSC 185, CBNS 101, CBNS 108

2. **Plant Genetics, Breeding, and Biotechnology**

   a) BPSC 150

   b) Additional units from the following to meet either the B.S. or B.A. requirement:

   BCH 153/BIOL 153/BPSC 153, BIOL 105, BIOL 107A, BIOL 107B, BIOL 108, BIOL 119, BIOL 148/BPSC 148, BIOL 155/BPSC 155, BPSC 135, BPSC 158, BPSC 185, CBNS 108, STAT 100B

3. **Ecology, Evolution, and Systematics**

   a) BPSC 146

   b) Additional units from the following to meet either the B.S. or B.A. requirement:

   ANTH 170/BPSC 170, BIOL 105, BIOL 108, BIOL 112/BPSC 112/ENTM 112, BIOL 116, BIOL 116L, BIOL 138/BPSC 138, BIOL 165/BPSC 165, BPSC 134/ENSC 134, BPSC 158, BPSC 166, BPSC 185, ENSC 100, GEO 151, GEO 153, GEO 169

4. **Plant Pathology, Nematology, and Pest Management**

   a) BIOL 120/MCBL 120/PLPA 120

   b) Additional units from the following to meet either the B.S. or B.A. requirement:

   BCH 183/BPSC 183, BIOL 121/MCBL 121, BIOL 121L/MCBL 121L, BIOL 124/MCBL 124, BPSC 146, BPSC 150, BPSC 158, BPSC 166, ENSC 134/BPSC 134, ENTM 100/BIOL 100, ENTM

109, ENTM 124, ENTM 127/BIOL 127, ENTM 129, ENTM 129L, ENSC 100, ENSC 120/NEM 120, NEM 159/BIOL 159, PLPA 120L/BIOL 120L/MCBL 120L, PLPA 123/BIOL 123/MCBL 123, PLPA 134/BIOL 134, PLPA 134L/BIOL 134L, ENSC 104

5. **Individualized specialization**

   For students who wish to pursue cross-disciplinary education in plant biology. Course selection can be individualized, but needs to be approved by faculty advisor.

Minor

The minor in Plant Biology allows students majoring in other departments to obtain in-depth training in Plant Biology.

Requirements for the minor in Plant Biology are as follows:

1. **BIOL 104/BPSC 104 (4 units)**
2. **One course (4–5 units) from the following:** BIOL 132/BPSC 132, BIOL 138/BPSC 138, BIOL 143/BPSC 143, BPSC 133
3. **12 to 20 units from the following:** ANTH 170/BPSC 170, BCH 153/BIOL 153/ BPSC 153, BCH 183/BPSC 183, BIOL 132/ BPSC 132, BIOL 138/BPSC 138, BIOL 143/ BPSC 143, BIOL 148/BPSC 148, BIOL 155/ BPSC 155, BIOL 165/BPSC 165, BPSC 133, BPSC 134/ENSC 134, BPSC 135, BPSC 146, BPSC 150, BPSC 158, BPSC 166, BPSC 190, BPSC 195H, BPSC 197, BPSC 198-I, BPSC 199, PLPA 120/BIOL 120/MCBL 120

Note: No more than 4 units of BPSC 190–199 may be used to fulfill this requirement. The course used to fulfill the requirement in 2 cannot also be used to fulfill the requirement in 3.

See Minors under the College of Natural and Agricultural Sciences in the Colleges and Programs section of this catalog for additional information on minors.

Graduate Program

The Department of Botany and Plant Sciences offers programs leading to the M.S. and Ph.D. degrees in Plant Biology. Research in these programs can focus on basic and/or applied questions.

Admission

Applicants who have a baccalaureate degree and who satisfy the general requirements of the university listed in the Graduate Studies section of this catalog are considered for admission to graduate status. Students applying to the M.S. and Ph.D. program must submit GRE General Test scores (verbal, quantitative, and analytical).

Regardless of the area of their major for the baccalaureate degree, students must have had, or complete soon after entering graduate school the following:

1. A year of course work in general biology
2. A year of course work in general chemistry
3. A course in genetics
4. A course in biochemistry or ecology
5. A course in calculus
6. Two courses in physics and/or statistics

Credit from these courses does not count toward the graduate degree.

Immediately after being admitted, each student should identify a faculty advisor and consult with that advisor or the graduate advisor regarding educational goals; scheduling initial course work and possible lab rotations; and forming a guidance committee. Further guidance on these matters is provided in the Botany and Plant Sciences Graduate Student Handbook.

Master's Degree

The Department of Botany and Plant Sciences offers programs leading to the M.S. degree in Plant Biology.

The master's degree may be earned under Plan I (Thesis) or Plan II (Comprehensive Examination). Students must meet all general requirements of the Graduate Division. The detailed course program is determined by the guidance committee after considering the specific interests of the student. Department requirements are as follows:

Plan I (Thesis)

1. **Three courses from Section I are required.** Students who have taken courses comparable to those in Section I during their baccalaureate training may have a portion or all of this section waived. Recommendations for waivers should specify alternative courses and should be sent to the department educational advisory committee for approval. In such instances, however, it is expected that their programs include increased units in courses from Sections II, III, and/or IV.
2. **Two courses (6 units) from Section II are required.** In fulfilling the Section II requirement, students may use no more than one course cross-listed by Botany and Plant Sciences and another program. If such a cross-listed course is used toward fulfilling the Section II requirement, the same course may not be used toward fulfilling the Section I or III requirements. No more than four units may be in professional development courses.
3. **At least 6 units from Section III must be taken.**
4. **Preparation of a thesis: Not more than 12 units from Section V (299 units) may apply toward the degree.** If the student takes research courses (290/297) from Section IV, not more than 6 units may be applied toward the degree. A total of 12 units of 297/299 may be used towards the degree.

Seminar Requirement

All full-time students must enroll in the BPSC 250 seminar during each quarter in which it is offered. Part-time students must take one BPSC 250 seminar for every 12 units of courses. All students must present at least one BPSC 250 seminar and complete at least one quarter of BPSC 240 (or approved similar equivalent that involves substantial student presentations). Students are encouraged to take BPSC 200A and BPSC 200B to substitute for one BPSC 240.

Plan II (Comprehensive Examination)

1. **Three courses from Section I are required.** Students who have taken courses comparable to those in Section I during their baccalaureate training may have a portion or all of this section waived. In such instances, however, it is expected that their programs include increased units in courses from Section II and/or III. Recommendations for waivers should specify alternative courses and should be sent to the educational advisory committee for approval.
2. **Two courses (6 units) from Section II are required.** In fulfilling the Section II requirement, students may use no more than one course cross-listed by Botany and Plant Sciences and another program. If such a cross-listed course is used toward fulfilling the Section II requirement, the same course may not be used toward fulfilling the Section I or III requirements. No more than 4 units may be in professional development courses.
3. **At least 3 courses (11-12 units) from Section III are required.**
4. **Students must complete at least 6 units from Section IV for a research project (297) or literature review (290)**, which should be described in a report to be submitted for evaluation by the comprehensive examination committee.
5. **Comprehensive written and oral examinations**

Seminar Requirement

All full-time students must enroll in the BPSC 250 seminar during each quarter in which it is offered. Part-time students must take one BPSC 250 seminar for every 12 units of courses. All students must present at least one BPSC 250 seminar and complete at least one quarter of BPSC 240 (or approved similar equivalent that involves substantial student presentations). Students are encouraged to take BPSC 200A and BPSC 200B.

Courses available for fulfilling the requirement for the M.S. degree in Plant Biology:

Section I — Upper-division undergraduate courses: ANTH 170/BPSC 170, BCH 153/ BIOL 153/BPSC 153, BCH 183/BPSC 183, BIOL 104/BPSC 104, BIOL 112/BPSC 112/ ENTM 112, BIOL 120/MCBL 120/PLPA 120, BIOL 132/BPSC 132, BIOL 134/PLPA 134, BIOL 138/BPSC 138, BIOL 143/BPSC 143, BIOL 148/BPSC 148, BIOL 155/BPSC 155, BIOL 165/BPSC 165, BPSC 133, BPSC 134/ ENSC 134/, BPSC 135, BPSC 146, BPSC 148, BPSC 150, BPSC 158, BPSC 166

Section II — Graduate and upper-division undergraduate courses in related departments or programs and professional development courses (i.e., BPSC 200A - BPSC 200B).Applicable courses are approved by the Graduate Educational Advisory Committee. A minimum of 6 units of course work is required. No more than 4 units may be from professional development classes.

Section III — BCH 205/BPSC 205/CMDB 205/GEN 205/MCBL 205/PLPA 205, BCH 231/ BPSC 231, BPSC 201 (E-Z) (for a maximum of 2 units), BPSC 210, BPSC 221, BPSC 222,

BPSC 225 (E-Z), BPSC 230, BPSC 231, BPSC 232, BPSC 234, BPSC 237, BPSC 239, BPSC 240 (only if taken in addition to the required seminar units; see seminar requirement), BPSC 243, BPSC 245, BPSC 246, and BPSC 247

Section IV — Research courses: BPSC 290 and BPSC 297

Section V — Thesis research: BPSC 299, Thesis for Plan I

Normative Time to Degree 7 quarters

Doctoral Degree

The Department of Botany and Plant Sciences offers programs leading to the Ph.D. degree in Plant Biology.

The student must meet the general requirements of the Graduate Division.

Admission
Either prior to entering the graduate program or before advancement to candidacy, students must have completed the equivalent of BPSC 104 and one other course from the core plant biology courses (BIOL 107A, BPSC 132, BPSC 135, BPSC 138, BPSC 143, BPSC 146). Course requirements for each student are determined by individual guidance committees and by the educational advisory committee. No later than the second quarter in residence, students meet with a guidance committee to (1) determine a course program to be submitted to the educational advisory committee,and (2) choose a major area of specialization and two minor areas.

Course Work
Guidance committees and students should design individual course programs that meet the specific needs of the student and the requirements of the Ph.D. program. Course programs should prepare students for the qualifying examination and dissertation research. All first-year students must enroll in BPSC 200A and 200B during their first Fall and Spring quarters. Students must take a minimum of 3 graduate-level courses (11-12 units) relevant to the specialization. Graduate courses taken previously may be considered towards fulfilling this requirement. Students' course programs must be approved by the educational advisory committee. At the time of submission of course programs to the educational advisory committee, the area of specialization and two minor areas to be covered on the qualifying examination should be specified. Students may petition to change the course program, area of specialization, or minor areas at any time.

Students entering the Plant Biology Ph.D. program have four choices, as listed below. Students with a general interest in plant biology and/or evolution are encouraged to choose the first.

Ph.D. in Plant Biology
Students who choose to obtain a Ph.D. in Plant Biology without one of the following concentrations are encouraged to – with the advice and consent of their Major Professor and Guidance Committee – select a set of graduate-level courses (11-12 U) that is specifically tailored to their individual research interests and career objectives.

Students can also choose from one of three concentrations:

Ph.D. in Plant Biology (Concentration in Plant Cell, Molecular, and Developmental Biology)
To earn the concentration in Plant Cell, Molecular, and Developmental Biology (appears on the transcript only), students must complete BPSC 231, BPSC 232, and BPSC 237. In addition, the required BPSC 240 course must be on a topic related to the concentration.

Ph.D. in Plant Biology (Concentration in Plant Ecology)
To earn the concentration in Plant Ecology (appears on the transcript only), students must complete BPSC 245, and two additional courses (7-8 units) from the following list: EEOB 211, EEOB 212, EEOB 217, EEOB 230, BPSC 225J, BPSC 243, BPSC 246, BPSC 247, ENTM 241, ENSC 218, ENSC 232, GEO 260, GEO 268 and BPSC 246. In addition, the required BPSC 240 course must be on a topic related to the concentration.

Ph.D. in Plant Biology (Concentration in Plant Genetics)
To earn the concentration in Plant Genetics (appears on the transcript only), students must complete three graduate-level courses (11-12 units) relating to Genetics. Required courses must include two courses from the following list: BPSC 221, BPSC 222, BPSC 225K, BPSC 231, BPSC 234, EEOB 214, BIOL 221/MCBL 221/PLPA 226, GEN 240A. The additional units can be chosen in an area that supports the concentration. In addition, the required BPSC 240 course must be on a topic related to the concentration.

Written and Oral Qualifying Examinations
Advancement to candidacy depends on the student passing written and oral qualifying examinations. The qualifying examination covers the student's area of specialization and two minor areas. Granting of the degree is contingent upon acceptance of the dissertation by the candidate's dissertation committee and satisfactory oral defense of the dissertation.

Seminar Requirement
All candidates must enroll in the BPSC 250 seminar during each quarter in which it is offered until advancement to candidacy. After this time, PhD candidates must enroll in BPSC 250 seminar two quarters per year until conferral of the degree. The dissertation defense is normally presented in the BPSC 250 seminar series; however, if necessary, a special seminar may be scheduled for the defense. Also, students must present at least one BPSC 250 seminar in addition to the defense of the dissertation. All students must complete at least one quarter of BPSC 240 (or approved equivalent that involves substantial student presentations) during the Ph.D. program.

Professional Development Training
Ph.D. graduate students must enroll in BPSC 200A and BPSC 200B to fulfill their professional development training requirement.

Foreign Language Requirement None

Teaching Requirement
Students must obtain at least one quarter of teaching experience.

Normative Time to Degree 15 quarters

Normative Time to Candidacy 2 years

Lower-Division Courses

BPSC 011 Plants and Human Affairs 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): none. An introduction for non-science and non-Botany majors to the importance of plants and plant products in the shaping of human affairs and civilization. Covers the origin and practice of agriculture; the utilization of plant products; the latest agricultural advances, including genetic engineering; and the current agricultural and social issues. Plants and plant products are examined during class demonstrations and exercises.

BPSC 021 California's Cornucopia: Food From the Field to Your Table 5 Lecture, 3 hours; discussion, 1 hour; outside activities, 30 hours per quarter. Prerequisite(s): none Examines California's diverse agricultural products. Addresses related contemporary issues such as crop improvement by biotechnology, climate change, pollution, resource use, and nutrition. Also examines how the interplay of geography, history, and culture shapes the cuisine of a region.

BPSC 031 Spring Wildflowers 4 Lecture, 3 hours; laboratory, 3 hours; one Saturday field trip. Prerequisite(s): none General approach to the study of vegetative and floral features of plants as a means of identification and botanical classification of major plant families in Southern California. Secondary emphasis on the field biology of flowering plants.

BPSC 050 The Evidence For Evolution 4 Lecture, 3 hours; extra reading, 3 hours. Prerequisite(s): none. Introduces and explores the extensive evidence supporting evolution as the driver of biological diversity. Designed for non-science majors and/or those with limited prior knowledge about biology. Includes the scientific method, paleontology, natural selection, genetics, speciation, and the importance of sex. Addresses the broader need for scientific literacy in society. Cross-listed with ENTM 050.

BPSC 097 Lower-Division Research 1 to 4 Individual Study, 3 to 12 hours. Prerequisite(s): consent of instructor. Involves special research projects in plant biology performed under faculty supervision. Requires a final written report. Graded Satisfactory (S) or No Credit (NC). Course is repeatable to a maximum of 6 units.

Upper-Division Courses

BPSC 104 Foundations of Plant Biology 4 Lecture, 3 hours; laboratory, 3 hours. Prerequisite(s): BIOL 005C. A study of the plant world from cells to ecosystems. Examines the structure and function of organisms from the major plant groups and their role in the biosphere. The laboratory explores the unique properties of plants. Cross-listed with BIOL 104.

BPSC 109 Epigenetics 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BIOL 102. Introduction to mechanisms that cause a heritable change in phenotype without a change in the genetic code. Covers DNA modifications, histone modifications, and noncoding RNAs that influence the expression, maintenance,

and inheritance of traits. Discusses impacts of epigenetics on multicellular life, such as learning, memory, disease, and crosstalk with environments.

BPSC 112 Systematics 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BIOL 005C or equivalent. Principles and philosophy of classification. Topics include phylogenetic and phenetic methods, species concepts, taxonomic characters, evolution, hierarchy of categories, and nomenclature. Cross-listed with BIOL 112, and ENTM 112.

BPSC 132 Plant Anatomy 4 Lecture, 3 hours; laboratory, 3 hours. Prerequisite(s): BIOL 005A and BIOL 005B; BPSC 104 or BIOL 104; or consent of instructor. Functional and developmental aspects of plant cell, tissue, and organ structure. Covers all aspects of the flowering plant life cycle from germination to pollination and fruit and seed development. Cross-listed with BIOL 132.

BPSC 133 Taxonomy of Flowering Plants 5 Lecture, 3 hours; laboratory, 3 hours; three 1-day Saturday field trips. Prerequisite(s): BIOL 005C. Introduces the principles and methods of identifying, naming, and classifying flowering plants. Surveys selected flowering plant families in California and shows their interrelationships.

BPSC 134 Soil Conditions and Plant Growth 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BIOL 104/BPSC 104 or ENSC 100; or consent of instructor. A study of the chemical, physical, and biological properties of soils and their influence on plant growth and development. Topics include soil-plant water relations; fundamentals of plant mineral nutrition; soil nutrient pools and cycles; soil acidity, alkalinity, salinity, and sodicity; root symbioses; and rhizosphere processes. Cross-listed with ENSC 134.

BPSC 135 Plant Cell Biology 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BIOL 005C; BCH 100 or BCH 110A; or consent of instructor. Explores concepts of dynamic plant cell structures and functions as revealed by modern technologies such as genetic manipulation and live-imaging of cellular structures and molecules.

BPSC 138 Plant Developmental Morphology 4 Lecture, 3 hours; laboratory, 3 hours. Prerequisite(s): BCH 100 or BCH 110A or BCH 110HA (BCH 100 or BCH 110A or BCH 110HA may be taken concurrently), BIOL 005B, BIOL 005C, CHEM 008C and CHEM 08LC or CHEM 08HC and CHEM 08HLC, PHYS 002C or PHYS 02HC, PHYS 002LC or PHYS 02HLC; or consent of instructor. Introduces the key areas of research in plant morphology and developmental biology. Emphasizes flowering plants (angiosperms). Cross-listed with BIOL 138.

BPSC 143 Plant Physiology 4 Lecture, 3 hours; laboratory, 3 hours. Prerequisite(s): BIOL 005A, BIOL 005B, BIOL 005C, CHEM 001C or CHEM 01HC, CHEM 008C and CHEM 08LC or CHEM 08HC and CHEM 08HLC, MATH 007B or MATH 009B or MATH 09HB, PHYS 002C or PHYS 02HC, PHYS 02LC or PHYS 02HLC, BCH 100 or BCH 110A or BCH 110HA (BCH 100 or BCH 110A or BCH 110HA may be taken concurrently), BIOL 104/BPSC 104; or consent of instructor. A survey of the fundamental principles of plant physiology including photosynthesis, respiration, water relations, mineral nutrition, growth, morphogenesis, plant hormones, dormancy, and senescence. Cross-listed with BIOL 143.

BPSC 146 Plant Ecology 4 Lecture, 3 hours; laboratory, 18 hours per quarter; field trip, 12 hours per quarter. Prerequisite(s): BIOL 104/BPSC 104 or BIOL 116; STAT 100A; or consent of instructor. A study of the fundamentals of plant ecology. Emphasizes community ecology, environment, life histories, population dynamics, species interactions, succession, ecosystem and landscape ecology, and plant conservation ecology.

BPSC 148 Quantitative Genetics 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BIOL 005A, BIOL 05LA, BIOL 005B, BIOL 005C, BIOL 102, CHEM 001C or CHEM 01HC, CHEM 008C and CHEM 08LC or CHEM 08HC and CHEM 08HLC, MATH 007B or MATH 009B or MATH 09HB, PHYS 002C or PHYS 02HC, PHYS 02LC or PHYS 02HLC, BCH 100 or BCH 110A or BCH 110HA, STAT 100B; or consent of instructor. Examines approaches to studying the genetic basis of polygenic, metric traits. Includes types of gene action, partitioning of variance, response to selection, and inferring the number and location of quantitative trait loci. Cross-listed with BIOL 148.

BPSC 150 Genes, Selection, and Populations 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BIOL 102 with a grade of "C-" or better, upper-division standing; or consent of instructor. Considers the conscious manipulation of allelic frequencies in populations as the basis for domestication of crop and animal species. Examines the genetic basis and standard strategies for the improvement of targeted characteristics in populations of plants and animals through selection and introgression of specific genes and gene constructs.

BPSC 155 Chromosomes 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BIOL 005A, BIOL 005B, BIOL 005C, CHEM 001C or CHEM 01HC, CHEM 008C and CHEM 08LC or CHEM 08HC and CHEM 08HLC, MATH 007B or MATH 009B or MATH 09HB, PHYS 002C or 02HC, PHYS 02LC or PHYS 02HLC, BCH 100 or BCH 110A or BCH 110HA (BCH 100 or BCH 110A or BCH 110HA may be taken concurrently); or consent of instructor. An examination of the structure, function, and behavior of eukaryotic chromosomes. Cross-listed with BIOL 155.

BPSC 158 Subtropical and Tropical Horticulture 4 Lecture, 4 hours; occasional field trips. Prerequisite(s): BIOL 005C or BIOL 104/BPSC 104 or consent of instructor. Studies the important subtropical and tropical crops of the world, emphasizing fruits, including citrus and avocado, with special reference to their botany, germplasm resources, climatic adaptation, and culture.

BPSC 165 Restoration Ecology 4 Lecture, 3 hours; two 1-day field trips; three half-day field trips. Prerequisite(s): BIOL 104/BPSC 104 or BIOL 116 or ENSC 100; CHEM 008A and CHEM 08LA or CHEM 08HA and CHEM 08HLA; CHEM 008B and CHEM 08LB or CHEM 08HB and CHEM 08HLB; STAT 100A (STAT 100A may be taken concurrently); or consent of instructor. BIOL 102 and CHEM 008C are recommended. An examination of the basic ecological principles related to land restoration. Topics include enhanced succession, plant establishment, plant adaptations, ecotypes, weed colonization and competition, nutrient cycling, functions and reintroduction of soil microorganisms, restoration for wildlife, and the determination of successful restoration. Includes field trips to restored sites. Cross-listed with BIOL 165.

BPSC 166 Plant Physiological Ecology 4 Lecture, 3 hours; workshop, 1 hour. Prerequisite(s): BIOL 005C or consent of instructor; university-level courses in mathematics, physics, and chemistry are recommended. Topics include plant responses to light, temperature, evaporative demand, and limiting soil conditions. Explores photosynthesis, plant-water relations, and plant-temperature relations. Gives attention to plant adaptation to climates with varying aridity and temperature extremes.

BPSC 170 Ethnobotany 4 Lecture, 2 hours; seminar, 1 hour; discussion, 1 hour. Prerequisite(s): BIOL 104/BPSC 104 or consent of instructor. Introduces students to ethnobotanical research by reviewing selected ethnobotanical studies. Topics covered by lectures include fundamental principles of ethnobotany, the search for new medicines and other products made from plants, the role of humans in plant evolution, and the impact of plants on human cultures. Discussions focus on the past and present role of humans in plant conservation and the search for sustainable management practices in agriculture and forestry. Seminars by invited guests and enrolled students present selected topics in ethnobotany. Cross-listed with ANTH 170.

BPSC 183 Plant Biochemistry and Pharmacology of Plant Metabolites 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BCH 110A or BCH 110HA, BCH 110B or BCH 110HB; or BCH 100; or consent of instructor. Explores plant biochemistry and the significance of plant metabolites in medicine and pharmacology. Focuses on biotechnology, medicinal plants, and plant-derived drugs as well as the biochemical and pharmacological mode-of-action of secondary plant metabolites. Also addresses plant-specific biochemical processes such as photosynthesis. Cross-listed with BCH 183.

BPSC 185 Molecular Evolution 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BIOL 105 or BIOL 107A or consent of instructor; BIOL 108 is recommended. Explores the evolution of genes, proteins, and genomes at the molecular level. Focuses on the processes that drive molecular evolutionary change. Covers basic methodological tools for comparative and phylogenetic analyses of molecular data from an evolutionary perspective.

BPSC 190 Special Studies 1 to 5 variable hours. Library, laboratory or field work designed to meet special curricular needs. A written proposal signed by the supervising faculty member must be approved by the major advisor and the Department Vice Chair. A written report

must be filed. Course is repeatable, but total credit toward graduation may not exceed 6 units.

BPSC 191 Seminar in Agricultural Careers in the 21st Century 1 Seminar, 1 hour. Prerequisite(s): sophomore or junior standing; or consent of instructor. Introduces students to diverse career options in agriculture and biotechnology through seminars and interviews with industry, government, and academic professionals. Develops skillsets for finding and acquiring jobs in agricultural and biotechnology. Graded Satisfactory (S) or No Credit (NC)

BPSC 193 Senior Seminar 2 Seminar, 1 hour; lecture, 1 hour. Prerequisite(s): senior standing in Plant Biology. Emphasizes thinking across hierarchical levels and understanding structure-function relationships in plant biology. Includes lectures by instructors and presentation of classical or landmark papers by students. Satisfactory (S) or No Credit (NC) grading is not available.

BPSC 195H Senior Honors Thesis 1 to 4 Thesis, 3 to 12 hours. Prerequisite(s): upper division standing; admission to the University Honors Program or consent of instructor. Directed research and completion of a senior Honors thesis under the supervision of a faculty member. Course is repeatable to a maximum of 12 units.

BPSC 197 Research For Undergraduates 1 to 4 Research, 3 to 12 hours. Prerequisite(s): upper-division standing; consent of instructor. Individual research conducted under the direction of a Botany and Plant Sciences faculty member. A written proposal must be approved by the supervising faculty member and undergraduate advisor. A written report must be filed with the supervising faculty member at the end of the quarter. Course is repeatable.

BPSC 198I Individual Internship in Botany and Plant Sciences 1 to 12 Internship, 2 to 24 hours; written work, 1 to 12 hours. Prerequisite(s): upper-division standing; consent of instructor. An off-campus internship related to plant biology. The student conducts the internship in the public or private sector but is jointly supervised by an off-campus sponsor and a faculty member in Botany and Plant Sciences. Requires an initial written proposal and a final written report. Graded Satisfactory (S) or No Credit (NC). Course is repeatable to a maximum of 12 units.

BPSC 199 Senior Research 2 to 4 Laboratory, 6 to 12 hours.Prerequisite(s): senior status; a GPA of 3.2 or better in upper-division courses in Botany/Plant Science and Biology; or consent of instructor. Individual research on a problem relating to Botany/Plant Science. A written proposal signed by the supervising faculty member must be approved by the major advisor and the Department Vice Chair. A written report must be filed with the supervising faculty member. Course is repeatable, but total credit toward graduation may not exceed 9 units.

Graduate Courses

BPSC 200A Plant Biology Core 2 Lecture, 1 hour; practicum, 3 hours. Prerequisite(s): graduate standing in Plant Biology or consent of instructor. Explores plant biology research approaches. Emphasizes critical thinking and advanced planning of hypothesis testing, as well as experimental/descriptive/theoretical caveats, trade-offs, and options. Presents topics in a case-study approach. Also addresses professional development.

BPSC 200B Plant Biology Core 2 Lecture, 1 hour; practicum, 3 hours. Prerequisite(s): BPSC 200A. Builds on material covered in BPSC 200A. Focuses on creating complete grant proposals based upon the guidelines of an actual funding source. Presents topics in a case-study approach. Includes peer review of completed proposals.

BPSC 201 (E-Z) Plant Molecular Biology 1 to 2 Laboratory, 3 hours. Prerequisite(s): graduate standing. Explores the theory and principles of instruments and laboratory techniques applicable to research in the plant sciences. Experiments provide experience in the use of laboratory instruments and techniques including applications and limitations. E. Plant Molecular Biology; F. Applied Ecological Modelg Lab; G. Plant Systematics; I. Plant Microscopy; J. Plant Physiology; K. Plant Genetics; M. Plant Cell Biology; N. Plant Cytogenetics; Course is repeatable to a maximum of units.

BPSC 205 Signal Transduction Pathways in Microbes and Plants 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): graduate standing in the biological sciences, BIOL 107A or BIOL 113 or BIOL 114 or CBNS 101; or consent of instructor. Advanced topics in signal transduction pathways that regulate growth and development in plants and prokaryotic and eukaryotic microbes. Areas covered include two-component regulatory systems; quorum sensing; signaling via small and heterotrimeric G proteins; mitogen-activated protein kinase cascades; cAMP signaling; photoreceptors; plant hormone signaling; responses to low-oxygen stress; calcium signaling; and plant pathogenesis. Cross-listed with CMDB 205, BCH 205, GEN 205, MCBL 205, and PLPA 205.

BPSC 210 Methods in Arabidopsis Research 4 Lecture, 1 hour; discussion, 1 hour; laboratory, 6 hours. Prerequisite(s): BCH 110C or BCH 110HC or BIOL 107A; BIOL 102; consent of instructor. A study of modern techniques used in Arabidopsis research. Topics include plant growth conditions, pest control, genetic crosses, chemical and insertional mutagenesis, genetic mapping techniques, nucleic acid isolation and manipulation, transformation, and internet resources.

BPSC 221 Advanced Plant Breeding 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BIOL 148/BPSC 148 or consent of instructor; BPSC 150. Advanced treatment of plant breeding theory and practice including development and use of information on inheritance of traits; choice of breeding plans; breeding for yield, quality, and disease and stress resistance; and use of biotechnology.

BPSC 222 Origins of Agriculture and Crop Evolution 3 Lecture, 3 hours. Prerequisite(s): BIOL 102, BIOL 104/BPSC 104; or consent of instructor. Analysis of origins of agriculture in the Near East, China, the New World, and Africa. Survey of domestication and evolution of major crop plants and animals.

BPSC 225 (E-Z) Advanced Topics in Plant Biology 2 Lecture, 2 hours. Prerequisite(s): graduate standing. An in-depth examination of selected topics in plant biology. E. Agricultural Plant Biology; F. Applied Ecological Modeling; G. Plant Development; I. Plant Evolution & Systematics; J. Ecological Statistics; K. Molec Basis Crop Domestication; M. Plant Molecular Biology; N. Plant Biochemistry & Physiology; Course is repeatable to a maximum of units.

BPSC 230 Molecular Plant-Microbial Interactions 3 Lecture, 2 hours; discussion, 1 hour. Prerequisite(s): BCH 100, BIOL 120/ MCBL 120/PLPA 120, or equivalents. A study of the physiology of host-pathogen interactions with emphasis on the metabolism of diseased plants, nature of pathogenicity, and defense mechanisms in plants. Cross-listed with PLPA 230, CMDB 230, and GEN 230.

BPSC 231 The Plant Genome 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BCH 100, BIOL 107A; or BCH 110A or BCH 110HA, BCH 110B or BCH 110HB, BCH 110C or BCH 110HC; or consent of instructor. Gives students an appreciation for the structure of the plant nuclear, chloroplast, and mitochondrial genomes. Gene structure, regulation of gene expression, transposons, and methods of gene introduction are also emphasized. Cross-listed with BCH 231.

BPSC 232 Plant Development 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BCH 110C or BCH 110HC or BIOL 107A; BIOL 102; BIOL 104/BPSC 104; or consent of instructor. An examination of plant development, with emphasis on the genetic mechanisms used in patterning plant forms. Topics are taken from current literature and focus on molecular and cellular mechanisms.

BPSC 234 Statistical Genomics 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BIOL 102, STAT 231B; or consent of instructor. Examines statistical methods of genome analysis. Topics include screening for genetic markers, linkage analysis, linkage disequilibrium, and mapping genes for complex diseases and quantitative traits. Covers statistical techniques including analysis of least squares and maximum likelihood, Bayesian analysis, and Markov chain Monte Carlo algorithm. Cross-listed with GEN 234.

BPSC 237 Plant Cell Biology 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BIOL 107A or BIOL 143/BPSC 143 or BCH 100 or CBNS 101 or their equivalents, or consent of instructor. Studies the structure, function, and dynamics of plant cell division, expansion, and specialization. Emphasis on aspects unique to plants including cytoskeletal and cell plate dynamics during cytokinesis; intracellular trafficking and wall-dynamics during expansion; and targeting to chloroplasts and vacuoles during specialization.

BPSC 239 Advanced Plant Physiology 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BIOL 143/BPSC 143 or consent of instructor. Examines advances in plant physiology, with emphasis on carbon and nitrogen metabolism, mineral nutrition, solute transport and phloem translocation, plant growth regulators, and secondary compounds in relation

to growth and development.

BPSC 240 Special Topics in Plant Biology 2 Seminar, 2 hours. Prerequisite(s): graduate standing; or consent of instructor. Discussion of current literature within special areas of plant science. Graded Satisfactory (S) or No Credit (NC). Course is repeatable as content or topic changes.

BPSC 243 Plant Physiological Ecology 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BIOL 143/BPSC 143; BPSC 146 or equivalent; or consent of instructor. Analyzes adaptations and responses of plants to their environment, with emphasis on the physical environment, photosynthesis, temperature and water relations, growth and allocation, and plant interactions.

BPSC 245 Advanced Plant Ecology 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): MATH 009C or MATH 09HC; STAT 110 or STAT 231A or equivalent; an undergraduate course in ecology; or consent of instructor. Explores the fundamental ecological concepts, theoretical developments, quantitative methods, and experimental results involved in multiscale plant ecological studies. Emphasizes plant strategies, vegetation processes, ecosystem properties, and terrestrial landscapes and their interaction with environmental change and human land use.

BPSC 246 Landscape Ecology 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BIOL 116 or BPSC 146; STAT 231A; or consent of instructor. Introduces landscape ecology both as a sub-discipline of ecology and an interdisciplinary approach for environmental research. Includes identification of spatial patterns, pattern-process relationships, and scaling. Analyzes population, community, and ecosystem dynamics in connection with landscape functioning. Evaluates landscape theory and methods for applications in species conservation, pollution, and climate changes.

BPSC 247 Ecological Theory and Modeling 4 Lecture, 2 hours; discussion, 2 hours. Prerequisite(s): MATH 009C or MATH 09HC; STAT 110 or STAT 231B or equivalent; an undergraduate course in ecology; or consent of instructor. Explores the fundamental ecological theory and modeling methodology with emphasis on the ecosystem and landscape levels. Synthesizes current research developments in the context of their classic works.

BPSC 250 Seminar in Plant Biology 1 Seminar, 1 hour. Prerequisite(s): graduate standing or consent of instructor. Intensive study of selected topics in plant biology. Includes lectures by students, faculty, and invited scholars on subjects related to the principles of plant biology. Students who present a seminar receive a letter grade; other students receive a Satisfactory (S) or No Credit (NC) grade. Course is repeatable.

BPSC 252 Special Topics in Botany/Plant Science 1 Seminar, 1 hour. Prerequisite(s): graduate standing and consent of instructor. Oral presentations and intensive small-group discussion of selected topics in the area of special competence of each staff member. Course content will emphasize recent advances in the special topic area and will vary accordingly. Graded Satisfactory (S) or No Credit (NC). Course is repeatable.

BPSC 261 Seminar in Genetics, Genomics, and Bioinformatics 1 Seminar, 1 hour. Prerequisite(s): graduate standing or consent of instructor. Oral reports by visiting scholars, faculty, and students on current research topics in Genetics, Genomics, and Bioinformatics. Graded Satisfactory (S) or No Credit (NC). Course is repeatable. Cross-listed with BCH 261, BIOL 261, ENTM 261, PLPA 261, and GEN 261.

BPSC 290 Directed Studies 1 to 6 Individual Study, 3 to 18 hours. Prerequisite(s): consent of instructor. Library, laboratory, or field studies conducted under the direction of a faculty member. Designed to meet specific curricular needs in areas of plant biology not covered by formal course work and outside of required directed dissertation or thesis research. Not intended to replace BPSC 297 or BPSC 299.

BPSC 291 Individual Study in Coordinated Areas 1 to 6 Prerequisite(s): graduate standing. A program of study designed to advise and assist candidates who are preparing for examinations. Up to 6 units may be taken prior to the master's degree. Up to 12 units may be taken prior to advancement to candidacy for the Ph.D. Graded Satisfactory (S) or No Credit (NC). Course is repeatable upon recommendation of the instructor.

BPSC 292 Concurrent and Advanced Studies in Botany and Plant Sciences 1 to 4 Research, 3 to 12 hours. Prerequisite(s): consent of instructor. Elected concurrently with an appropriate undergraduate course, but on an individual basis. Devoted to one or more graduate projects based on research and criticism related to the course. Faculty guidance and evaluation is provided throughout the quarter.

BPSC 297 Directed Research 1 to 6 Research, 3 to 18 hours. Prerequisite(s): graduate standing or consent of instructor. Individual research conducted under the direction of a Botany and Plant Sciences faculty member. Graded Satisfactory (S) or No Credit (NC). Course is repeatable.

BPSC 299 Research For Thesis Or Dissertation 1 to 12 Thesis, 3 to 36 hours. Prerequisite(s): graduate standing. Original research in an area selected for the advanced degree. Graded Satisfactory (S) or No Credit (NC). Course is repeatable.

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