BIOS 2610: Integrative Genetics Syllabus

**3 credit class**

**MW 9:30 – 10:45 AM; CE 320 (Hybrid Touch Points, SYNC)**

**Instructor Information**

|  |  |  |
| --- | --- | --- |
| Instructor  Prof. Yury Chernoff  Krone EBB 5016 | Email  [yury.chernoff@biology.gatech.edu](mailto:yury.chernoff@biology.gatech.edu) | Office Hours  By Email appointment |
| **Teaching Assistant**  Andrew Ji | **Email**  aji9@gatech.edu | **Office Hours**  By Email appointment |

**General Information**

**Description**

## The Integrative Genetics curriculum is an advanced look at genetics. BIOS 2610 lecture must be taken together with the BIOS 2611 lab. Although listed as separate courses, one cannot withdraw only from the lab course and continue taking the lecture course or vice versa. Both courses are intended to integrate and expand a student’s knowledge in genetics beyond what is presented in typical undergraduate genetics courses. It is expected that students taking this class already know the fundamental genetic principles, such as Mendel’s laws and the role of DNA in inheritance. The course contents is primarily aimed at students having A or B in Biological Principles or equivalent, overall GPA of 3.0 or above (even those are not formal requirements), and interested in the in-depth knowledge of genetics.

## Integrative Genetics lecture presents a deeper dive into the fundamentals of genetics, integrating classical genetics discovery science with recent studies at molecular level and the applications of genetics. Rules of transmission genetics and their molecular basis are considered in parallel. In addition to a comprehensive coverage of general genetic principles, the course includes in-depth coverage of some topics emphasizing how genetic analysis techniques are used to uncover the rules and mechanisms of inheritance. Instruction includes a combination of traditional lecture, interactive lecture elements including primary literature review, in-class discussions, and Q&A. In addition to readings in the textbook, students will read and discuss assigned articles from the primary scientific literature to practice reading and interpreting this literature and to link textbook and lecture content to real world applications.

**Course Mode**

In Fall 2020, BIOS 2610 is taught in the "Hybrid Touch Points" fashion. Lectures will be offered in the remote, synchronous instructional model, with online attendance during class time expected from every student and monitored periodically.  Graded assignments or quizzes could be given during online lectures without prior notice.  Touch point in person discussion sessions will be held occassionally, with prior announcements made in the class.  During the 1st half or semester, touch point sessions will be held not more (and possibly less) frequently than once per 2-3 weeks; no touch point sessions will occur during the first week of class. Periodicity of touch point sessions for the second half of semester will be determined based on situation. Attendance at each touch point session will be determined in accordance to the needs and to the attendance limits, corresponding to Georgia Tech regulations and room capacity. Students not attending touch point sessions might receive alternative assignments. Major tests and exams will be completed remotely; any in person assignments will have remote alternatives. **Use of PPE (masks) and social distancing are required during the touch point sessions.** **Please refer to Georgia Tech safety guidelines.**

**Pre- &/or Co-Requisites**

*Required:* BIOS 1107 with Lab, or BIOL 1510/1511, or equivalent; *Co-Requisite:* BIOS 2611

## Course Goals and Learning Outcomes

By the end of this class, students will be able to:

(1) understand the fundamental principles of inheritance ranging from molecules to populations and how they apply to various groups of living organisms;

(2) explain the molecular mechanisms underlying the transmission of genetic traits;

(3) explain the molecular mechanisms underlying the transition from genes to phenotypes;

(4) apply genetic concepts to analysis of modern scientific literature;

(5) understand the genetic basis of human evolution and disease;

(6) explain how fundamental properties of DNA, RNA, and proteins are exploited in biotechnology, genetic engineering and genetic health testing.

**Course Requirements & Grading**

**Quizzes, HWs and In-class activities – 40%**

**Exams – 60%**

Extra credit could be assigned for exceptional performance in the class and active participation in the in-class activities.

**Description of Graded Components**

**Homeworks and Quizzes:** Will be posted on Canvas, given in class or both. In each case, the Professor will provide details on how to return the completed assignment, which may be through Canvas or by direct Email. Some quizzes would be given in class without a prior notice. Lowest scores on homeworks and quizzes (depending on the number of assignments taken) will be dropped.

**In-class activities:** This class will require your active participation in discussions, in class assignments, and group activities. These are designed to increase your comprehension and capacity to speak intelligibly about important topics in genetics.

**Exams:** Cover lecture materials, include questions of various types. Taken during assigned class periods with strict time control. lWhile use of supportive materials is allowed, note that exam format would make it highly inconvenient and probably useless to go through lectures or textbook during an exam.

**Grading Scale:** A – 90% and above; B - 80% and above; C - 70% and above; D - 60% and above; F – below 60%.

**Course Materials**

**Course Text**

## R.J. Brooker (2021) Genetics Analysis & Principles (7th Edition). McGraw-Hill Educ.  ISBN-13: 978-1260240856; ISBN-10: 1260240851 (Required.)

## The previous edition, R.J. Brooker (2018) Genetics Analysis & Principles (6th Edition). McGraw-Hill Educ. ISBN-13: 978-1259616020 can also be used (some chapter, page or question numbers may differ, though.)

## Outside Materials

## Journal articles, website links of interest/discussion, etc.

**Course Website and Other Classroom Management Tools**

All lectures (typically after the class) and outside materials (OMs) will be posted on Canvas. For some lectures, pre-lecture materials will also be posted. Lecture recordings will be accessible to participants. It is highly recommended that students take notes to supplement their understanding of lecture and OMs.

**Course Schedule (Tentative)**

*This schedule is subject to change;* OM = Outside Materials

|  |  |  |  |
| --- | --- | --- | --- |
| **Week** | **Date** | **Topic** | **Chapter** |
| 1 | Aug 17 | Lecture 1: Concepts of Inheritance | 1, 2 |
|  | Aug 19 | Lecture 2: Chromosome Basis of Inheritance | 1-3 |
| 2 | Aug 24 | Lecture 3: Life Cycles and Gene Function | 3, 4, 13.1, OM |
|  | Aug 26 | Lecture 4: Recombination and Mapping I | 6 |
| 3 | Aug 31 | Lecture 5: Recombination and Mapping II | 6, 19.6 |
|  | Sept 2 | Lecture 6: Recombination in Bacteria and Bacteriophages I | 7 |
| 4 | Sept 7 | No class (Labor Day) |  |
|  | Sept 9 | Lecture 7: Recombination in Bacteria and Bacteriophages II | 7, 9.1, 18.1-3, 19.6 |
| 5 | Sept 14 | Lecture 8: Non-Mendelian Inheritance | 5, 24.4, OM |
|  | Sept 16 | Lecture 9: Discussion/Review |  |
| 6 | Sept 21 | **EXAM I** (Covers weeks 1-5) |  |
|  | Sept 23 | Lecture 10: Chromosome Variations I | 8, OM |
| 7 | Sept 28 | Lecture 11: Chromosome Variations II | 8, 10 |
|  | Sept 30 | Lecture 12: Replication, Repair and Gene Mutation I | 9, 19 |
| 8 | Oct 5 | Lecture 13: Replication, Repair and Gene Mutation II | 9, 19 |
|  | Oct 7 | Lecture 14: Genetic Code and Translation | 13 |
| 9 | Oct 12 | Lecture 15: Transcription | 12 |
|  | Oct 14 | Lecture 16: Gene Regulation in Prokaryotes | 14 |
| 10 | Oct 19 | Lecture 17: RNA Modifications and Gene Regulation in Eukaryotes | 12.4, 15 |
|  | Oct 21 | Lecture 18: Discussion/Review |  |
| 11 | Oct 26 | **EXAM II** (Covers weeks 6-10) |  |
|  | Oct 28 | Lecture 19: Genetic Engineering and Genomics I | 20 |
| 12 | Nov 2 | Lecture 20: Genetic Engineering and Genomics II | 17.5, 21, 22, 23.1 |
|  | Nov 4 | Lecture 21: Quantitative and Population Genetics | 27, 28 |
| 13 | Nov 9 | Lecture 22: Genetic Basis of Evolution | 27, 29 |
|  | Nov 11 | Lecture 23: Genetic Basis of Human Evolution and Disease I | 2, 24, OM |
| 14 | Nov 16 | Lecture 24: Genetic Basis of Human Evolution and Disease II | 24, OM |
|  | Nov 18 | Lecture 25: Genetics of Viruses | 18, OM |
| 15 | Nov 23 | Lecture 26: Discussion/Review |  |
|  | Nov 25 | No class (Day before Thanksgivings) |  |
| Finals | Dec 7 | **FINAL EXAM** (Covers weeks 11-15), 8:00-10:50 AM |  |

**Course Expectations & Guidelines**

## Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit http://www.catalog.gatech.edu/policies/honor-code/ or <http://www.catalog.gatech.edu/rules/18/>. Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations. Please note that all quizzes must be taken in the classroom. Attempts to take the quizzes outside of the classroom, or facilitating other students taking the quizzes outside of the classroom, will be considered cheating.

## Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or <http://disabilityservices.gatech.edu/>, as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

## Attendance and/or Participation

Class time will be used for lectures, quizzes, group activities, and exams. If you miss lecture, *you* are responsible for obtaining all notes, announcements, and assignments. Written confirmation of a legitimate excuse, such as a severe illness, will be required if any assessment is missed. The institute’s excused absence policy will be enforced in this course (http://www.catalog.gatech.edu/rules/4/). *No exceptions!*

## Collaboration & Group Work

This class will require active participation in group activities and in class discussions.

## Extensions, Late Assignments, & Re-Scheduled/Missed Exams

There will be no credit given for any assignments turned in after the deadline. Students that miss any assignments/exams for approved Institute activities and religious observances will be excused for any missed credit or given an opportunity to take assignments at different time periods, assuming that proper documentation is provided. See <http://www.catalog.gatech.edu/rules/4/> for more information.

## Student-Faculty Expectations Agreement

At Georgia Tech we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. See <http://www.catalog.gatech.edu/rules/22/> for an articulation of some basic expectation that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

**Student Use of Mobile Devices in the Classroom**

Lecture or touch point discussion is a time when we all work together, so be courteous to your fellow students and do not disrupt class by entering and leaving the room, reading, talking, allowing cell phones to ring, etc. During online lecture, please keep your microphones muted and only turn them on if you need to ask or answer a question, during the time period specifically allocated by lecturer. ***Do not use your electronic devices (laptops, tablets, smartphones, etc.) for activities unrelated to class during a class period.***

**Campus Resources for Students**

**In your time at Georgia Tech, you may find yourself in need of support. Below you will find some resources to support you both as a student and as a person.**

**Academic Support**

* **Center for Academic Success** <http://success.gatech.edu>
  + **1-to-1 tutoring** <http://success.gatech.edu/1-1-tutoring>
  + **Peer-Led Undergraduate Study (PLUS)** <http://success.gatech.edu/tutoring/plus>
  + **Academic coaching http://success.gatech.edu/coaching**
* **Residence Life's Learning Assistance Program**

<https://housing.gatech.edu/learning-assistance-program>

* + **Drop-in tutoring for many 1000 level courses**
* **OMED: Educational Services** (<http://omed.gatech.edu/programs/academic-support>)
  + **Group study sessions and tutoring programs**
* **Communication Center** (<http://www.communicationcenter.gatech.edu>)
  + **Individualized help with writing and multimedia projects**
* **Academic advisors for your major** <http://advising.gatech.edu/>

**Personal Support**

*Georgia Tech Resources*

* The Office of the Dean of Students: <http://studentlife.gatech.edu/content/services>; **404-894-6367**; Smithgall Student Services Building 2nd floor
  + You also may request assistance at <https://gatech-advocate.symplicity.com/care_report/index.php/pid383662?>
* Counseling Center: <http://counseling.gatech.edu>; **404-894-2575**; Smithgall Student Services Building 2nd floor
  + Services include short-term individual counseling, group counseling, couples counseling, testing and assessment, referral services, and crisis intervention. Their website also includes links to state and national resources.
  + *Students in crisis may walk in during business hours (8am-5pm, Monday through Friday) or contact the counselor on call after hours at* ***404-894-2204****.*
* Students’ Temporary Assistance and Resources (STAR): <http://studentlife.gatech.edu/content/need-help>
  + Can assist with interview clothing, food, and housing needs.
* Stamps Health Services: <https://health.gatech.edu>; **404-894-1420**
  + Primary care, pharmacy, women’s health, psychiatry, immunization and allergy, health promotion, and nutrition
* OMED: Educational Services: <http://www.omed.gatech.edu>
* Women’s Resource Center:  <http://www.womenscenter.gatech.edu>; 404-385-0230
* LGBTQIA Resource Center:  <http://lgbtqia.gatech.edu/>; 404-385-2679
* Veteran’s Resource Center:  <http://veterans.gatech.edu/>; 404-385-2067
* Georgia Tech Police: 404-894-2500

**Statement of Intent for Inclusivity**

As members of the Georgia Tech community, we are committed to creating a learning environment in which all of my students feel safe and included. Because we are individuals with varying needs, we are reliant on your feedback to achieve this goal. To that end, we invite you to enter into dialogue with us about the things we can stop, start, and continue doing to make my classroom an environment in which every student feels valued and can engage actively in our learning community.

**Expectations and Guidelines Specific to Fall 2020**

Each of us has a responsibility to ourselves and our fellow Yellow Jackets to be mindful of our shared commitment.

* We are all required to wear a face covering while inside any campus facilities/buildings, including during in-person classes, and to adhere to social distancing of at least 6 feet. If an individual forgets to bring a face covering to class or into any indoor space, there will be a clearly marked supply of these in each building. If a student fails to follow Georgia Tech’s policies on social distancing and face coverings, they will initially be reminded of the policy and if necessary, asked to leave the class, meeting, or space. If they still fail to follow the policy, they may be referred to the Office of the Dean of Students. [Information on the Institute’s policy on face coverings.](https://hr.gatech.edu/face-coverings)
* During in-person events, students are expected to sit in assigned seats and to come to class only on days that are assigned to them.
* Papers, projects, tests, homework, and other assignments will only be accepted in electronic form unless the assignment is a physical artifact.

Additional information is available in the [Student Guidebook](https://health.gatech.edu/coronavirus/students/guidebook).

**Student Illness or Exposure to Covid-19**

During the semester, you may be required to quarantine or self-isolate to avoid the risk of infection to others.  Quarantine is the separation of those who have been exposed to someone with Covid-19 but who are not ill; isolation is the separation of those who have tested positive for Covid-19 or been diagnosed with Covid-19 by symptoms.

If you have not tested positive but are ill or have been exposed to someone who is ill, please follow the [Covid-19 Exposure Decision Tree](http://health.gatech.edu/coronavirus/decision-tree) for reporting your illness.

During the quarantine or isolation period you may feel completely well, ill but able to work as usual, or too ill to work until you recover.

Remote courses and remote class sessions during hybrid courses. Unless you are too ill to work, you should be able to complete your remote work while in quarantine or isolation.

In-person courses and in-person class sessions during hybrid courses. When in isolation or quarantine you will be unable to attend in-person course sessions but your instructor may require you either to participate in the course remotely, complete some complementary work that parallels what you are missing in class, or make up some class work when you return.

If you are ill and unable to do course work this will be treated similarly to any student illness. The Dean of Students will have been contacted when you report your positive test or are told that it is necessary to quarantine and will notify your instructor that you may be unable to attend class events or finish your work as the result of a health issue. Your instructor will not be told the reason. We have asked all faculty to be lenient and understanding when setting work deadlines or expecting students to finish work, and so you should be able to catch up with any work that you miss while in quarantine or isolation. Your instructor may make available any video recordings of classes or slides that have been used while you are absent, and may prepare some complementary asynchronous assignments that compensate for your inability to participate in class sessions. Ask your instructor for the details.

**CARE Center, Counseling Center, Stamps Health Services, and the Student Center**

These uncertain times can be difficult, and many students may need help in dealing with stress and mental health. The [**CARE Center**](https://care.gatech.edu/) and the [**Counseling Center**](https://counseling.gatech.edu/), and [**Stamps Health Services**](https://health.gatech.edu/) will offer both in-person and virtual appointments. Face-to-face appointments will require wearing a face covering and social distancing, with exceptions for medical examinations. Student Center services and operations are available on the [**Student Center**](https://studentcenter.gatech.edu/) website. For more information on these and other student services, contact the Vice President and Dean of Students or the [**Division of Student Life**](https://studentlife.gatech.edu/).

**Accommodations for Students at Higher Risk for Severe Illness with Covid-19**

Students may request an accommodation through the Office of Disability Services (ODS) due to 1) presence of a condition as defined by the Americans with Disabilities Act (ADA), or 2) identification as an individual of higher risk for Covid-19, as defined by the Centers for Disease Control (CDC). Registering with ODS is a 3-step process that includes completing an application, uploading documentation related to the accommodation request, and scheduling an appointment for an “intake meeting” (either in person or via phone or video conference) with a disability coordinator.

If you have been approved by ODS for an accommodation, instructor will work closely with you to understand your needs and make a good faith effort to investigate whether or not requested accommodations are possible for this course. If the accommodation request results in a fundamental alteration of the stated learning outcome of this course, ODS, academic advisors, and the school offering the course will work with you to find a suitable alternative that as far as possible preserves your progress toward graduation.