

Rutgers, The State University of New Brunswick

Plant Biology Graduate Student Handbook-2019

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 Laborator (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)

Courses for those seeking the Applied M.S.

1. General Biology with Laboratory (2 terms required)
2. General Chemistry with Laborator (2 terms required)
3. Organic Chemistry (1 term required, 2 recommended)
4. Two Plant Science courses from: Genetics, Plant Physiology, Taxonomy, Plant Pathology, Ecology
5. Once course either in Calculus or Statistics
6. One course in Physics, Geology or Soils

B. 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.

C. Academic record and test scores:

1. A minimum **GPA of 3.0** is required

2. The Graduate Record Examination (**GRE**)*

153 or better Verbal

148 or better Quantitative

4 Writing

Required for Ph.D. and exempted for Masters with an undergrad degree from a U.S. University

3. A Graduate Record Examination (GRE) Advanced Test in app.subjects (Recommended not required):

Biology/Biochemistry/or Cell & Molecular Biology

4. Test of English as Foreign Language (**TOEFL**) with minimum scores (IBT):

22 Writing

21 Reading

17 Listening

23 Speaking

83 TOTAL

International English Language Testing System (**IELTS**) with minimum score of 7.0

II. Degree Offered

A. Master of Science (M.S.) with Thesis

1. M.S. with Thesis
2. M.S. without Thesis

B. Doctor of Philosophy (Ph.D.)

III. Degree Requirements (Courses & Credits)

A. Minimum Number of Credits in the Program

1. Courses (400 level or higher)

- * M.S. with thesis - 26 credits
- * M.S. without thesis - 31 credits
- * Ph.D. - 32 credits

2. Research

- * M.S. with thesis - 6 credits
- * M.S. without thesis- topic research and presentation of one paper - 1
- * Ph.D. - 34 credits

3. Additional 6 credits in course or research (Ph.D.)

- * The six additional credits in course/research to be determined by the student and their committee.
- * The total minimum number of credits for the Ph.D. is 72
- * Not more than 6 Credits accepted with a grade of C or C+. The rest of the credits MUST be 'B' or better grade.

4. Cumulative Average for Graduation

- The minimum of 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.

6. Low Cumulative Average

- 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 terms.
- * A student who is on academic probation for two consecutive semesters can be expelled from the Plant Biology Graduate Program.

B. Lab Rotations

- Students entering the Graduate Program without an advisor will rotate through laboratories of Plant Biology Faculty in their first academic year. A student MUST reach out the Faculty Members of interest to setup rotation and timeline. It is expected that the student will identify their home laboratory by the end of the first year.
- * M.S. - up to 3 credits of lab rotation. Maximum 2 Labs
 - * Ph.D. - up to 6 credits of lab rotation i.e. 3/Fall and 3/Spring. Maximum 3 Labs.

C. Credits

Undergraduate Courses

- * Only 400 level courses are allowed
- * 12 credits maximum allowed to be counted towards your degree for either M.S. or Ph.D.

Transfer Credits

- * 8 course credits maximum for M.S. (Maximum 8 non-matriculated)
- * 21 course credits maximum for Ph.D. (Maximum 12 non-matriculated)
- * 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

Five curriculum tracks are offered

1. Horticulture and Plant Technology
2. Molecular and Cellular Biology
3. Plant Breeding and Genomics
4. Plant Pathology
5. Natural Products and Human Health

Core Curriculum:

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

● CORE COURSES

TRACK	COURSES
* Horticulture and Plant Technology	Advanced Plant Physiology (16:765:502)
* Molecular and Cellular Biology	Plant Molecular Biology (16:765:513) (Cross-listed with 11:126:413)
* Plant Breeding and Genomics	Plant Breeding (16:765:529) (Cross-listed with 11:776:406)
* Plant Pathology	Principles of Plant Pathology (16:765:531)
* Natural Products and Human Health	Natural Products & Human Health (16:765:540)

Ph.D. - Three (3) Core Courses are required from above including one from your track.

M.S. w/thesis & without thesis - Three (3) Core Courses are required from above including one from your track.

One additional course is required in your track for **ALL students**:

● TRACK COURSES

TRACK	COURSES
* 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)
* Natural Products and Human Health	Fungi & Human Health (16:765:515)-(Cross-listed with 11:776:415)

● A second advanced TRACK COURSE is required in your track for **Ph.D. students**:

TRACK	COURSES
* Horticulture and Plant Technology	Plant Disease Clinic (16:765:536)
* Molecular and Cellular Biology	Advanced Plant Breeding (16:765:528)
* Plant Breeding and Genomics	Advanced Plant Genetics (16:765:510)
* Plant Pathology	Plant Disease Clinic (16:765:536)
* Natural Products and Human Health	Plant Biochemistry & Metabolism (16:765:520)

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 .

For students in the degree programs of Ph.D., - **Total three (3) Core Seminars are required (matching the core courses)** from below including one from your track. **Core Seminar is NOT required and is optional for Masters.** Core seminars should match the core courses you have taken.

● CORE SEMINARS

TRACK	CORE SEMINARS
* Molecular and Cellular Biology	Core Seminar in Plant Biology - I (16:765:621)
* Horticulture and Plant Technology	Core Seminar in Plant Biology - II (16:765:622)
* Plant Pathology	Core Seminar in Plant Biology - III (16:765:623)
* Plant Breeding and Genomics	Core Seminar in Plant Biology - IV (16:765:624)
* Natural Products and Human Health	Core Seminar in Plant Biology - V (16:765:625)

● ADDITIONAL COURSE REQUIREMENT

For **all students** in the degree programs of Ph.D., OR M.S.

- * Scientific Communications in Plant Biology

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

If a student enrolled in the M.S. degree program wishes 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.

You MUST speak with an advisor and have that individual sign your registration form. If you register over the internet you must still get the advisor's approval; he/she will then send an e-mail to the registrar indicating that you may then be allowed to register.

Qualifying Examination

- **The written qualifying examination** 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.

Five sections will be offered for the written qualifying examination. Students will be required to take three sections, in accordance

with the three-core courses (matching the core seminars) attended during the first two years of the Ph.D. program.

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.

Eligibility take written exam: Any Doctoral Pre-qualifying student planning to sit for the written qualifying exam should make sure of having completed the following core courses and matching seminars:

Enrollment year 2017 onwards - student should have completed following of 3 core courses and matching seminars

Advanced Plant Physiology (16:765:502)		Core Seminar in Plant Biology -II (16:765:622)
Plant Molecular Biology (16:765:513)		Core Seminar in Plant Biology -I (16:765:621)
Plant Breeding(16:765:529)		Core Seminar in Plant Biology -IV (16:765:624)
Principles of Plant Pathology (16:765:531)		Core Seminar in Plant Biology -III (16:765:623)
Natural Products & Human Health (16:765:540)		Core Seminar in Plant Biology -V (16:765:625)

Enrollment year preceding 2017* - student should have completed following of 4 core courses and matching seminars

Advanced Plant Physiology (16:765:502)		Core Seminar in Plant Biology -II (16:765:622)
Plant Molecular Biology (16:765:513)		Core Seminar in Plant Biology -I (16:765:621)
Plant Breeding(16:765:529)		Core Seminar in Plant Biology -IV (16:765:624)
Principles of Plant Pathology (16:765:531)		Core Seminar in Plant Biology -III (16:765:623)
Natural Products & Human Health (16:765:540)		Core Seminar in Plant Biology -V (16:765:625)

*** If a student had a "B" or better in the four core courses then they have the option to choose 3 out of four sections of the exam.**

IV. Seminars

- 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.

V. Graduate Committee & Committee Meetings

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. The decision about the committee members number and approvals are done by the Graduate School New Brunswick (GSNB). Thus whenever there is any change or addition, the student must let the Graduate Program Director and the coordinator know so it can be shared with the GSNB.

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

Ph.D. : The outside member and their contact information should be reported to the Plant Biology Graduate Program Office as soon as they are identified. Complete Committee Member Information Form from Graduate Coordinator (4 committee members required (minimum). 3 must be members of the Plant Biology faculty. 1 non-Plant Biology faculty member required.)

The student must bring copies of the following items for each committee member to all meetings of the graduate committee:

- A brief curriculum vitae summarizing education, experience, publications, etc.
- A list of science and math courses taken, listing institutions and grades received and copy of recent transcript.

M.S. without Thesis

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.

M.S. with Thesis

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.

Link for submission of Electronic Thesis & Dissertation Style Guide: <http://gsnb.rutgers.edu/academics/electronic-thesis-and-dissertation-style-guide>

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.

Link for submission of Electronic Thesis & Dissertation Style Guide: <http://gsnb.rutgers.edu/academics/electronic-thesis-and-dissertation-style-guide>

➔ **Dissertation/Thesis**

<http://gsnb.rutgers.edu/current-students>

VI. Forms and Fees

● These are entirely a student's responsibility.

● 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 themselves informed and up-to-date by consulting the graduate catalogue and the Graduate School Office. All forms can be obtained online. One copy is returned to the Plant Biology Office. The original is taken to the Graduate School Office, College Avenue Campus.

➔ **FORMS link:** <http://gsnb.rutgers.edu/resources/graduate-student-forms>

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 (**M.S. candidacy 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.

Ph.D.

1. 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.
2. 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.
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

Time Limits for Completion of Degrees

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

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:

* Availability of assistantship positions

* Satisfactory performance academically

* Satisfactory performance as an assistant

* Number of previous assistantships 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

d. 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.



PLANT BIOLOGY GRADUATE PROGRAM- Core Curriculum

5 TRACKS

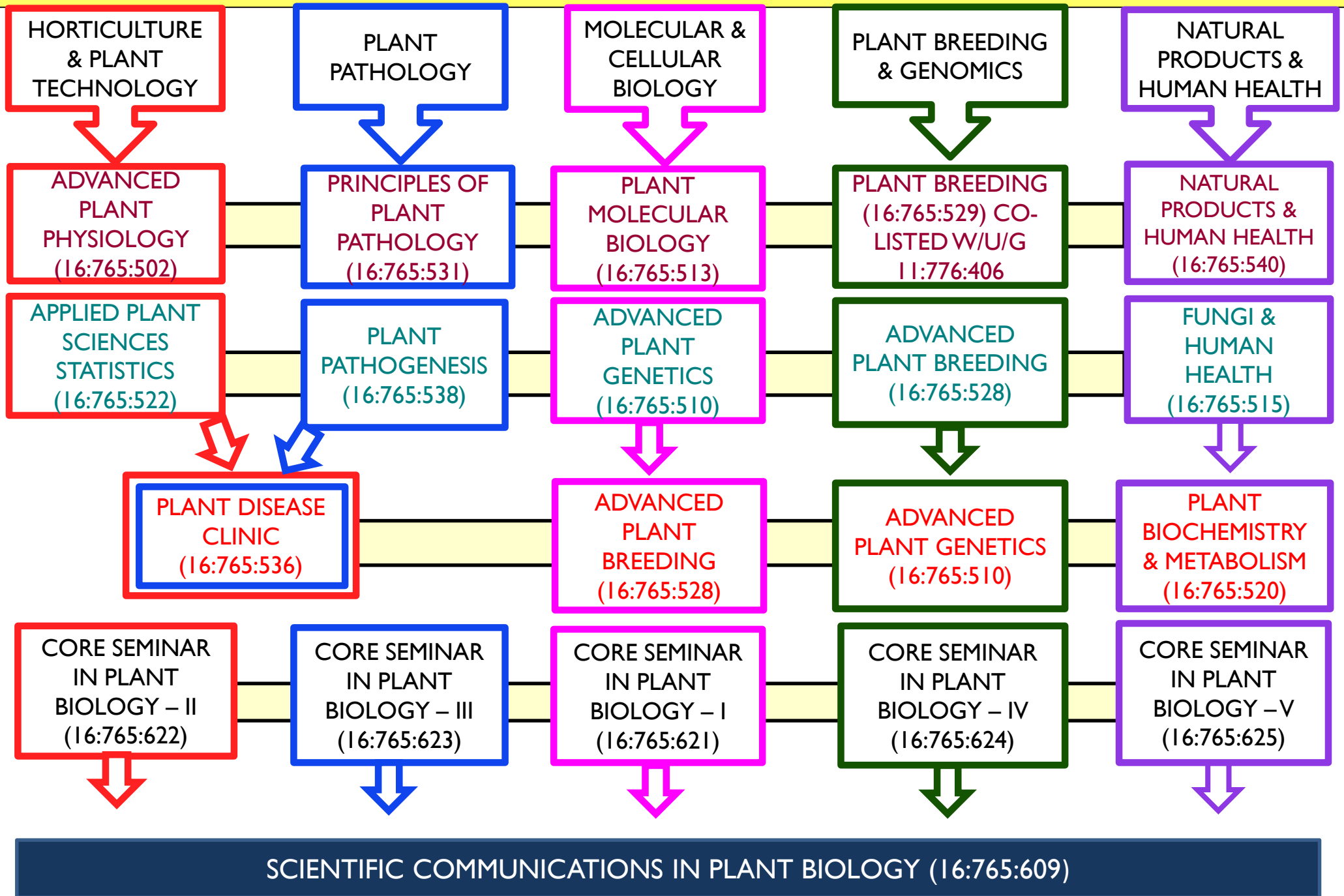
1). Total **THREE (3) CORE COURSES** required (1) one from chosen track & two (2) **Core Courses** from Other Tracks for **ALL students** (Ph.D. & M.S.)

2). One (1) **ADDITIONAL** Course in your chosen track for **ALL students**

3). An **ADVANCED Additional Course** (1) in your chosen track for Ph.D. students

4). Ph.D. students - **CORE SEMINARS** – Total three (3) Core Seminars required (1) one from chosen track, & (2) from Other Tracks (matching your core courses) **Seminars are optional for M.S.**

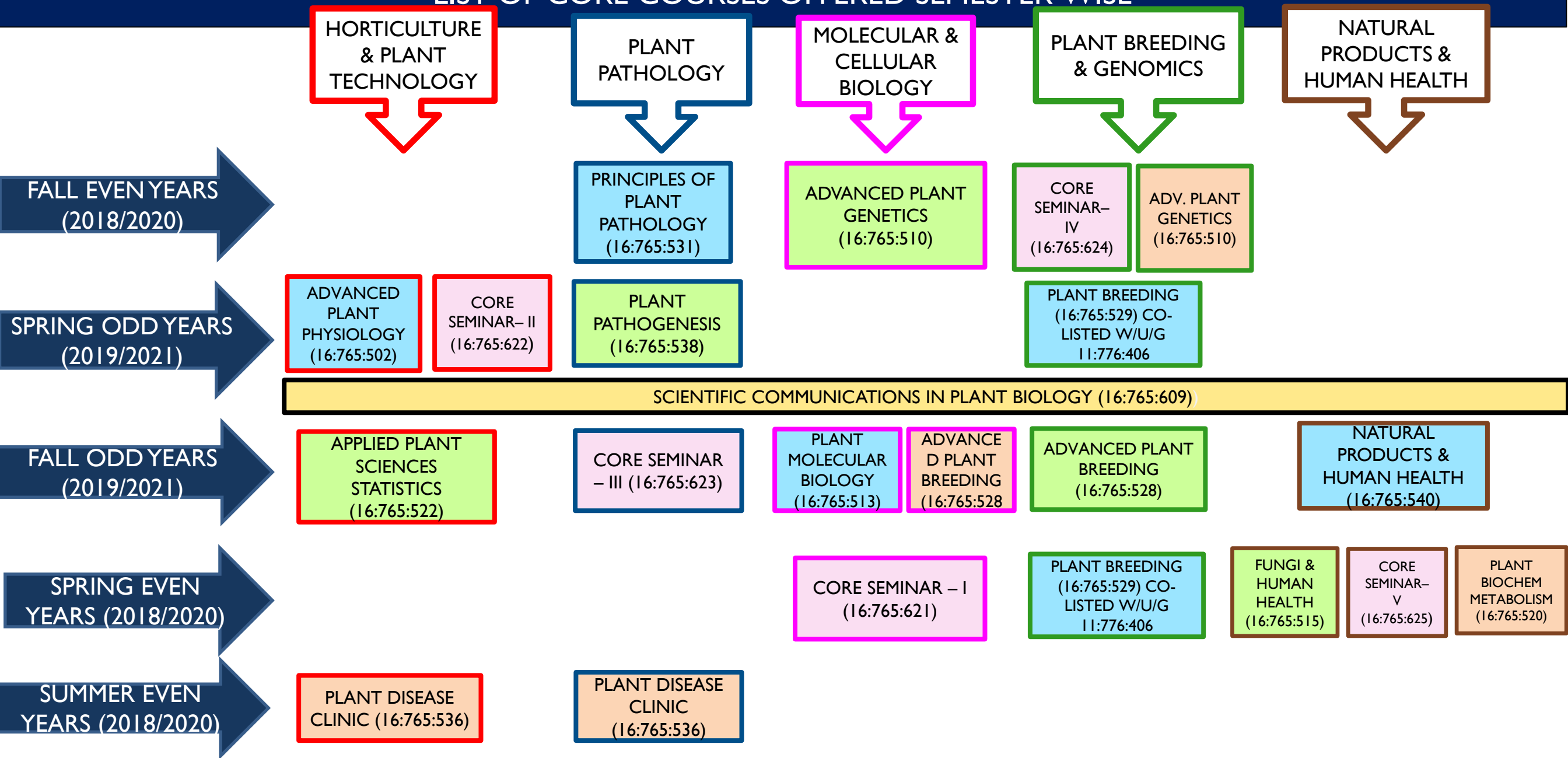
5). Additional Course Requirement for **ALL students**



**Please note the curriculum is subject to change.

PLANT BIOLOGY GRADUATE PROGRAM- CORE CURRICULUM SCHEDULE

LIST OF CORE COURSES OFFERED SEMESTER-WISE



CORE COURSE

ADD.COURSE

2ND ADD. COURSE

CORE SEMINAR

MANDATORY COURSE

**PLEASE NOTE THE CURRICULUM SCHEDULE IS SUBJECT TO CHANGE

PLANT BIOLOGY GRADUATE PROGRAM- SUGGESTED TIME LINE

Suggested Timeline for M.S.

YEAR 1	YEAR 2	YEAR 3
Take all required courses.	Choose a faculty advisor	Make good progress on research projects
Students should be enrolled in 15-16 credits.	Form a committee of 3 faculty members to approve course and research project	Complete research projects
Complete Rotations* (Optional)	Complete all course requirements	Complete and define Thesis

*Students who have not identified faculty advisor

Suggested Timeline for Ph.D.

YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Take all required courses.	Choose a faculty advisor	Form a committee of 4 faculty members to approve research project	Make good progress on research projects	Complete dissertation
Students should be enrolled in 15-16 credits.	Complete all required Courses	Complete oral Qualifying Exam	Complete research projects	Defend for the Degree
Complete 3 Rotations* (Optional)	Take the written Qualifying Exam	Complete all course requirements		
*Students that have not identified faculty advisor				

List of few electives:

- 16:765:522 – Applied Plant Statistics
- 16:765:536 – Plant Disease Clinic
- 16:765:510 - Advanced Plant Genetics
- 16:765:528 – Advanced Plant Breeding
- 16:765:538 - Plant Pathogenesis
- 16:765:585 – Bioinformatics
- 16:765:533 – Advanced Mycology
- 16:765:539 - Advanced Technologies in Biosciences