

I. Admission Requirements

- A. Courses for those seeking the Ph.D., M.S., M.S./Ph.D.
 - 1. General Biology with laboratory (2 terms required)
 - 2. General Chemistry with laboratory (2 terms required)
 - 3. Organic Chemistry (1 term required, 2 recommended)
 - 4. Genetics
 - 5. A course in Plant Biology (e.g. Botany, Physiology, or Ecology)
 - 6. Calculus (1 term required, 2 recommended)
 - 7. Physics (1 term required, 2 recommended)

- B. Courses for those seeking the Applied M.S. (This option is meant to terminate with the M.S. degree)
 - 1. General Biology with laboratory (2 terms required)
 - 2. General Chemistry with laboratory (2 terms required)
 - 3. Organic Chemistry (1 term required, 2 recommended)
 - 4. Two Plant Science courses from the following: Genetics, Plant Physiology, Taxonomy, Plant Pathology, Ecology
 - 5. One course in either Calculus or Statistics
 - 6. One course in Physics, Geology or Soils

- C. Lack of an admission requirement may be made up without credit early in a graduate student's curriculum. In certain cases, course requirements can be modified or waived upon approval of the admission committee with the consultation of the faculty advisor or track coordinator.

- D. Academic record and test scores:
 - 1. A minimum GPA of 3.0 is required.
 - 2. The Graduate Record Examination (GRE) (Verbal, Quantitative and Analytic) and Test of English as Foreign Language (TOEFL) or International English Language Testing System (IELTS) are required for admission. Minimum scores for the GRE: 500 Verbal, 600 Quantitative, 4 Writing. A Graduate Record Examination Advanced Test in an appropriate subject such as Biology, Biochemistry, or Cell & Molecular Biology, is strongly recommended, but not required. Minimum scores for the TOEFL (IBT): 22 writing, 21 reading, 17 listening, 23 speaking with a total of 83. The minimum for the IELTS is 7.0.

II. Degrees Offered

- A. Master of Science (M.S.)
 - 1. M.S. with thesis
 - 2. Applied M.S. with thesis (in the applied areas, such as Horticulture and Plant Technology)
 - 3. M.S. without thesis (usually terminal in this program)
- B. Doctor of Philosophy (Ph.D.)

III. Degree Requirements

- A. Minimum Number of Credits
 - 1. Courses (400 level or higher)
 - a. M.S. with thesis - 26 (including up to 3 credits of lab rotation)
 - b. M.S. without thesis - 31
 - c. Ph.D. - 32 (including up to 6 credits of lab rotation)
 - 2. Research
 - a. M.S. with thesis - 6
 - b. M.S. without thesis - topic research and presentation of one paper -1
 - c. Ph.D. - 34
 - 3. The total minimum number of credits for the Ph.D. is 72. (Six credits in course/research to be determined by the student and their committee). **The maximum number of credits with a grade of C or C + is 6. The rest of the credits must be B or better.**
 - 4. **The minimum cumulative average for graduation is 3.0 (B) for all courses taken at Rutgers University after admission into the Plant Biology program as a matriculated student.** A student may elect to include grades from 400 and 500 level courses taken at Rutgers while a non-matriculated student in his/her official cumulative average.

5. A student who receives a term average below 3.0 or whose cumulative average falls below 3.0 will be placed on academic probation for the next term. A student who is on academic probation for two consecutive semesters can be expelled from the Plant Biology Graduate Program.

6. Students entering the Graduate Program without an advisor will rotate through 2 laboratories of Plant Biology Faculty in their first year. It is expected that the student will identify their home laboratory by the end of the first year.

B. Undergraduate Courses

1. Only 400 level courses are allowed
2. 12 credits maximum for either M.S. or Ph.D.

C. Transfer Credits

1. 8 course credits maximum for M.S. (Maximum 8 non-matriculated)
2. 21 course credits maximum for Ph.D. (Maximum 12 non-matriculated)
3. Courses taken in fulfillment of undergraduate requirements may not be transferred

Transfer of credits toward completion of the M.S. degree is done following the first committee meeting; transfer of credits toward the Ph.D. degree is done following passage of the oral qualifying examination.

D. Subject Matter

Four curriculum tracks are offered:

- a. Horticulture and Plant Technology
- b. Molecular and Cellular Biology
- c. Plant Breeding and Genomics
- d. Plant Pathology

1) Core curriculum

For students in the degree programs of Ph.D., M.S. (Non-applied option) with thesis, and MS without thesis, the core curriculum includes the following four core courses.

Advanced Plant Physiology (16:765:502);
Plant Molecular Biology (16:765:513);
Advanced Plant Systematics (16:215:507);
Principles of Plant Pathology (16:765:531)
and
Introduction to Plant Biology (16:765:501).

For all students in the Applied M.S. with thesis program, the core curriculum includes two of the four required core courses and Introduction to Plant Biology (16:765:501).

2) One additional course is required in each track for ALL students.

Horticulture and Plant Technology -	Applied Plant Sciences Statistics (16:765:522)
Molecular and Cellular Biology	Advanced Plant Genetics (16:765:510)
Plant Breeding and Genomics	Advanced Plant Breeding (16:765:528)
Plant Pathology -	Plant Pathogenesis (16:765:538)

3) A second advanced course is required in each track for Ph.D. students.

Horticulture and Plant Technology -	Plant Disease Clinic (16:765:536)
Molecular and Cellular Biology	Plant Developmental and Cell Biology (16:765:514)
Plant Breeding and Genomics	Advanced Plant Genetics (16:765:510)
Plant Pathology -	Plant Disease Clinic (16:765:536)

The advanced course requirements can be satisfied outside of a student's track at the discretion of the student's advisor and program director. Other course requirements for a given student will be determined by the student's advisor and advisory committee, in consultation with the coordinator of the student's chosen curricular track. The track coordinator should serve as a resource for helping students and committees select proper courses. As such, the track coordinator should be aware of courses scheduled to be taught through this program and through related programs. Students should consult their faculty adviser before registering for classes. All current students are required to register for the coming semester by the early registration deadline printed in the appropriate Schedule of Classes.

4) Other course requirements

For students in the degree programs of Ph.D., M.S.(Non-applied option) with thesis, and MS without these

1. Seminar in Plant Biology
2. Core Seminars in Plant Biology I and II

For all Applied M.S. with thesis

1. Seminar in Plant Biology

Any deviation from these course requirements must be approved in writing by the student's advisor and the program director. Please consult the program website for the appropriate form.

E. Other Requirements

1. Residence: M.S., none. Ph.D., one year minimum.
2. Teaching: At least one term recommended for the Ph.D.
3. Language: None required, at least one recommended.
4. Other: Graduate committees may add requirements as appropriate.

If a student enrolled in the M.S. degree program wished to transfer to the Ph.D. degree program in Plant Biology, then he/she would have to reapply and if, accepted into the Ph.D. program, would need to satisfy **ALL** of the requirements for the Ph.D. track.

F. Graduate Committees

1. M.S.: 3 members minimum- at least 2 from this program, no outside member required.
2. Ph.D.: 4 members minimum- at least 3 from this program, 1 must be from outside this program. The outside member and their contact information should be reported to the Plant Biology Graduate Program Office as soon as they are identified.

G. Qualifying Examination

1. The **written** qualifying examination is comprehensive and focuses on the basics of Plant Biology with emphasis on the core courses described in section III D2. It will be administered by the Qualifying Exam Committee at the end of the second year of a student's entry into the Ph.D. program. Students enrolling in the program during a given Fall semester will take the written qualifying exam as a group. Students may choose to take 3 out of the 4 sections of the written exam providing that they received a B or better in the section they choose not to take.
2. The **oral** qualifying examination must be taken after the written qualifying examination has been passed in its entirety. The oral exam is comprehensive and focuses on the academic track area and all courses to be transferred for credit towards the course requirement. The oral qualifying exam will include a description of the student's proposed dissertation research, which normally constitutes the first part of the exam meeting, and critical examination and discussion of the research proposal. The oral qualifying exam must be taken at least one year (two terms) before the final examination (dissertation defense). **Plant Biology Graduate Students are required to pass the oral examination no later than the end of their third year matriculated in the Ph.D. program.**

IV. Graduate Committee Meetings

- A. The student must bring copies of the following items for each committee member to all meetings of the graduate committee:
 1. A brief curriculum vitae summarizing education, experience, publications, etc.
 2. A list of science and math courses taken, listing institutions and grades received and copy of recent transcript.

It is the student's responsibility to identify an appropriate advisory committee. This should be done in consultation with the student's thesis or dissertation advisor and/or track coordinator as early as possible in the degree program.

M.S. - 3 committee members required (minimum). 2 must be members of the Plant Biology faculty.

Ph.D. - 4 committee members required (minimum). 3 must be members of the Plant Biology faculty. 1 **non-Plant Biology** faculty member required.

B. M.S. with Thesis

1. Meeting 1: It is recommended that this be held no later than the end of the student's second semester of matriculation. It

must be held within 15 months of matriculation. Its purpose is to determine the student's program for the degree, including approval of any courses for which transfer of credit is sought, and to discuss the proposed research problem. The student should prepare and distribute to the committee members **before** the meeting a rather detailed proposal covering background for the projected research, with pertinent bibliography and details of the experimental procedures to be employed.

2. Meeting 2: Final oral examination.

- a. Presentation of the research will be in seminar form, approximately 40-45 minutes long, advertised on bulletin boards and by email a week in advance by the student, and open to the public. Arrangements for the seminar and examination rooms should be done through the program office at least a month in advance of the proposed defense.
- b. Discussion of research will proceed in greater depth after the audience has been dismissed and only the committee remains.
- c. Questions on any topic concerning Plant Biology will be asked. Exam time will be divided about evenly between the research and general subject matter.
- d. This exam cannot take place before the thesis has been written and read by all members of the committee. It must be taken before the particular deadline date set by the Graduate School for the awarding of a May, October, or January degree.

A master's thesis in this program generally includes a body of research that is publishable as a paper in a refereed scientific journal. Such a paper in itself generally does not constitute a thesis. The thesis usually provides more detail in terms of methodology, a more extensive literature review and introduction, a broader discussion of results, and conclusions that may point to future research.

C. M.S. without thesis

1. Meeting 1: Must be held by the end of the student's second semester of matriculation, or as soon as possible after a student has chosen this degree option. Its purpose is to determine the student's program for the degree, including approval of any courses being transferred for credit, and to discuss the subject of the paper to be written. Students should prepare a brief outline of the general topic to be covered and distribute it to the committee members in advance of the meeting.
2. Meeting 2: Final oral examination (Thesis Defense).
 - a. Brief presentation of paper topic, 30 min. maximum. Discussion of paper. Questions on any topic concerning Plant Biology. Exam time will emphasize the general subject matter.
 - b. This exam cannot take place before the paper has been written, read and approved by all members of the committee. It must be taken before the particular deadline date set by the Graduate School for the awarding of a May, October or January degree.

The non-thesis master's paper generally represents a thorough review of a subject area of particular interest to a student. It may include results of research performed by the student, but deemed insufficient for submission as a master's thesis.

D. Ph.D.

1. Meeting 1: It is recommended that this be held no later than the end of the student's second semester of matriculation. It must be held within 15 months of matriculation. Its purpose is to determine the student's program for the degree, including discussion and preliminary approval of any courses for which transfer of credit is sought, and discussion of the proposed research problem.
2. Meeting 2: Oral qualifying examination. Must be taken after a student has completed most of the course requirements, and after the written qualifying examination. It must be taken by the end of the third year, and should be at least one year before the degree is to be awarded. This meeting includes, but is not limited to, defense of the dissertation proposal. Academic and research requirements for the degree should be defined at this meeting.
3. Meeting 3: Finalizing dissertation requirements. Although a formal meeting is not required, it is suggested that a student meet with committee members before the writing process begins to ensure that all research expectations of individual

committee members have been met, and to approve the dissertation format. This can often be done most easily in the context of a 30-45 minute meeting.

4. Meeting 4: Final oral examination (Dissertation Defense).
 - a. Presentation of the research will be in seminar form, 40-50 min. long, advertised on bulletin boards and by e-mail a week in advance and open to the public. Arrangements for the seminar and examination rooms should be done through the program office at least a month in advance of the proposed defense.
 - b. Discussion of research: the formal presentation will be open to questions from anyone in attendance. After the audience has been dismissed and only the committee remains, questions on the research and on topics related to the research may be continued.
 - c. This exam cannot take place before the dissertation has been written, read and approved by all members of the committee. It must be taken before the particular deadline date set by the Graduate School for the awarding of a May, October or January degree. It must be taken at least one year (two terms) after the oral qualifying examination has been passed. The usual procedure is to have the dissertation read and edited at least once by the primary advisor, respond to those editorial comments, and distribute the dissertation to the rest of the committee, at least two weeks (longer is preferred) before the Dissertation defense seminar.

A Doctoral dissertation in this program generally includes a body of research that is publishable as a paper or papers in a refereed scientific journal. Such a paper(s) generally do not constitute a dissertation. The dissertation usually provides more detail in terms of methodology, a more extensive literature review and introduction, a broad discussion of results, and conclusions that may point to future research.

E. M.S. and Ph.D.

1. Continuation to the Ph.D. following completion of the M.S. is not automatic. Admission to the Ph.D. program must be approved by the Admissions Committee of the Plant Biology Program. The exam committee should be informed before the exam commences so that the committee can help judge whether the student should be admitted to the Ph.D. program. Following the exam, the committee chair should write a short letter of evaluation, recommend the student for continuation into the Ph.D. program if appropriate.

Dissertations must be written in compliance with the rules of the Graduate School of New Brunswick, Rutgers, The State University of New Jersey.

V. Seminars

- A. There are two weekly seminar series at times determined at the start of each semester. One series will be primarily for presentations by invited speakers and faculty; the other will be primarily for student presentations. **All** full-time students and those part-time students who can attend are **expected** to do so regularly for each semester of matriculation.
- B. Credit in the "Seminar in Plant Biology" course requires presentation of a seminar and poster to the program. Thesis or dissertation defense seminars do not constitute seminars for course credit. In some circumstances, a student's research may be included as a component of a seminar for course credit, but it is not intended that these seminars be personal research presentations. Approval of seminar topic is by the faculty member in charge of the seminar series.

VI. Forms and Fees

- A. These are the student's responsibility entirely.
- B. The regulations of the Graduate School must be followed. Graduate School or University requirements always supersede Graduate Program requirements. Since the Graduate School regulations change from time to time, it is important that the student keep informed and up-to-date by consulting the graduate catalogue and the Graduate School Office. All forms are obtained online. One copy is returned to the Plant Biology Office. The original is taken to the Graduate School Office, College Avenue Campus.
- C. M.S.
 1. After the first committee meeting: if credits are to be transferred, obtain forms for transfer of credit, fill in, get appropriate transcript, have signed by Graduate Director, return one copy to the Plant Biology Office, turn in three copies to the Graduate School.

2. Semester in which degree is to be awarded:

- a. Early in semester: obtain M.S. candidacy form, fill out, have signed by Graduate Director, return copy to Plant Biology Office. File original with the Graduate School, College Avenue Campus. This admits student to candidacy for M.S. when approved. Obtain booklet giving instructions for preparation of thesis. File diploma application and pay graduation fee before deadline date set by Graduate School (approximately mid-semester).
- b. Prior to final exam, pick up form submitted earlier at Graduate School. Upon completion of exam, have form signed by committee members, file copy with Plant Biology Office, return original to Graduate School immediately (3 weeks before Graduate School deadline date).
- c. Turn in two copies of thesis, prepared according to instructions in the Graduate School "Style Guide" booklet, by deadline date set by Graduate School. The copies must be signed by all committee members (3 weeks before Graduate School deadline date). File abstract and title page with the Graduate Plant Biology Office.

D. Ph.D.

1. Prior to oral qualifying exam: obtain Ph.D. candidacy form, fill out, have available at exam to be signed by committee members, have signed by the Graduate Program Director, return copy to Plant Biology Office, file original with the Graduate School. This admits student to candidacy for Ph.D. when approved.
2. If credits are to be transferred, obtain form for transfer of credit, fill in, get appropriate transcript(s), have signed by Graduate Director, return to Plant Biology Program Office for processing.
3. Semester in which degree is to be awarded:
 - a. Early in semester: Obtain booklet giving instructions for preparation of dissertation. All students are encouraged to attend one of the Dissertation & Thesis workshops given by the Graduate School. Times and locations are posted outside the Program office and can be found on the Graduate School website.
 - b. File diploma application and pay graduation and dissertation microfilming fees before deadline date set by Graduate School (approximately mid-semester).
 - c. Prior to final exam: pick up candidacy form submitted after qualifying exam, have signed by committee at time of exam, file copy with Plant Biology Office, return original to Graduate School immediately (3 weeks before Graduate School deadline date).
 - d. Turn in two copies of dissertation, prepared according to instructions in the "Style Guide" booklet provided by the Graduate School, by deadline date set by Graduate School. The copies must be signed by all committee members (at least 3 weeks before Graduate School deadline date). File abstract and title page with the Plant Biology Graduate Program Office.

VII. Time Requirements

A. Time Limits for Completion of Degrees

1. M.S. - 3 years full-time or 5 years part-time
2. Ph.D. - 7 years

- B. A student requesting an extension of time must petition the Executive Council of the Graduate School on a form available from the Graduate School Office.

VIII. Assistantships and Fellowships

When possible, a combination of fellowship, research assistantship, and teaching assistantship funding should be sought to support a student through graduate school. Ideally, every Ph.D. student will serve for at least one year as a teaching assistant.

- A. Teaching and Graduate Research Assistantship appointments are for one year only (normally the academic or calendar year; rarely one semester). Students are required to work an average of 15 hours per week for their assistantship.
- B. Renewal of an appointment is possible but not automatic. New applications must be submitted each year. Renewal depends upon:

1. Availability of assistantship positions.
 2. Satisfactory performance academically.
 3. Satisfactory performance as an assistant.
 4. Number of previous assistantship appointments held; the maximum number of years for which a student will normally be supported is the following:
 - a. Entering with B.S. to M.S. - 3 years
 - b. Entering with M.S. to Ph.D. - 4 years
 - c. Entering with B.S. to Ph.D. - 6 years
- C. Teaching Assistantships serve to train students in this important component of their future professions and to fulfill the needs of the University. Applications for new or renewed teaching assistantships should be acquired through the program office and returned in January for consideration of a Fall assistantship.
- The time limits are to ensure regular and reasonable turnover in the graduate student body. There is no guarantee that a student will be supported until a degree has been completed.
- E. A small number of fellowships are available and may be awarded to the most outstanding students and applicants.

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