

- Identify and evaluate the different patterns of inheritance in individuals, families, and populations
- Explain the connection between the genotype and the phenotype of an individual at the molecular level
- Discuss the impact of our current knowledge of genetics and genomics on our understanding of developmental, clinical, and evolutionary biology
- Demonstrate basic laboratory skills in Molecular Genetics

After successful completion of this course, students will be able to:

1. Construct pedigrees and identify potential inheritance patterns based on pedigrees
2. Construct Punnett Squares and use Punnett Squares to predict the probability of outcomes from crosses;
3. Conduct quantitative probability analysis to evaluate the outcome of genetic crosses;
4. Account for different inheritance patterns using a molecular understanding of gene expression;
5. Trace genetic information from DNA sequences, through RNA transcription and processing, to amino acid sequences in peptides;
6. Describe the replication and packaging of DNA in eukaryotes and prokaryotes;
7. Describe and use modern techniques in molecular biology;
8. Evaluate the use of genetic markers to locate disease genes and characterize a genome;
9. Define the role of genetic determinants in human disease, and particularly in cancer;
10. Describe common genetic motifs that control development;
11. Correlate genetic changes with evolutionary changes.

COURSE FORMAT AND STRUCTURE

Two 50-min lectures per week and one 50-min recitation per week

One 3-hr laboratory session per week

COURSE MATERIALS

Introduction to Genetic Analysis, A. Griffiths et al., 12th ed. (Macmillan learning)

Achieve access card (includes the eBook): ISBN: 9781319401399 (\$109.99 list price for 1-term)

COURSE REQUIREMENTS

1. Participation:

- Attendance, participation in in-class activities count toward the final grade (see below)

2. Assignments

- Graded adaptive/reading quizzes will be administered through canvas
 - Adaptive/reading quizzes are DUE before the recitations (see course schedule).
- Graded homework questions will be administered through canvas.
 - Assignments are DUE by 11:59 p.m. EST on the due date listed in the course schedule.
 - Deadlines are an unavoidable part of being a professional and this course is no exception. Course requirements must be completed and submitted on or before specified due date and delivery time deadline.
 - To encourage you to stay on schedule, due dates have been established for each assignment; 10% of the total points will be deducted for assignments received 1 day late; assignments received more than 1 day late will receive 0 points

3. Exams:

Three 1-hour exams

- Exams will consist of multiple choice, matching quizzes, fill-in, and short answer questions. Material for exams is taken from lecture, homework assignments and in-class activities.
- Please take note of the dates: NO make-up exam will be given without a valid excuse.

- Valid excuses include ONLY: medical excuse (physician's note required), deaths in the immediate family and other documented crises, call to court-imposed legal obligations (e.g., jury duty) and religious days.
- Under no circumstances will make-up exams be given for student convenience. Students must contact the instructor prior to the exam to be excused (except in unforeseeable circumstances). The make-up exam MUST be taken within one week of the original exam date

4. Lab - Weekly attendance mandatory (see below for detailed information)

GRADING PROCEDURE

Grades will be based on:

- Attendance & Participation = 10%
- Assessments = 20%
 - Reading/Adaptive Quizzes
 - Homework
- Three 1-hour exams = 45% (5% the first exam; 20% each the second and third exam)
- Lab = 25%
 - See below for detailed information

GRADING SCHEME

NO rounding off offered

Grade	Range	
A	100%	to 93%
A-	<92.99%	to 90%
B+	<89.99%	to 87%
B	<86.99%	to 83%
B-	<82.99%	to 80%
C+	<79.99%	to 77%
C	<76.99%	to 73%
C-	<72.99%	to 70%
D+	< 69.99	to 67%
D	<66.99%	to 60%
F	<60%	to 0%

Academic Integrity

Undergraduate Honor System (100-400 level)

Enrollment into the undergraduate class of Stevens Institute of Technology signifies a student's commitment to the Honor System. Accordingly, the provisions of the Stevens Honor System apply to all undergraduate students in coursework and Honor Board proceedings. It is the responsibility of each student to become acquainted with and to uphold the ideals set forth in the Honor System Constitution. More information about the Honor System including the constitution, bylaws, investigative procedures, and the penalty matrix can be found online at <http://web.stevens.edu/honor/Links> to an external site.

The following pledge shall be written in full and signed by every student on all submitted work (including, but not limited to, homework, projects, lab reports, code, quizzes, and exams) that is assigned by the course instructor. No work shall be graded unless the pledge is written in full and signed.

"I pledge my honor that I have abided by the Stevens Honor System."

Reporting Honor System Violations

Students who believe a violation of the Honor System has been committed should report it within ten business days of the suspected violation. Students have the option to remain anonymous and can report violations online at www.stevens.edu/honor Links to an external site.

EXAM CONDITIONS

The following procedures apply to exams for this course. As the instructor, I reserve the right to modify any conditions set forth below by printing revised Exam Conditions on the exam.

1. Students cannot use ANY of the following electronic devices during the exams. Note that the laptop is allowed ONLY if the exams are administered through canvas. Be advised that the Lockdown browser (see below) will be reinforced for online exams.

Device	YES	NO
Laptop	X (conditional)	
Cell phone		X
Tablet		X
Smart watch		X
Google glass		X

2. Students may use the following materials during quizzes and/or exams. Refer to the list.

Material	YES	NO
Handwritten notes	X	
Typed notes		X
Textbook		X
Other		X

3. Students are/are NOT allowed to work with or talk to other students during exams.

LEARNING ACCOMMODATIONS

Stevens Institute of Technology is dedicated to providing appropriate accommodations to students with documented disabilities. The Office of Disability Services (ODS) works with undergraduate and graduate students with learning disabilities, attention deficit-hyperactivity disorders, physical disabilities, sensory impairments, psychiatric disorders, and other such disabilities in order to help students achieve their academic and personal potential. They facilitate equal access to the educational programs and opportunities offered at Stevens and coordinate reasonable accommodations for eligible students. These services are designed to encourage independence and self-advocacy with support from the ODS staff. The ODS staff will facilitate the provision of accommodations on a case-by-case basis.

For more information about Disability Services and the process to receive accommodations, visit <https://www.stevens.edu/office-disability-services> Links to an external site. If you have any questions please contact: Phillip Gehman, the Director of Disability Services Coordinator at Stevens Institute of Technology at pgehman@stevens.edu or by phone 201-216-3748.

Disability Services Confidentiality Policy

Student Disability Files are kept separate from academic files and are stored in a secure location within the Office of Disability Services. The Family Educational Rights Privacy Act (FERPA, 20 U.S.C. 1232g; 34CFR, Part 99) regulates disclosure of disability documentation and records maintained by Stevens Disability Services. According to this act, prior written consent by the student is required before our Disability Services office may release disability documentation or records to anyone. An exception is made in unusual circumstances, such as the case of health and safety emergencies.

INCLUSIVITY

Name and Pronoun Usage

As this course includes group work and class discussion, it is vitally important for us to create an educational environment of inclusion and mutual respect. This includes the ability for all students to have their chosen gender pronoun(s) and chosen name affirmed. If the class roster does not align with your name and/or pronouns, please inform the instructor of the necessary changes.

Inclusion Statement

Stevens Institute of Technology believes that diversity and inclusiveness are essential to excellence in academic discourse and innovation. In this class, the perspective of people of all races, ethnicities, gender expressions and gender identities, religions, sexual orientations, disabilities, socioeconomic backgrounds, and nationalities will be respected and viewed as a resource and benefit throughout the semester. Suggestions to further diversify class materials and assignments are encouraged. If any course meetings conflict with your religious events, please do not hesitate to reach out to your instructor to make alternative arrangements.

You are expected to treat your instructor and all other participants in the course with courtesy and respect. Disrespectful conduct and harassing statements will not be tolerated and may result in disciplinary actions.

MENTAL HEALTH RESOURCES

Part of being successful in the classroom involves a focus on your whole self, including your mental health. While you are at Stevens, there are many resources to promote and support mental health. The Office of Counseling and Psychological Services (CAPS) offers free and confidential services to all enrolled students who are struggling to cope with personal issues (e.g., difficulty adjusting to college or trouble managing stress) or psychological difficulties (e.g., anxiety and depression) and who can visit the office in person. CAPS is open from 9:00 am – 5:00 pm Mondays, Wednesdays, Thursdays, and Fridays and from 9:00 am – 7:00 pm on Tuesdays during the Fall and Spring semesters; appointments are highly encouraged. For those students who cannot visit the Stevens campus for an in-person appointment, you can contact a local mental health care provider for an in-person appointment, or if you are enrolled in the Stevens Student Health Insurance, you may call Care Connect for 24/7 mental health support at 1-888-857-5462.

EMERGENCY INFORMATION

In the event of an urgent or emergent concern about the safety of yourself or someone else in the Stevens community, please immediately call the Stevens Campus Police at 201-216-5105 or on their emergency line at 201-216-3911. These phone lines are staffed 24/7, year-round. For students who do not reside near the campus and require emergency support, please contact your local emergency response providers at 911 or via your local police precinct. Other 24/7 national resources for students dealing with mental health crises include the National Suicide Prevention Lifeline (1-800-273-8255) and the Crisis Text Line (text “Home” to 741-741). If you are concerned about the wellbeing of another Stevens student, and the

matter is not urgent or time sensitive, please email the CARE Team at care@stevens.edu. A member of the CARE Team will respond to your concern as soon as possible.

TENTATIVE LECTURE SCHEDULE

NOTE: The instructor reserves the right to modify the schedule as necessary to assure the course objectives are met or exceeded. The student will be promptly informed of any such change.

Week	Date	Day	Topic	Reading	Reading/Adaptive Quizzes DUE @ 11:00 AM	Homework DUE @ 11:59 PM
1	2-Sep	Friday	Introduction	Chapter 1		
	5-Sep	Monday	Labor Day - NO Class			
	7-Sep	Wed	Single-gene inheritance (I)	Chapter 2		
	9-Sep	Friday	Single-gene inheritance (II)			
2	12-Sep	Monday	Recitation Chapter 2		Chapter 2	
	14-Sep	Wed	Independent Assortment of Genes (I)	Chapter 3		
	16-Sep	Friday	Independent Assortment of Genes (II)			
3	19-Sep	Monday	Recitation Chapter 3		Chapter 3	
	21-Sep	Wed	Review Chapter 2			
	23-Sep	Friday	Review Chapter 3			
4	26-Sep	Monday	Genetic Linkage and Mapping (I)	Chapter 4		HW Chapters 2 & 3
	28-Sep	Wed	Genetic Linkage and Mapping (II)			
	30-Sep	Friday	Recitation Chapter 4		Chapter 4	
5	3-Oct	Monday	Gene Interaction (I)	Chapter 5		HW Chapter 4
	5-Oct	Wed	Gene Interaction (II)			
	7-Oct	Friday	Recitation Chapter 5		Chapter 5	
6	10-Oct	Monday	Fall Recess - NO Class			
	11-Oct	Tuesday*	Genetic of Bacteria (I)	Chapter 6		
	12-Oct	Wed	Genetic of Bacteria (II)			
	14-Oct	Friday	Recitation Chapter 6		Chapter 6	
7	17-Oct	Monday	Exam 1 (Ch. 2-6)			HW Chapters 5 & 6
	19-Oct	Wed	DNA Replication	Chapter 7		
	21-Oct	Friday	RNA Transcription and Processing (I)	Chapter 8		
8	24-Oct	Monday	RNA Transcription and Processing (II)			
	26-Oct	Wed	Protein Structure and Their Synthesis (I)	Chapter 9		
	28-Oct	Friday	Protein Structure and Their Synthesis (II)			
9	31-Oct	Monday	Recitations Chapters 7, 8 & 9		Chapters 7, 8 & 9	
	2-Nov	Wed	Gene Regulation in Bacteria (I)	Chapter 11		
	4-Nov	Friday	Gene Regulation in Bacteria (II)			HW Chapters 7, 8 & 9
10	7-Nov	Monday	Recitation Chapter 11		Chapter 11	
	9-Nov	Wed	Gene Regulation in Eukaryotes (I)	Chapter 12		
	11-Nov	Friday	Gene Regulation in Eukaryotes (II)			
11	14-Nov	Monday	Recitation Chapter 12 & Exam 2 review		Chapter 12	
	16-Nov	Wed	Exam 2 (Ch. 7-9, 11 & 12)			HW Chapters 11 & 12
	18-Nov	Friday	DNA damage, repair and mutation (I)	Chapter 15		
12	21-Nov	Monday	DNA damage, repair and mutation (II)			
	23-Nov	Wed				
	25-Nov	Friday	Thanksgiving - No Class			
13	28-Nov	Monday	The Dynamic Genome	Chapter 16		
	30-Nov	Wed	Recitation Chapters 15 & 16		Chapters 15 & 16	
	2-Dec	Friday	Large scale chromosomal changing (I)	Chapter 17		
14	5-Dec	Monday	Large scale chromosomal changing (II)			
	7-Dec	Wed	Population Genetics (I)	Chapter 18		HW Chapters 15 & 16
	9-Dec	Friday	Population Genetics (II)			
15	12-Dec	Monday	Recitation Chapters 17 & 18		Chapters 17 & 18	
	14-Dec	Wed	Evolution of genes, traits and species - Last day of class	Chapter 20		HW Chapters 17 & 18

BIO484 Lab
Introduction to Molecular Genetics Laboratory

Stevens Institute of Technology
Fall 2022

Instructor: Dr. Brunella Taddeo, Ph.D.

- **Canvas Course Address:** <https://sit.instructure.com/courses/61815>
- **Course Schedule:** Tuesday 11:00 AM - 1:50 PM (LA) and 2:00 - 4:50 PM (LB)
- **Contact Info:** btaddeo@stevens.edu
- **Office Hours:** by appointment

For policies and general course information see the main BIO484 syllabus:

Course Web Address: <https://sit.instructure.com/courses/61812>

Lab Course Description

This laboratory course consists of weekly laboratory sessions that will familiarize the students with various molecular and biochemical techniques for isolating, replicating, and analyzing nucleic acids and studying modes of inheritance. Lab will also be used to enhance skills such as scientific information literacy, scientific writing, and presentation.

COURSE REQUIREMENTS

- **Course Attendance**
 - Attendance at ALL lab sessions is mandatory and no-make lab will be given.
 - In the event of an unanticipated absence due to illness or emergency, evidence of the necessity of the absence must be provided in the form of a physician's note or equivalent, i.e. a contactable supervisory adult that will substantiate the necessity of your absence.
 - Anticipated absences must be due to extenuating circumstances, - vacations, weddings, family gathering are not excusable reasons for not attending the laboratory.
- **Pre-course preparation and timeliness**
 - The lab will commence promptly at 11:00 AM (section A) and 2:00 PM (section B) with a discussion of the techniques and approaches for the experiments to be executed that day. You must prepare for the lab in advance so that we can begin executing experiments as soon as the initial lab discussion is completed to ensure that you can complete the assigned tasks during the lab period. Each time you are late to class or not prepared for the lab, it will result in loss of attendance/participation points.
- **Lab conduct, professionalism, and participation**
 - Lab safety is of critical importance. Carefully read the following:
 - There is no food or drink allowed in the lab.
 - All long hair must be pulled back, and clothing or accessories with dangling parts may not be worn.
 - Close toed shoes must be worn in lab.
 - Backpacks and coats cannot be stored on the bench.
 - You must review the protocols provided before the start of lab and understand the research being executed as well as the equipment and chemical risks before starting.

- While in the lab it is important to work both independently to achieve a specific objective, and with your partner. Pay attention and ask questions to ensure you understand the objectives for the lab and the scientific background. Be sure to label your materials clearly with your lab name, the date, and the content. You must have your lab notebook set up and ready at the start of each class.
- You must focus on the science at hand during the duration of the lab. Professionalism in the lab includes, but is not limited to, not using cell phones or computers for anything other than lab-related tasks, keeping conversations directed to lab work, taking careful notes on experimental procedures, and offering to answer questions before being called on.
- **Computers**
 - You will need access to computers to do many of the analyses and data mining experiments in this lab course. Please, if possible, bring your laptop computers to each lab meeting. In addition, there will be free software downloads we will recommend for your use as the course progresses.
- **Text and Materials**
 - There is no lab manual for this course. Handouts and other assigned articles will be posted on Canvas prior to the class session in which they will be discussed. Additional reading materials can be found in Chapters 10 and 18 of the textbook adopted for the course (Introduction to Genetic Analysis, 12th ed., Griffiths *et al.*).
 - Students are required to provide a hardcover ruled notebook (Composition book). This is to be used for class preparation, note taking and data collection.
 - A lab coat and protective goggles are strongly recommended for use during the lab sessions especially when handling microorganisms.

GRADING PROCEDURE

Students will be evaluated based on

- | | |
|----------------------------------|----------------|
| ● Attendance: | 5% |
| ● Lab Conduct and Participation: | 5% |
| ● Keeping Lab notebook: | 10% |
| ● Weekly quizzes/homework: | 20% |
| ● 2 Lab Reports: | 20% each (40%) |
| ● Final project presentation: | 20% |

TENTATIVE LAB SCHEDULE (subject to change)

More detailed schedules, protocols and background information will be posted on canvas or handed out at the start of each lab session. Note that many lab sessions will have overlapping content and, as with authentic research in a lab, the experiments continue from one lab to the next.

Week	Date	Topic	Lab Report DUE @ 11:59 PM
1	6-Sep	Introduction to the course	
		Lab Safety (video)	
		Micropipetting exercise	
2	13-Sep	PTC gene analysis (Part 1)	
		DNA Extraction	
		PCR	
3	20-Sep	PTC gene analysis (Part 2)	
		Digestion of PCR products	
		Gel electrophoresis	
4	27-Sep	PTC gene analysis (Part 3)	
		Analysis of data	
		Introduction to the project	
5	4-Oct	Cloning & Sequencing series (1)	
		DNA Extraction from plant	
		First PCR	
6	11-Oct	NO LAB - Monday schedule	
7	18-Oct	Cloning & Sequencing series (2):	Lab report 1: Using a SNP to predict bitter-tasting ability
		Treat initial PCR	
		Set up nested PCR	
8	25-Oct	Cloning & Sequencing series (3):	
		Gel electrophoresis	
		PCR fragment purification	
9	1-Nov	Cloning & Sequencing series (4):	
		Ligation	
		Bacteria transformation	
10	8-Nov	Cloning & Sequencing series (5):	
		Plasmid isolation (miniprep)	
		Set up restriction analysis	
11	15-Nov	Cloning & Sequencing series (6):	
		Gel electrophoresis	
		Select sample for sequencing	
12	22-Nov	Cloning & Sequencing series (7):	
		Bioinformatics	
13	29-Nov	Cloning & Sequencing series (8):	
		Data analysis (I)	
14	6-Dec	Cloning & Sequencing series (9):	
		Data analysis (II)	
15	13-Dec	Project Presentations	Lab report 2: Cloning and Analysis of GAPC gene from the plant of your choice