THE GENETICS MAJOR

STUDENT HANDBOOK

DEPARTMENT OF GENETICS

RUTGERS–NEW BRUNSWICK
School of Arts and Sciences

2024 – 2025 Academic Year

Revised 5/17/24

Table of Contents

I. Introduction to the Major

The Department of Genetics offers students majoring in Genetics the opportunity to work on important research problems with renowned scientists in state-of-the-art laboratories. While these opportunities are only possible in a major research university, Genetics majors still enjoy small class sizes and the personal attention one would expect only at a smaller college.

The Major in Genetics provides an excellent background in the natural sciences within an overall liberal arts curriculum. We provide comprehensive instruction in Mendelian, molecular, evolutionary, statistical, and computational genetics. Students not only learn the terms, concepts, and theories underlying the field of genetics, but also are able to use what they have learned to critically analyze published research as well as conduct their own research. At the end of four years, all students are able to design experiments, conduct the research using the appropriate laboratory techniques, and analyze and interpret their data. They also learn to communicate their discoveries through a written article appropriate for publication in a peer-reviewed journal, as well as through oral presentations and posters appropriate for scientific meetings. Upon completion of our degree, our students are prepared to enter graduate or professional schools, or the life sciences and health professions workforce.

Undergraduate research is the intellectual heart of our major. The Department is committed to teaching science through the way we *do* science - through the process of research and discovery. Every student completes *a minimum* of two semesters of independent scholarship, either laboratory research or independent study, under the direction of a faculty member. Many of our students are authors on researcher papers in leading scientific journals. All undergraduate majors are afforded the independent scholarship opportunities.

Undergraduate students work closely with Genetics faculty members in addition to their research mentor. Upper-level elective courses have small enrollments. In addition, every student is assigned a faculty advisor upon declaring the major. This advisor can discuss course selection and career goals.

The success of our major is documented by the success of our students. Genetics is one of the smaller departments at Rutgers University, but we consistently rank among the top three departments for students completing an Honors thesis. Our majors go on to top graduate and professional schools or obtain technical positions conducting research in industry or academia.

Learning Goals: The curriculum of the Department of Genetics is centered around four main goals. These goals shape our innovative courses and provide the basis for life-long learning.

- Knowledge specific goals: Know the terms, concepts and theories in genetics.
- Integrate the material from multiple courses and research. That is, to think holistically and to see the whole as well as the parts.
- Use genetic information and ideas to critically analyze published research articles in genetics.
- At the end of four years, all our students will be able to design an experiment, carry out the research using the appropriate laboratory techniques and analyze and interpret their data. They will also be able to communicate their discoveries through a written article appropriate for publication in a peer-reviewed Genetics journal, and through talks or posters appropriate for scientific meetings.

This student handbook is meant to be an introduction to students who are considering majoring in Genetics. In addition, it is a quick reference that describes the curriculum and the requirements for conducting and completing the Genetics major. While the department updates this handbook regularly, students should nevertheless check the Genetics Department website or consult with a Genetics Department advisor to obtain information and guidance on the latest policies and procedures.

II. Departmental Contact Information

There are two departmental offices, both of which are located on the Busch campus in two different buildings. The Main Departmental Office, as well as the Human Genetics Institute, is in the Life Sciences Building, 145 Bevier Road, Piscataway, NJ 08854-8082 (henceforth called "LSB"). The Undergraduate Departmental Office is located in the Nelson Biological Laboratories Building, Room B412, 604 Allison Road, Piscataway, NJ 08854-8082 (henceforth called "Nelson").

For most undergraduate administrative questions, students are encouraged to contact the Undergraduate Departmental Office:

Genetics Undergraduate Office
Program Coordinator
Genetics Undergraduate Departmental Office
Nelson B412, Busch Campus
geneticsugd@hginj.rutgers.edu

Students may also contact the Vice Chair for more specific questions concerning the requirements of the major:

Dr. Gary Heiman
Vice Chair & Undergraduate Director
Nelson B412, Busch Campus
Busch Campus
heiman@rutgers.edu

For Genetics Department administrative issues:

Marylou Carmona
Department Administrator
Nelson B422, Busch Campus
Phone: 848-445-1638
carmona@dls.rutgers.edu

Dr. Tara Matise
Chair
Nelson B410
Busch Campus
matise@rutgers.edu

III. Faculty Listing

See the Departmental Faculty webpage for current listing (CLICK HERE).

IV. Declaring the Major

Students wishing to major in Genetics must have satisfied the following requirements:

- Be a School of Arts and Sciences (SAS) student,
- Been enrolled at Rutgers University for at least one semester,
- Have a cumulative GPA of at least 2.00,
- *Note: that a GPA of 2.80 is required to register for independent research and therefore to graduate in the major. Therefore, students with an overall GPA < 3.0 must meet with the UGD before declaring the major,*
    - *Genetics is a credit-intensive major.*
    - *Students entering the major with a GPA of < 3.0 may struggle to complete the major on time.*
- Have earned a "C" or better in the following courses or their equivalents (e.g., AP credit, officially accepted transfer credit, et cetera):
    - General Biology (119:115-116)
    - General Biology Lab (119:117)
    - General Chemistry, either of these two-course combinations:
        - 160:161-162
        - 160:163-164
    - Mathematics, any one of these two-course combinations:
        - 640:135,136 (Calculus I, Calculus II for the Biological Sciences)
        - 640:151-152 (Calculus I and II for Mathematical and Physical Sciences)
        - 640:135 and 960:401 (Basic Statistics for Research)
        - 640:151 and 960:401 (Basic Statistics for Research)

Note: A grade of "C" or better in courses credited toward the major is required for graduation, and each course may be repeated only once to replace D/F grades. 640:136 (Calc II, 4 cr) may be substituted for 640:138. 640:192 (Honors Calc II, 4 cr) may be substituted for 640:152. 960:379 (Basic Probability) or 960:212 may be substituted for 960:401 (Basic Stats for Research).

To declare the major, students should register online at MyMajor (http://mymajor.sas.rutgers.edu/).
Once students have completed their online registration, they must be approved by the Department Chair or Vice Chair. No one will be approved for the major until they have watched the Major Declaration Video. More information about this meeting can be found on the Department website:
https://genetics.rutgers.edu/academics/undergraduate/requirements

All communication with students will be conducted electronically through your Rutgers email. Due to the Federal Education Rights and Privacy Act (FERPA) information related to your academics cannot be sent to an alternate email.

There is no minor in Genetics. Please note that students may not major in more than one of the four programs of study offered by the Division of Life Sciences. In addition, students may not declare a major in both Genetics and Biotechnology (SEBS), or Genetics and Microbiology (SEBS). In general, students may not major in Genetics and minor in a Biology-oriented program from SEBS. Please see the Major/Minor Restrictions webpage for prohibited major/minor combinations. Contact the Vice Chair (heiman@rutgers.edu) if you have questions about a second major. Students majoring in Genetics may not minor in one of the other programs offered by the Division of Life Sciences.

TRANSFER STUDENTS:

- SAS Transfer page
- Transfer from Institutions not a part of Rutgers: Transfer Credit Policies
- Transfer from other Rutgers Schools: School-to-school transfer webpage

V. Learning Goals and Curriculum

The Department of Genetics curriculum is centered around four main goals:

1. Knowledge specific goals: Know the terms, concepts and theories in the field of genetics.
2. Integrate the material from multiple courses and research. That is, to think holistically and to see the whole as well as the parts.
3. Use genetic information and ideas to critically analyze published research articles in the field of genetics.
4. At the end of four years, all our students will be able to design an experiment, carry out the research using the appropriate laboratory techniques and analyze and interpret their data. They will also be able to communicate their discoveries through a written article appropriate for publication in a peer-reviewed genetics journal, and through talks or posters appropriate for scientific meetings.

COMPLETING THE MAJOR

The curriculum is based on the Rutgers New Brunswick Undergraduate Catalog. The Genetics Major Curriculum is comprised of five components (plus the prerequisite courses to declare):

Prerequisites – Completed prior to declaring the Genetics Major (Approved AP and transfer credits may be substituted)
A. Life Sciences Core – Required for all DLS Majors (Approved AP and Transfer credits may be substituted)
B. Genetics Core – Required for all Genetics Majors (All credits must be completed at Rutgers)
C. Genetics Independent Scholarship – Required six credits, 2.8 Minimum GPA to register, (12 credits required for honors)
D. Genetics Electives – Required six credits (50% must be taken within the Genetics Major i.e. 01:447)
E. Electives OR Independent Scholarship – Required six credits (Additional Genetics Lab may be used as an elective)

The following screenshots come from our Curriculum Worksheet. We suggest you download this worksheet to ensure you complete all to graduate.

Requirement	Course Number	Cr.	Sem/Yr	Grade
Prerequisites - *Completed prior to declaring the Genetics Major (Approved AP and transfer credits may be substituted)*				
☐ **General Biology I**	01:119:115	4		
☐ **General Biology II**	01:119:116	4		
☐ **Gen. Biology Lab**	01:119:117	2		
☐ **General Chemistry I**	01:160:161 *or* 01:160:163 (Honors)	4		
☐ **General Chemistry II**	01:160:162 *or* 01:160:164 (Honors)	4		
☐ **Calculus I**	01:640:135 *or* 01:640:151	4		
☐ **Calc. II or Statistics**	01:640:136 *or* 01:640:152 (4 cr) *or* 01:640:192 *or* 01:960:401 *or* 01:960:212 (3 cr) *or* 01:960:379	3-4		

***Note**: Appropriate AP credits or transfer courses approved by the Office of Undergraduate Instruction (OUGI) may be substituted. Other substitutions are described in the Curriculum Worksheet, available at https://genetics.rutgers.edu/academics/undergraduate/student-forms and require the permission of the departmental Vice Chair (heiman@rutgers.edu).*

Requirement	Course Number	Cr.	Sem/Yr	Grade
A. ***Life Sciences Core – Required: 4 courses (Approved AP and Transfer credits may be substituted)***				
☐ **Intro to Experimentation**	01:160:171	1		
☐ **Organic Chemistry I**	01:160:307 *or* 01:160:315 (Honors)	4		
☐ **General Physics I**	01:750:203 + 205 (lab) *or* 01:750: 271 + 275 (lab) *or* 01:750:193 *or* 01:750 201 *(193 & 201 have integrated lab)*	4-5		
☐ **General Physics II**	01:750:204 + 206 (lab) *or* 01:750:272 + 276 (lab) *or* 01:750:194 *or* 01:750:202 *(194 & 202 have integrated lab)*	4-5		
B. ***Genetics Core –*** *Required: 5 courses for all Genetics Majors (All below courses must be completed at Rutgers)*				
☐ **Genetic Analysis I**	01:447:384	4		
☐ **Genetic Analysis II**	01:447:385	4		
☐ **Lab Course** *(See Lab Note below)*	01:447:315 *or* 01:447:302 *or* 01:447:203 *or* 01:447:303 *or* 01:694:214 *or* 01:694:215 *or* 01:694:316	3		
☐ **Mol Bio & Biochem.**	01:694:395 *or* 01:694:407	3		
☐ **Comm. in Genetics**	01:447:430 *or* 01:447:414 and 01:447:415 *(Honors, Thesis Writ. – senior year)*	3		

Notes:

- To find which semester courses are offered, see **Schedule of Classes on Genetics website.**
- *Genetics 447:380 may not be substituted for either Genetics Analysis I or II (447:384-385)*
- *If a student should switch from the Genetics major to one of the other Division of Life Sciences majors, both 447:384 and 447:385 (**and only both**) may be used to fulfill the Genetics requirement for those majors (normally fulfilled by Genetics 447:380)*
- *Genetics major core requirements (i.e., 447:384-385, the lab courses, 694:301, 694:407, 447:430, 447:414-415), electives, and research courses **cannot** be satisfied by transfer courses.*
- ***Lab Course Notes:** 01:694:214 and 01:694:215 are only offered to first-year students with AP Biology credit and AP General Chemistry credits (or taking General Chemistry concurrently). 01:447:203 is only offered to first & second-year students in the SAS Honors Program or the Honors College. Students cannot receive credit for both 01:447:203 and 01:447:302.*
- *447:430 must be taken after having completed at least one semester of independent research (preferably taken concurrently with their second semester of research)*
- *Students doing an Honors thesis in Genetics will take the 447:414-415 series in their senior year (concurrent with Honors in Genetics 447:408-409) instead of 447:430.*
- ***IMPORTANT Organic Chemistry note:** If you plan to pursue a graduate degree in which a full year of organic chemistry (plus lab) is suggested/required (e.g., medical or dental school), we strongly recommend taking Organic Chemistry II + lab as an elective (6 credits).*

Requirement	Course Number	Cr.	Sem/Yr	Grade
C. Genetics Independent Scholarship *– Required: 2 courses (6 credits or 12 for honors) 2.8 Minimum GPA to register*				
☐ **Research & Scholar.**	01:447:406,407,408,409,410,488,489,490	3-6		
☐ **Research & Scholar.**	01:447:406,407,408,409,410,488,489,490	3-6		

Note: Students must complete 6 credits of Research or Independent Scholarship taken with a single Rutgers University faculty advisor over two semesters (except for the Genetic Counseling Rotation, which is performed under more than one advisor)

Requirement	Course Number	Cr.	Sem/Yr	Grade
D. Genetics Electives *– Required: 3 courses from Genetics (447) courses*				
☐ **Genetics Elective**	See attached table (447 courses only). Course:	3		
☐ **Genetics Elective**	See attached table (447 courses only). Course:	3		
☐ **Genetics Elective**	See attached table (447 courses only). Course:	3		
E. Electives OR Independent Scholarship *– Required: 2 courses** (additional Genetics Lab may count as an elective)*				
☐ **Research & Scholar.**	01:447:406,407,408,409,410,488,489,490. Course:	3-6		
☐ **Research & Scholar.**	01:447:406,407,408,409,410,488,489,490. Course:	3-6		
☐ **Approved Elective**	See attached table. Course:	3-6**		
☐ **Approved Elective**	See attached table. Course:	3		

*** Organic Chemistry II + lab= 6 credits counts as one course*

There are alternative routes through the Genetics Independent Scholarship and Electives requirement (Sections D&E). One student might enter a research laboratory in his or her junior year and complete 12 credits of research (3 per semester) for two years. Another student might work with a faculty member during his or her Senior year to develop educational software for Genetics (6 credits of *Advanced Independent Study*). A third student might complete a year of research in his or her junior year and then complete a year of *Advanced Independent Study* developing informational websites. Some example pathways for completing the major are provided at the end of this handbook. Each student has a faculty advisor and can develop their individualized major within the overall guidelines.

APPROVED GENETICS ELECTIVES

Elective Course	*Course Number*	*Cr.*
Organic Chemistry II + lab (see note below)	01:160:308 *or* 01:160:316 **PLUS** 01:160:311 *or* 01:160:314-315	6**
Introduction to Computer Science	01:198:111	4
Data Structures	01:198:112	4
Honors Computational Genetics	01:447:203 (Honors)	3
Analysis of Sci Literature	01:447:216 (Honors)	3
Intro to Cancer	01:447:245	3
Quant Biology & Bioinformatics	01:447:302	3
Computational Genetics for Big Data	01:447:303	3
Introduction to Research in Genetics	01:447:315	3
Soc., Leg., Ethic. Issues Genetics	01:447:354	3
Evolutionary Medicine	01:447:356	3
Developmental Genetics	01:447:370	3
General Microbiology	01:447:390	4
Pathogenic Microbiology	01:447:392	3
Genomes	01:447:451	3
Genetics of Compulsive Behavior	01:447:460	3
Genetic Approaches & Research Analysis	01:447:465	3
Evolutionary Developmental Bio	01:447:470	3
Behavioral & Neural Genetics	01:447:484	3
Molecular Pathways & Sig Trans	01:694:411	3
Proteomics and Functional Genomics	01:694:412	3
Chromatin and Epigenomics	01:694:413	3
Membrane Dynamics in Health and Disease	01:694:420	3
Spec. Top. Mol. Bio. & Biochem.	01:694:421	3
Gene Reg. in Cancer and Development	01:694:492	3
Methods & Applications Mol. Bio.	11:126:427	4
Nucleotide Sequence Analysis	11:126:483	3
Bioinformatics	11:126:485	3
Microbial Genetics & Genomics	11:680:480	3
Human Genetics	16:681:535	3

**** If you take Organic Chemistry II, it will meet a Genetics elective requirement ONLY if Organic Chemistry Lab is also taken.**

Additional information about specific courses can be found on the Genetics Department website:
https://genetics.rutgers.edu/academics/undergraduate/course-descriptions

and at the DLS course description website:

http://biology.rutgers.edu/courses

To find which semester courses are offered, see **Schedule of Classes on Genetics website.**

To help students plan and follow their progress in the major, we have provided a Curriculum Worksheet on the Departmental website:
https://genetics.rutgers.edu/academics/undergraduate/student-forms

All students are responsible for making sure that they are on target for their appropriate graduation date.
This can easily be done by:

- Keeping careful records using the Curriculum Worksheet.
- Seeing your assigned advisor at least once per semester
- Checking Degree Navigator (https://dnadvisor.rutgers.edu/)

In addition, the Department often sends general announcements during the year as reminders. All announcements to students will be sent electronically, so students should make sure the Department has their most current email address on file.

Students should follow the curriculum as outlined in the worksheets, **not as listed in the catalog.** The online catalog might not reflect the most recent curriculum.

Please note that a grade of "C" or better in courses credited toward the major is required for graduation (i.e., all the courses listed in the worksheet). Under no circumstances will grades of credit/no credit or pass/fail be accepted.

USING DEGREE NAVIGATOR FOR THE GENETICS MAJOR

Genetics majors may also use Degree Navigator (https://dnadvisor.rutgers.edu/) to determine whether they are on track for graduation. The sections within Degree Navigator matches the sections within our Curriculum Worksheet.

When students log into Degree Navigator, they should select "Major in Genetics (NB)" and version "Spring 2020" for the most updated version of the major within Degree Navigator. The program description for the major, along with its specific conditions, will appear within Degree Navigator.

Notes:

- If approved by the Vice Chair, graduate courses may be used for elective credit.
- A minimum of 6 credits of independent scholarship is required. This must be taken over two semesters with a single advisor.
- 01:447:406-407 Research in Genetics requires a GPA of 2.8 or better or permission of Vice Chair.
- Each course may be repeated only once to replace D/F grades.
- 01:447:408-409 Honors Research in Genetics requires a GPA of 3.4 or better and requires concurrent registration in 01:447:414 (Fall) and 01:447:415 (Spring).
- 50% of Genetics electives must be taken within the Genetics Major (01:447 courses).

Conditions:

- You must achieve a minimum grade of C for All Genetics Courses.
- No credits may be used from Non-New Brunswick Courses.
- Residency Requirement in RU-NB - No credits may be used from Non-New Brunswick Courses in requirements. This includes:
    - R3 - Genetics Core,
    - R4 - Genetics Independent Scholarship,
    - R5 - Genetics Electives,
    - R6 - Independent Scholarship and Genetics Electives.

VI. Departmental Certificates

GENETIC COUNSELING CERTIFICATE PROGRAM (GCCP)

The Department of Genetics offers an undergraduate Certificate in Genetic Counseling (GCCP) for students interested in later applying to Masters-level programs in Genetic Counseling after graduation. The goal of the GCCP is to provide students with guidance, coursework, and relevant clinical experience for graduate school applications. This is a highly competitive option and is only open to declared Genetics majors. The Certificate will be awarded only in conjunction with the awarding of a baccalaureate degree in Genetics. At the end of the program students will:

- Understand Genetic Counseling as a profession
- Understand application requirements for Masters-level programs
- Gain experience in talking with people who are in crisis
- Gain experience in a clinical Genetic Counseling clinic

Students accepted into the GCCP will meet weekly with the GCCP director for one semester and attend a rotation at a local Genetic Counseling clinic. At the clinic, students will observe counseling sessions, perform literature searches, observe weekly clinical and ultrasound meetings, and assist with chart preparation (for more information, see below). In addition, all successful applicants are expected to volunteer at a crisis hotline such as *We Care* or *Scarlet Listeners*. All questions about the program should be directed to Dr. Gary Heiman (heiman@rutgers.edu). For a more information on the genetic counseling career see: https://www.nsgc.org/About/About-Genetic-Counselors

Prerequisites for Certificate Program:

- Declared the Genetics major
- Have a minimum 3.2 cumulative GPA (greater than 3.4 preferred)
- Interview with the GCCP Director (Dr. Gary Heiman)
- Completion of the Rutgers University Human Subjects Certification (IRB)

Required Courses (15 credits) and Volunteer Experience

- Genetic Counseling Rotation (447:488) – *special permission required*.
- Basic Statistics Coursework (960:401 or 960:379)
- General Psychology (830:101)
- Abnormal Psychology (830:340)
- A Bioethics Course (3 credits), either:
    - Social, Legal and Ethical issues and the new Genetics (447:354)
    - Bioethics (730:249)
    - Genetics, Law, and Social Policy (119:154)
- Crisis Hotline experience: Students must volunteer at a hotline for at least one semester, such as *CONTACT We Care* or *Scarlet Listeners*.

Genetic Counseling Rotation (447:488)

Students will be placed at a local Genetic Counseling clinic to shadow a genetic counselor for one semester. This course can only be taken once. During this semester, the student is expected to spend 8 hours a week at the rotation plus meet weekly with the GCCP Director, Dr. Heiman.

Note: The Genetic Counseling Rotation course (01:447:488) counts as 3 research credits for the Genetics major. The other three required research credits may be fulfilled with a related Advanced Independent Study Project, or with a 3-credit research project with a faculty member or in the Rutgers University Cell and DNA Repository (RUCDR).

For more information, see the Genetic Counseling Certificate webpage

COMPUTATIONAL GENETICS CERTIFICATE PROGRAM

The Department of Genetics offers a Certificate in Computational Genetics (CCG). The volume of data being generated in Genetics and related life science fields has been expanding tremendously in recent years, and career opportunities for geneticists with computational and quantitative expertise are simultaneously growing. This proposed certificate program is intended for students who are either interested in applying to graduate-level programs or planning careers in Computational Genetics, Statistical Genetics, Bioinformatics, or other programs in quantitative biomedical related research. The goal of the CCG is to provide students with guidance, coursework, and relevant data design and analysis experience necessary for graduate school applications. This is a highly competitive option and only open to declared Genetics Majors. The Certificate is awarded only in conjunction with the awarding of a baccalaureate degree in Genetics.

At the end of the program students will:

- Have gained competence in genetic data analysis using basic computer programming and statistical analysis
- Be prepared to apply to M.S. or Ph.D. graduate programs in the areas of Computational Genetics and Bioinformatics
- Be prepared to apply for career positions in industry, biotech companies, pharmaceutical companies, medical centers, or universities

Students accepted into the certificate program will meet regularly with the CCG director and participate in a Computational Genetics lab for at least two semesters. Completion of the certificate will require an additional 10 credits beyond those needed to complete the Genetics major. If interested, 3 or 7 of those additional credits could be applied to a minor in either statistics or computer science, respectively. All questions about the program should be directed to Dr. Derek Gordon (gordon@biology.rutgers.edu).

Prerequisites for Certificate Program:

- Declared the Genetics major
- Have a minimum 2.80 GPA
- Interview with the Program Director (Dr. Derek Gordon)

Required Courses (22 credits)

- Introduction to Computer Science (198:111)
- Data Structures (198:112)
- Basic Probability (960:379)
- Basic Statistics for Research (960:401) or Introduction to Statistical Analysis (960:384)
- Quantitative Biology & Bioinformatics (447:302) or Computational Genetics of Big Data (447:303) or Honors Computational Genetics (447:203)
- Research in Genetics (6 credits total)
    - Standard Version (447:406-407)
    - Honors Version (447:408-409)

Students interested in Computational Genetics might also consider completing a minor (or a double major) in:

- Data Science (https://mps.rutgers.edu/data-science)
- Computer Science (http://www.cs.rutgers.edu)
- Statistics (http://www.stat.rutgers.edu)
- Biomathematics (https://math.rutgers.edu/academics/undergraduate/interdisciplinary/majors/1071-bio-mathematics-interdisciplinary-majors)

For more information, see the Certificate in Computational Genetics (CCG) webpage

CANCER GENETICS CERTIFICATE PROGRAM (CCP)

The advent of personalized therapies, pharmacogenomics, and personal genomes are all recent advances that impact the field of Cancer Genetics. A generous donation from Nancy and Duncan MacMillan was provided to initiate this program to enhance education in Cancer Genetics and Research.

This program is only open to declared Genetics Majors. The Certificate will be awarded only in conjunction with the awarding of a baccalaureate degree in Genetics.

At the end of the program students will:

1. Have gained knowledge in Cancer Genetics with an expanded curriculum focused on Cancer biology.
2. Have at least one year of experience conducting laboratory research in a Cancer research lab.
3. Be prepared to apply to M.S., MD, or Ph.D. graduate programs in the areas of Cancer Genetics or for career positions in industry, biotech companies, pharmaceutical companies, medical centers, policy-driving institutes, or universities.

The program would require the following of participating students:

a) Conduct research in a Cancer Genetics lab for at least two semesters
b) Complete 6 course credits in a Cancer-related coursework, including 3 course credits beyond those credits already needed to complete the Genetics major. Suggested courses are in the table below but others will also be considered with prior approval. Only 3 of these extra credits can include research in genetics beyond the 6 credits already required.
c) Attend at least 6 additional learning opportunities in Cancer Genetics. These include attending Cancer Research Seminars at Rutgers and uploading a synopsis of the seminar to the program's Canvas site, or, attending a Cancer Genetics Roundtable session, discussion/topic review/lunch meetings with faculty researching topics in Cancer Genetics.
d) Engage in community outreach to promote education, advance community support, reduce cancer health disparities, or research fundraising efforts in cancer prevention, control, and/or research. Typically, at least a 20-hour effort, with prior approval from the program director.

Prerequisites for admission to the CCP Certificate Program:

- Undergraduate student declared to major in Genetics.
- Have a minimum 3.2 GPA, 3.4 strongly preferred.
- Submit a CV and arrange an interview with Dr. Mike Verzi (Cancer Genetics Certificate Program) Director, (mv347@hginj.rutgers.edu).

A limited number of candidates will be accepted each year and be considered in December, be sure to indicate your interest well before this time.

For more information, see the Cancer Genetics Certificate Program webpage.

VII. Advising

Each student will be assigned a faculty advisor from the Department of Genetics. In most cases, this advisor will remain the student's advisor for the balance of the time that he or she is a major. The role of the advisor is to:

- Assist students in course selection,
- Monitor student progress to ensure that all requirements are fulfilled by graduation,
- Approve students for enrolling in independent research,
- Assist, where possible, in career planning.

Students are encouraged to see their advisor on a regular basis, generally once or twice per academic year. Please feel free to contact advisors by email to make appointments or to ask specific questions that do not require a full appointment. It is the student's responsibility to make sure that he or she is on target for graduation. Students completing the junior year should schedule an appointment with their advisor to review their program for their final year. If in doubt, students should make use of their advisor! Advisors are listed by graduating class:

See this website for current Advising list

VIII. Independent Scholarship Requirement

INDEPENDENT SCHOLARSHIP – GETTING STARTED

Undergraduate research is the intellectual heart of our major. The Department is committed to teaching science through the way we do science - through the process of research and discovery. Every student completes a minimum of two semesters of independent scholarship, either laboratory research or independent study, under the direction of a faculty member. The following table lists the independent scholarships options in Genetics. The Research in Genetics (447:406/407) is the most common version.

Course	Title	Semester offered	Credits per semester	Notes
447:406	Research in Genetics	Fall/Summer	3	Can take twice, based on project need
447:407	Research in Genetics	Spring	3	Can take twice, based on project need
447:408	Honors in Genetics	Fall	3 – 6	Seniors only, associated with 414
447:409	Honors in Genetics	Spring	3 – 6	Seniors only, associated with 415
447:410	Research In Genetics-Writing Intensive	Fall/Spring/Summer	3	Just like 406/407; can take twice
447:489	Advanced Independent Study	Fall/Summer	3	Taken once unless valid reason
447:490	Advanced Independent Study	Spring	3	Taken once unless valid reason

Students can do independent scholarship with any appropriate faculty member at Rutgers-New Brunswick. It is ultimately the responsibility of the student to identify a research mentor to sponsor their independent scholarship project. The hardest part about undergraduate research is finding a faculty mentor who has the space and resources to accept the student into his or her research lab. We recommend that students browse through research faculty websites to draw up a list of a dozen or more researchers conducting studies that are of interest to the student. It is the responsibility of the student to contact potential faculty mentors. Students should familiarize themselves with the research of potential faculty prior to contacting them about possible laboratory positions. For a listing of possible Independent Scholarship opportunities, see:

1) Lab Research Opportunities
2) Non-Genetics Lab Research Opportunities (faculty that have recently accepted Genetics students into their labs)

An appropriate time for students to begin the search for a research mentor would be during the semester *just prior to* starting independent scholarship. For example, if you want to start research in the fall semester, a good time to start looking for a research mentor is early in the previous spring semester. Do not wait until the registration period for the fall semester. If you want to start research in the spring semester, a good time to start looking for a research mentor is early in the fall semester. *There are a limited number of positions for students to do laboratory research and these positions fill up fast!*

Students are strongly encouraged (but not required) to begin some research before their Senior year (usually no more than 6 credits total). Indeed, Sophomore year is an ideal time to begin searching for a laboratory.

All research courses are by Departmental permission only. The Independent Scholarship Form will be submitted digitally through DocuSign and can be obtained from the Departmental website (see Steps to register below).

Disciplinary Probation and Honors in Genetics. Students who were previously placed on Disciplinary Probation (as defined in the University Code of Student Conduct: http://studentconduct.rutgers.edu/university-code-of-student-conduct will be ineligible to register for Honors in Genetics. A student placed on Disciplinary Probation while completing their thesis research will be removed from Departmental Honors as according to University Policy.

NOTE: faculty members are not obligated to keep a student doing research in their lab for more than 2 semesters.

Independent Scholarship – PREREQUISITES

It is the responsibility of the student to find a research mentor for his/her Independent Scholarship. Independent Scholarship requires a heavy commitment of time and effort on the part of the student and can impact the performance in coursework for students who have not yet managed the foundational material for the discipline. Therefore, there is **a minimum GPA requirement of 2.80 for *Research in Genetics* (447:406-407)**.

NOTE: There is no GPA requirement for *Advanced Independent Study in Genetics (447:489-490)*. However, it is the responsibility of the student to find a sponsor.

If a student is unable to find a Research or Advanced Independent Study, it will not be possible to complete the major. In such a case, please make an appointment with the Vice Chair (heiman@rutgers.edu) who will discuss various options.

INDEPENDENT SCHOLARSHIP – GENERAL INFORMATION

To make the experience worthwhile for both the student and the research mentor, we expect the student to commit a sizable amount of time to the independent scholarship. Independent scholarship is not, and should not, be "an easy A" course. On average, the student should expect to spend between 3 to 5 hours a week per credit in the lab during the Fall or Spring semesters for Research in Genetics (see 2nd page of expectations summer research). Thus, for a typical three-credit course in Fall or Spring, students would be expected to work 9-12 hours per week. During this period, the student will be expected to be in the lab conducting experiments, organizing their data, reading about their research project, attending lab functions and meetings, and completing reports and their research paper. For Advanced Independent Study, see 2nd page of expectations.

Please note that students taking research for credit may not receive financial compensation from their research mentor's grants or from university fellowships (e.g., SURF, Aresty Research Assistant Program, et cetera) for the same effort in the lab, even if the work seems unrelated. Students may accept fellowships for courses taken for credit if all of the funds from the fellowship are supplied to the mentoring laboratory to cover the costs of supplies for the student's research (e.g., the Aresty fellowship program).

Student behavior. Conducting an independent scholarship with a faculty member is a privilege. Students are expected to treat members of the lab and the research mentor (or person in charge) with common courtesy, decency, and respect. They will refrain from behaviors that interfere with the laboratory research and/or teaching/learning process. All behaviors that, in the judgment of the research mentor, interfere with the research and teaching/learning process may be considered disruptive. Students who are deemed as disruptive may be asked to leave the lab, not allowed to return for subsequent semesters, and/or reported to Office of Student Conduct.

INDEPENDENT SCHOLARSHIP – STEPS TO REGISTER

1) **Find a research mentor**. Find a research mentor and discuss project (see Independent Scholarship – Getting Started above). See Lab Research Opportunities webpage.
2) **Complete the relevant Independent Scholarship Form (SEE WEBPAGE)**: There are different forms depending on the type of Independent Scholarship and if the research mentor is a Genetics faculty member:
    a. Research Form | Genetics Faculty Member (447:406-407)
    b. Research Form | Non-Genetics Faculty Member (447:406-407)
    c. Research Form | Writing Intensive Research (01:447:410) or Summer Research (447:406)
    d. Honors Research Form | Honors Thesis (447:408-409). Students performing *Honors in Genetics* will need to register for 447:414-415 *Thesis Writing and Communication* concurrent with the semesters in which they perform their Honors research.
    e. Advanced Independent Study Form (01:447:489-490)
    f. Research Form | More than Three (3) Credits (447:406-407) – VERY RARE!
    g. Non-research Form | Effective Communications Only (447:430)
    h. Non-Major Research Form | Non-Major (447:406)
3) **Instructions (SEE INSTRUCTIONS)**.
    a. Students will need to provide their contact information, their GPA, and the name and contact information of their research mentor. Students will need to show that they have completed any necessary safety training and eCOI. Students will also need to provide a brief description of their proposed project.
    b. A detailed Project Overview will be required before the end of the add-drop period of the semester. Your research mentor must read and approve this statement before you submit it. Please include a brief history of the study, the methods that you will use, and your goals. Describe any preliminary work you have done for the proposal. Your proposal should provide a brief synopsis of the present state of knowledge in the area in which you will be working, and it should detail why your study will contribute to the advancement of our understanding beyond the present level.
    c. The form should also include a statement about previous research experience. Please list the course numbers, the number of credits, and the semesters in which previous research was conducted. Please indicate the research mentor and if your project includes interviewing, surveying, observing, sampling, or testing people. If so, you must obtain clearance from the Office of Research & Sponsored Programs; discuss with your research mentor how to do this. Please indicate if your project includes vertebrate animals. If so, you must be added to your research mentor's animal research protocol. Please indicate if and when you received safety training from REHS (all students conducting *Research in Genetics* in a lab at Rutgers must attend a REHS Laboratory Safety Training prior to commencing research in the lab. More information can be obtained at http://rehs.rutgers.edu/rehs_train.html#labsafety).
4) **All Research forms must be submitted through DocuSign.**
    a. Once you complete the form and sign, it will be routed to your mentor to review and sign. Using the correct email address, you will need to route them to your Research Mentor for a signature.
5) **Request a SPN through our online SPN request system.**
    a. Request an SPN for the type of Independent Scholarship (406, 407, 408, 409, 410, 489, 490) or Effective Communications only (430)
    b. Once everyone signs the Independent Scholarship form, you will be sent a SPN via email to register.

NOTE: A new approval form and research description is required for each semester of research.

INDEPENDENT SCHOLARSHIP - EXPECTATIONS

For each independent scholarship type, we provided a document that details the expectations for the student and their independent scholarship mentor. Please review, particularly the 2nd page. If your mentor is not a member of Genetics Faculty, please also share the respective document with him/her.

- Research in Genetics (447:406-407)
- Research in Genetics (447:406-407)- SUMMER RESEARCH
- Research in Genetics – Writing Intensive (447:410)
- Advanced Independent Study in Genetics (447:489-490)
- Honors Research in Genetics: FALL (447:408)
- Honors Research in Genetics: SPRING (447:409)

INDEPENDENT SCHOLARSHIP - TRAVEL STIPENDS

Genetics Majors engaged in independent research are eligible to apply for a Departmental travel stipend to attend a scientific meeting if they are the first author of a presentation. If approved, the Department of Genetics will provide up to $500.00 in matching funds. The award requires that at least 50% of the total meeting costs come from another source (e.g., the student's research mentor). Interested students should apply to the Chair (geneticschair@dls.rutgers.edu), with a CC to their research mentor. In this application, provide the name, dates, and location of the meeting and the source of any matching funds. Also, provide the name of their research mentor (and lab PI if different) and submit a copy of their meeting abstract (including title, all authors, and the research summary).

IX. Departmental Honors

DEPARTMENTAL HONORS OPTIONS

The Department of Genetics recognizes graduating students who have made outstanding academic achievements by awarding ***departmental honors***. The department awards two types of departmental honors (see below) and these are awarded at the discretion of the Genetics Honors Committee. To be considered, students must meet all criteria for that type of honors and submit the honors request, via Honors Research DocuSign Form by the deadline (April 1st of junior year).

The two types of departmental honors and their criteria are as follows:

1. **Departmental Honors – Thesis**
   a. GPA requirement: a student must have attained, at the end of the junior year, a cumulative GPA ≥3.4 and a Genetics major GPA ≥3.4 (including prerequisites).
   b. Complete 6 or more credits of Honors in Genetics 01:447:408-409) during senior year
   c. Complete a total of 12 or more research credits (including the 6 credits of 01:447:408-409)
   d. Complete Honors **Thesis and Communication in Genetics 447:414 and 415** during senior year
   e. Complete and defend a research thesis before a faculty committee (see Thesis Guidelines)
   f. Present at Honors Day
   The honors committee may award Honors, High Honors, or Highest Honors.
   For details on the research thesis, see the Genetics Honors Research webpage.
   https://genetics.rutgers.edu/academics/undergraduate/departmental-honors/honors-research

2. **Departmental Honors- Certificate Program**
   a. GPA requirement: a student must have attained, by April 1st of senior year, a cumulative GPA ≥3.4 and a Genetics major GPA ≥3.4 (including prerequisites).
   b. Complete a departmental certification program (e.g., CompGen or Genetic Counseling)
   The honors committee may award Honors, High Honors, or Highest Honors.
   By April 1st, the student must formally apply to request consideration for Honors by completing the respective departmental honors form and submitting it through DocuSign.

DEPARTMENTAL HONORS THESIS

Students who complete and defend an Honors thesis will be automatically considered for departmental honors. Students can apply to do an Honors thesis by completing the relevant sections of the **Research Approval Form**. The form is available at https://genetics.rutgers.edu/academics/undergraduate/student-forms/independent-scholarship-forms. They must register either for an Honors course sequence in Genetics (01:447: 408 and 409) or for a course sequence in a college Honors Program. These decisions should be discussed with an advisor and approved by the Department Vice Chair. Accepted students are expected to complete at least 12 credits in an independent research project, resulting in a thesis. Students may do research with Rutgers faculty outside of the Department with the approval of their advisor and the Vice Chair. Students will prepare a thesis and present an oral defense to a committee of three faculty. At least one member of the committee must come from the Department of Genetics. Students will present their research at a Departmental Symposium in April.

Guidelines for College Honors Research

An SAS student eligible for Departmental Honors will be designated as an SAS Paul Robeson Scholar. Some students may opt to complete a SAS Interdisciplinary Honors Thesis (090:495,496). Information about the SAS Interdisciplinary Honors Thesis may be found online at http://sasundergrad.rutgers.edu/academics/additional-academic-programs/thesis-programs. Please contact the SAS Honors Program at honors@sas.rutgers.edu or 848-932-7964 for more information about SAS Interdisciplinary Honors Thesis.

Students doing an SAS Interdisciplinary Honors Thesis might also qualify for Departmental Honors. See the Vice Chair (heiman@rutgers.edu) for details about this or other options for SAS Honors.

Appropriate Honors Courses Include:

- 01:447:408-409 Honors in Genetics (3-6, 3-6)
- 01:090:495-496 SAS Honors Interdisciplinary Thesis (3, 3) *

Students may not register for more than one of these courses in a given semester. Completed research studies can only be used to complete one of these options.

Students must also complete **Honors Thesis and Communication in Genetics** 447:414 and 415** in order to qualify for departmental Honors. These courses should be taken concurrently with 447:408-409, 015:497-498, or 01:090:495-496.

*Must have completed an additional 6 credits of research relevant to the final thesis.

** The SAS course *01:090:491-492, Research Workshop,* will **not** substitute for 447:414-415.

DEPARTMENTAL HONORS WITHOUT A THESIS

Students who do not complete a thesis as described above, but instead complete a certificate program (either in Genetic Counseling or in Computational Genetics) will be considered for departmental honors. These students will be considered by the Honors Committee for either baseline Honors, High Honors, or Highest Honors. The level of honors will be determined by the Honors Committee. Again, *there is no magic formula used to determine level of Honors for these students*. The Committee takes into consideration multiple factors **in aggregate**, including but not limited to (1) cumulative GPA, (2) recommendation of the faculty member overseeing the certificate program (i.e., Dr. Heiman for the Genetic Counseling Certificate Program and Dr. Gordon for the Computational Genetics Certificate Program), and (3) whether or not the student took the honors versions of Genetic Analysis 1 and/or 2 (i.e., 01:447:384:H1 and/or 01:447:385:H1) and the grades received in those courses.

Students who wish to apply for honors by completing a certificate program can do so by filling out the appropriate online form at the bottom of the Departmental Honors webpage.
https://genetics.rutgers.edu/academics/undergraduate/departmental-honors

X. The SAS Core Curriculum and The Genetics Major

The Core Curriculum of SAS establishes common goals that, along with a major specialization, prepare graduates for successful lives and careers. For more information about the SAS Core, please see http://sasundergrad.rutgers.edu/academics/requirements/core. Students should note that because of the credit-intensive requirements of our Department's curriculum, Genetics majors are exempt from the SAS requirement of a specialized minor. In addition, several courses within the major satisfy learning goals of the SAS Core Curriculum:

1. Goals: Contemporary Challenges [CC]

Students take two courses (at least 6 credits) that meet at least one of these four goals:

- Analyze the degree to which forms of human difference shape a person's experiences of and perspectives on contemporary issues.
- Analyze a contemporary global issue from a multidisciplinary perspective.
- Analyze the relationship that science and technology have to a contemporary social issue.
- Analyze contemporary issues of social justice.

The Contemporary Challenges Learning Goal must be fulfilled by taking classes at Rutgers-New Brunswick; transfer and AP courses are not certified to meet these learning goals.

Genetics courses meeting this goal:

- *Genetic Analysis I* (447:384)
- *Social, Ethical and Legal Implications of the New Genetics* (447:354)

2. Goals: Areas of Inquiry

- **Natural Sciences [NS]**
  - Met by introductory life science courses (e.g., *General Biology* 115-116)
- **Social and Historical Analysis [SCL], [HST]**
  - Not met in major
- **Arts and Humanities [AH]**
  - Not met in major

3. Goals: Cognitive Skills and Processes

3.A. Writing and Communication [WC], [WCr], [WCd]

Students take three courses (at least 9 credits), including Expository Writing (01:355:101), one WCr, and one WCd, and, in doing so, meet all five goals:

- Communicate complex ideas effectively, in standard written English, to a general audience.
- Respond effectively to editorial feedback from peers, instructors, and/or supervisors through successive drafts and revision. [WCr]
- Communicate effectively in modes appropriate to a discipline or area of inquiry. [WCd]
- Evaluate and critically assess sources and use the conventions of attribution and citation correctly.
- Analyze and synthesize information and ideas from multiple sources to generate new insights.

Genetics Courses Meeting the WC Goals

- *Effective Communication Skills in Genetics* (447:430) [WCr] [WCd]
- *Research in Genetics Writing Intensive* (447:410) [WCr] [WCd]
- *Thesis Writing and Communication in Genetics* (447:414, with concurrent registration in 447:408) [WCr]
- *Thesis Writing and Communication in Genetics* (447:415, with concurrent registration in 447:409) [WCd]

3.B. Quantitative and Formal Reasoning [QQ], [QR]

Students take two courses (at least 6 credits) and meet both goals:

- Formulate, evaluate, and communicate conclusions and inferences from quantitative information. [QQ]
- Apply effective and efficient mathematical or other formal processes to reason and to solve problems. [QR]

Genetics Curriculum Requirements Meeting the QQ/QR Goals

This goal is met by the current requirement of two calculus courses, or one calculus course and statistics (960:401).

Summary of 447 courses that meet SAS Core requirements and/or Honors requirements:

Course	Number and Credits	SAS Req.
Impl New Genetics	447:354 (3 cr.)	CC
Genetic Analysis I	447:384 (4 cr.)	CC, Honors*
Thesis Wri and Com	447:414 (1.5 cr.)	WCr
Thesis Wri and Com	447:415 (1.5 cr.)	WCd
Effective Comm	447:430 (3 cr.)	WCr, WCd
Res in Gen –Writing	447:410 (3 cr.)	WCr, WCd
Genetics of Compulsive Behavior	447:460 (3 cr.)	WCd

**Only the Honors section of Genetic Analysis I and II will count towards fulfilling honors course requirements within the SAS Honors Program or the Honors College.*

XI. Genetics Department Awards to Graduating Seniors

In May, the Department of Genetics announces Awards for Undergraduate Majors in Genetics who are graduating at the end of the Spring semester. For additional information on any of the awards, contact Dr. Heiman (heiman@rutgers.edu).

The Duncan and Nancy Macmillan Award for Research Excellence

This award recognizes a graduating Senior who has demonstrated outstanding accomplishment in research by the completion of a project of publication quality.
To receive this award, the student must submit an application, which includes:

1. A description of the student's research accomplishments
2. A letter of recommendation from the student's research mentor
3. An oral presentation of the research project at the Departmental Honors Day Symposium (typically held during the first week in April)

An application for this award can be found here (Genetics Awards Webpage). The application is typically due around the first week of April. Check the department website in Spring for the exact date.

The Howard C. Passmore Award For Distinguished Academic Achievement

This award recognizes a graduating Senior who has demonstrated outstanding achievement in academic coursework, participation in research, and commitment to service. To receive this award, the student must submit an application, which includes:

1. A transcript of courses, including any courses taken at other academic institutions
2. A statement of research accomplishments
3. A detailed description of service activities at Rutgers University and/or the community at large

An application for this award can be found here (Genetics Awards Webpage). The application is typically due around the first week of April. Check the department website in Spring for the exact date.

The Department of Genetics Award for Excellence in a Research Presentation

This award is presented to a graduating Senior who shows extraordinary skills in scientific communication to an audience of peers at the Departmental Honors Day (held during the first week in April). All students participating in Honors Day Presentations are automatically considered for this award. An application for this award can be found here (Genetics Awards Webpage).

XII. Association of Undergraduate Geneticists (AUG)

The Association of Undergraduate Geneticists (AUG) is a club for any undergraduate student who is interested in the field of Genetics. The primary goal of the AUG is to serve as an educational and social environment for its members. The Association works closely with the Rutgers Genetics Department in an effort to update the students on research opportunities, seminars of interest, and various other Departmental activities. The AUG itself also invites guest speakers who share their knowledge, expertise, and views on the science of Genetics as it relates to philosophy, politics and policy-making, religion, etc.

Apart from lectures and seminars, student interaction is encouraged through movie nights, trips and many more, as yet undecided activities. We always look forward to thoughts and ideas from our student-members. The AUG is an exciting and expanding group of young scientists and the Association invites and welcomes any suggestions!

The AUG also offers experienced student mentors to assist freshmen, sophomore and even junior students. These mentors can offer valuable “inside” information pertaining to the Genetics major, for example, classes and professors. This “inside” information is viewed from a perspective of current students who have already experienced the different processes involved.

Please don’t hesitate to contact any AUG Officer or visit their website:
https://genetics.rutgers.edu/academics/undergraduate/aug-association-of-undergraduate-geneticists

XIII. Academic Integrity

The faculty members of the Department of Genetics are committed to teaching Genetics from an interactive, research perspective. In many courses, you will be evaluated using take-home, open-book tests and papers. Perhaps the most serious error that a researcher can commit is to fabricate his or her data. We expect our students to be honest, not to cheat or plagiarize. Therefore, if a student violates academic integrity, he or she will *immediately* be reported to the appropriate Dean for disciplinary action.

The following is the official Rutgers policy on academic integrity: **http://academicintegrity.rutgers.edu/**

XIV. Joint BA/MD and BA/DMD Programs

The Health Professions Office (HPO) within the Division of Life Sciences offers special joint academic programs for students interested in careers in medicine or dentistry. These programs are designed for high-achieving students who are able to complete their Rutgers core requirements by the end of their junior year. In their senior year, students will take the complete first year curriculum at either RWJ Medical School (RWJMS), New Jersey Medical School (NJMS), or the Rutgers School of Dental Medicine (RSDM), depending on the specific program. Students will receive Rutgers University credit for select medical school courses towards the completion of their major and elective credit toward their undergraduate degree.

The benefits of these programs are:

- Students will have a conditional, early-acceptance to medical or dental school
- Students will pay only for three years of tuition at Rutgers plus four years of tuition at medical or dental school
- Credits for some classes taken during the first year at the medical or dental school will count toward both the MD (or DMD) and the BA degrees.

Students must apply during their sophomore year. More information on these programs can be found here:

https://hpo.rutgers.edu/special-programs/academic-programs/ba-md-rwj
https://hpo.rutgers.edu/special-programs/academic-programs/ba-md-njms
https://hpo.rutgers.edu/special-programs/academic-programs/ba-dmd-njds

Please note RWJMS, NJMS, and RSDM have specific course exchanges to allow first year medical or dental coursework to apply towards the undergraduate BA degree. The Department of Genetics will accept up 6 credits from these exchanged courses towards the completion of the major. **Three of these credits can be used to satisfy the biochemistry (694:301) requirement of the major** (although we do recommend that students take undergraduate biochemistry anyway to give them the best preparation for first year medical coursework). **Three of these credits can be used to satisfy a non-447 Genetics elective.** All other requirements of the major, including the research requirement, must be completed by the end of the junior year. Students must apply in advance to the Vice Chair (heiman@rutgers.edu) to be formally approved for this exchange.

XV. Courses Offered by the Department of Genetics

Note: Many courses are offered during only ONE (1) SEMESTER. Some are offered EVERY OTHER YEAR. Credits are listed in parentheses.

See webpage for listing of course descriptions (**Course Descriptions**)

To find which semester the following courses are offered, see **Schedule of Classes on Genetics website.**

XVI. Example Pathways Towards Completing the Genetics Major

Here we present some example pathways by which a student can complete the Genetics major. Many additional paths to achieve the major are also possible. Consult your advisor.

Example 1: Standard Pathway, No AP Credit

- **Freshman Year**
  - *Fall*
    - 01:119:115 (General Bio I, 4 cr)
    - 01:160:161 (General Chemistry I, 4 cr)
    - 01:640:135 (Calc I, 4 cr)
  - *Spring*
    - 01:119:116 (General Bio II, 4 cr)
    - 01:119:117 (General Bio Lab, 2 cr)
    - 01:160:162 (General Chemistry II, 4 cr)
    - 01:160:171 (Intro to Experimentation, 1 cr)
    - 01:640:401 (Basics Stats for Research, 3 cr)
- **Sophomore Year**
  - *Fall*
    - 01:750:203 (General Physics I, 3 cr)
    - 01:750:205 (General Physics Lab I, 1 cr)
    - 01:160:307 (Organic Chem I, 4 cr)
    - 01:447:384 (Genetic Analysis I, 4 cr)
  - *Spring*
    - 01:750:204 (General Physics II, 3 cr)
    - 01:750:206 (General Physics Lab II, 1 cr)
    - 01:160:308 (Organic Chem II, 4 cr)
    - 01:447:385 (Genetic Analysis II, 4 cr)
- **Junior Year**
  - *Fall*
    - 01:694:407 (Biochemistry, 3 cr)
    - Genetics Elective (3 cr, See list on page 13)
  - *Spring*
    - 01:447:407 (Research in Genetics, 3 cr)
    - Genetics Elective (3 cr, See list on page 13)
    - Required lab course (see Curriculum Worksheet for options)
- **Senior Year**
  - *Fall*
    - Genetics Elective (3 cr, See list on page 13)
    - 01:447:430 (Eff Comm Skills Genetics, 3 cr)
    - 01:447:406 (Research in Genetics, 3 cr)
  - *Spring*
    - Genetics Elective (3 cr, See list on page 13)
    - 01:447:407 (Research in Genetics, 3 cr)
    - 01:160:311 (Organic Chem Lab, 2 cr)

Example 2: Standard Pathway, AP Credit for General Biology

- **AP Credit**
  - *Biology*
    - 01:119:115 (4 cr)
    - 01:119:116 (4 cr)
    - 01:119:117 (2 cr)
- **Freshman Year**
  - *Fall*
    - 01:160:161 (General Chemistry I, 4 cr)
    - 01:640:135 (Calc I, 4 cr)
  - *Spring*
    - 01:160:162 (General Chemistry II, 4 cr)
    - 01:160:171 (Intro to Experimentation, 1 cr)
    - 01:640:401 (Basics Stats for Research, 3 cr)
    - 01:750:203 (General Physics I, 3 cr)
    - 01:750:205 (General Physics Lab I, 1 cr)
- **Sophomore Year**
  - *Fall*
    - 01:750:204 (General Physics II, 3 cr)
    - 01:750:206 (General Physics Lab II, 1 cr)
    - 01:160:307 (Organic Chem I, 4 cr)
    - 01:447:384 (Genetic Analysis I, 4 cr)
  - *Spring*
    - 01:160:308 (Organic Chem II, 4 cr)
    - 01:447:385 (Genetic Analysis II, 4 cr)
    - Required lab course (see Curriculum Worksheet for options)
- **Junior Year**
  - *Fall*
    - 01:447:406 (Research in Genetics, 3 cr)
    - 01:160:311 (Organic Chem Lab, 2 cr)
    - 01:694:407 (Biochemistry, 3 cr)
  - *Spring*
    - 01:447:407 (Research in Genetics, 3 cr)
    - Genetics Elective (3 cr, See list on page 13)
    - 01:447:430 (Eff Comm Skills Genetics, 3 cr)
- **Senior Year**
  - *Fall*
    - Genetics Elective (3 cr, See list on page 13)
    - 01:447:406 (Research in Genetics, 3 cr)
  - *Spring*
    - Genetics Elective (3 cr, See list on page 13)
    - 01:447:407 (Research in Genetics, 3 cr)

Example 3: Honors Pathway, Extensive AP Credit

- **AP Credit**
  - *Biology*
    - 01:119:115 (4 cr)
    - 01:119:116 (4 cr)
    - 01:119:117 (2 cr)
  - *Chemistry*
    - 01:160:161 (4 cr)
    - 01:160:162 (4 cr)
    - 01:160:171 (2 cr)
  - *Calculus*
    - 01:640:151 (4 cr)
    - 01:640:152 (4 cr)
- **Freshman Year**
  - *Fall*
    - 01:694:215 (Honors Intro to Research, 3 cr)
    - 01:750:203 (General Physics I, 3 cr)
    - 01:750:205 (General Physics Lab I, 1 cr)
    - 01:447:203 (Honors Computational Genetics, 3 cr)
  - *Spring*
    - 01:750:204 (General Physics II, 3 cr)
    - 01:750:206 (General Physics Lab II, 1 cr)
- **Sophomore Year**
  - *Fall*
    - 01:447:406 (Research in Genetics, 3 cr)
    - 01:160:307 (Organic Chem I, 4 cr)
    - 01:447:384 (Genetic Analysis I, 4 cr)
  - *Spring*
    - 01:447:407 (Research in Genetics, 3 cr)
    - 01:160:308 (Organic Chem II, 4 cr)
    - 01:447:385 (Genetic Analysis II, 4 cr)
- **Junior Year**
  - *Fall*
    - 01:447:406 (Research in Genetics, 3 cr)
    - 01:160:311 (Organic Chem Lab, 2 cr)
    - 01:694:407 (Biochemistry, 3 cr)
  - *Spring*
    - 01:447:407 (Research in Genetics, 3 cr)
- **Senior Year**
  - *Fall*
    - 01:447:408 (Honors in Genetics, 6 cr)
    - 01:447:414 (Thesis Writing & Communication in Genetics, 1.5 cr)
    - Genetics Elective (3 cr, See list on page 13)
  - *Spring*
    - 01:447:409 (Honors in Genetics, 6 cr)
    - 01:447:415 (Thesis Writing & Communication in Genetics, 1.5 cr)
    - Genetics Elective (3 cr, See list on page 13)

Example 4: Genetic Counseling Pathway with AP Biology

- **AP Credit**
  - *Biology*
    - 01:119:115 (4 cr)
    - 01:119:116 (4 cr)
    - 01:119:117 (2 cr)
- **Freshman Year**
  - *Fall*
    - 01:160:161 (General Chemistry I, 4 cr)
    - 01:640:135 (Calc I, 4 cr)
  - *Spring*
    - 01:160:162 (General Chemistry II, 4 cr)
    - 01:160:171 (Intro to Experimentation, 1 cr)
    - 01:640:401 (Basics Stats for Research, 3 cr)
    - 01:750:203 (General Physics I, 3 cr)
    - 01:750:205 (General Physics Lab I, 1 cr)
- **Sophomore Year**
  - *Fall*
    - 01:750:204 (General Physics II, 3 cr)
    - 01:750:206 (General Physics Lab II, 1 cr)
    - 01:160:307 (Organic Chem I, 4 cr)
    - 01:447:384 (Genetic Analysis I, 4 cr)
  - *Spring*
    - 01:160:308 (Organic Chem II, 4 cr)
    - 01:447:385 (Genetic Analysis II, 4 cr)
    - 01:447:302 (Quantitative Biology & Bioinformatics, 3 cr)
- **Junior Year**
  - *Fall*
    - 01:447:406 (Research in Genetics, 3 cr)
    - 01:160:311 (Organic Chem Lab, 2 cr)
    - 01:694:407 (Biochemistry, 3 cr)
  - *Spring*
    - 01:447:488 (Genetic Counseling Rotation, 3 cr)
    - Genetics Elective (3 cr, See list on page 13)
    - 01:447:430 (Eff Comm Skills Genetics, 3 cr)
- **Senior Year**
  - *Fall*
    - Genetics Elective (3 cr, See list on page 13)
    - 01:447:406 (Research in Genetics, 3 cr)
  - *Spring*
    - Genetics Elective (3 cr, See list on page 13)
    - 01:447:407 (Research in Genetics, 3 cr)