BIOS 2610: Integrative Genetics Syllabus

**3 credit class**

**TR 9:30 – 10:50 AM; Aug 21 – Dec 13th, 2018; Van Leer C457**

**Instructor Information**

|  |  |  |
| --- | --- | --- |
| Instructors | Email | Office Hours & Location |
| Dr. Yury Chernoff  Dr. Matthew Torres | [yury.chernoff@biology.gatech.edu](mailto:yury.chernoff@biology.gatech.edu)  [mtorres35@gatech.edu](mailto:mtorres35@gatech.edu) | By appointment – Krone EBB 5016  By appointment – Krone EBB 4009 |
| **Teaching Assistant(s)** | **Email** | **Office Hours & Location** |
| Owen Hale | [ohale@gatech.edu](mailto:ohale@gatech.edu) | Mon 6-7 PM ES&T L1118 |

**General Information**

**Description**

## The Integrative Genetics curriculum, with required lecture and lab, is an advanced look at introductory genetics for students who excelled in Biological Principles or earned a 5 on the AP Biology exam. Integrative Genetics lecture must be taken together with the Integrative Genetics Lab (BIOS 2811). 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.

## Integrative Genetics lecture presents a deeper dive into the fundamentals of genetics, integrating classical genetics discovery science with recent genetics discoveries and the applications of genetics. Rules of transmission genetics and their molecular basis are considered in parallel. The course includes in-depth coverage of some topics, in addition to a comprehensive coverage of general genetic principles. In-depth coverage emphasizes how genetic analysis techniques are used to uncover the genetic 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.

## Pre- &/or Co-Requisites

## BIOS 1107 AND (BIOS 1107L OR BIOS 1207L), or BIOL 1510, or BIOL 1511, or equivalent. Co-Requisite: BIOS 2611

## *Recommended for: Any student who has received an A or B in Biological Principles, currently has an overall GPA 3.0 or above, and is interested in the in-depth knowledge of Genetics.*

## 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 the 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**

Your grade will be determined by a combination of quizzes, in-class activities, and online homework assignments combined with in-class exams. The relative value of these assessments are:

|  |  |  |
| --- | --- | --- |
| Assignment | Date | Weight (Percentage, points, etc.) |
| Quizzes, HWs &  In-class activities | Throughout the semester | 20% (10% each half) |
| Exam I | Sept 13 | 20% |
| Exam II | Oct 11 | 20% |
| Exam III | Nov 8 | 20% |
| Final Exam | Dec 13 | 20% |

**Extra Credit Opportunities**

Extra credit will be assigned for exceptional performance in the class (including answering questions from Professor to the class during lectures and active participation in in-class activities [see below]).

**Description of Graded Components**

Homework: Will be posted on T-square, given in class or both. In each case, the Professor will provide details on how to return the completed assignment, which may be through T-square or during class.

In-class quizzes: Will be given in the class periodically without prior notice. Usually these take no more than 10 min each. Questions will be based on true or false statements, fill in the blank, multiple choice, definitions, short answer, and simple problems. For those who have taken all quizzes in the given half of the class, the worst quiz score in each half of the class 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 (problems, definitions, true/false statements, list and describe questions, multiple choice questions). Taken in class in a closed book format.

**Grading Scale**

A 90-100%

B 80-89%

C 70-79%

D 60-69%

F 0-59%

**Course Materials**

**Course Text**

## R.J. Brooker (2018) Genetics Analysis & Principles (6th Edition). McGraw-Hill Educ. ISBN-13: 978-1259616020 (Required)

## 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 T-Square. It is highly recommended that students take notes to supplement their understanding of lecture and OMs.

**Course Schedule**

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Week | Date | Topic | Chapter | Instructor |
| 1 | 21-Aug | Concepts of Inheritance | 1, 2 | YC |
|  | 23-Aug | Chromosome Basis of Inheritance | 2, 3 | YC |
| 2 | 28-Aug | Life Cycles and Gene Function | 3, 4, OM | YC |
|  | 30-Aug | Quantitative Genetics | 28 | YC |
| 3 | 4-Sept | Recombination and Mapping | 6 | YC |
|  | 6-Sept | Molecular Mechanisms of Recombination | 6, 20 | YC |
| 4 | 11-Sept | Recombination in Bacteria / Review | 7, OM | YC |
|  | 13-Sept | **EXAM I** (Covers weeks 1-4) |  | YC |
| 5 | 18-Sept | Organelle Genetics and Protein-based Inheritance | 5, 25, OM | YC |
|  | 20-Sept | Chromosome Variations and Transpositions | 8, 20 | YC |
| 6 | 25-Sept | Genome and Gene Mutations | 8, 19, OM | YC |
|  | 27-Sept | Population Genetics | 27 | YC |
| 7 | 2-Oct | Genetic Basis of Microevolution and Speciation | 27, 29 | YC |
|  | 4-Oct | Genetic Basis of Human Evolution, Alcohol Consumption and Disease | 2, 25, OM | YC |
| 8 | 9-Oct | No class – Fall break |  |  |
|  | 11-Oct | **EXAM II** (Covers weeks 1-8) |  | YC |
| 9 | 16-Oct | Molecular Structure and Organization of DNA | 9-10 | MT |
|  | 18-Oct | DNA Replication | 11 | MT |
| 10 | 23-Oct | Exploiting the Fundamental Properties of DNA | 21.1-21.3, OM | MT |
|  | 25-Oct | Gene Transcription and RNA Modification | 12 | MT |
| 11 | 30-Oct | The Genetic Code and Translation of mRNA | 13 | MT |
|  | 1-Nov | Genetic Health Testing and Implications | 24, OM | MT |
| 12 | 6-Nov | Review/Flex |  | MT |
|  | 8-Nov | **Exam III** (Covers weeks 9-12) |  | MT |
| 13 | 13-Nov | Gene Regulation in Bacteria and Bacterial Immunity | 14, OM | MT |
|  | 15-Nov | CRISPR-Cas Technology – Discovery and Mechanism (In Class Primary Literature Discussion) | 21.4, OM | MT |
| 14 | 20-Nov | Gene Regulation in Eukaryotes I | 15 | MT |
|  | 22-Nov | No class – Thanksgiving break |  |  |
| 15 | 27-Nov | Epigenetics and Molecular Technologies II | 16, 21.6, OM | MT |
|  | 29-Nov | Genetics of Cancer | 25 | MT |
| 16 | 4-Dec | Review/Flex |  | MT |
|  | 6-Dec | No class |  |  |
| 17 | 13-Dec | **FINAL EXAM** (11:20 – 12:10) (Covers weeks 9-16) |  | MT |

**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 [see in-class activities].

## 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. 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 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. ***In addition, while in class, do not use your electronic devices (laptops, tablets, smartphones, etc.) for activities unrelated to class.***

**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.