HUGEN 2040: Molecular Basis of Human Inherited Disease, Fall 2021

General information

Meeting time: Tuesdays and Thursdays, 2:00-3:20 PM
Classroom: A115 Public Health
Zoom: https://pitt.zoom.us/j/91344300019, passcode 2040 (optional at least through 9/9/21)

Credit Hours: 3

Instructors

Name	Office	email	phone	Office hours
Beth Roman, PhD	3132 PUBHL	romanb@pitt.edu	412.624.7006	Mondays,12:30-1:30 Thursdays, 3:30-4:30
Zsolt Urban, PhD	3130 PUBHL	urbanz@pitt.edu	412.648.8269	By appointment
David Finegold, MD	3134 PUBHL	dnf@pitt.edu	412.624.7854	By appointment
Haley Director (TA)	PUBHL Commons	hrd14@pitt.edu		Wed 1-2

Canvas Access

Login through the Pitt portal, http://my.pitt.edu, with your Pitt username and password.
On your dashboard, click on the course title, **2221_HUGEN_2040_SEC1070_MOL BASIS OF HUMN INHERITED DS**.

Catalogue Description

This course will provide an overview of selected human inherited disorders and integrate clinical descriptions with recent genetic, molecular genetics and biochemical insights. Current state of the art molecular genetics methodologies will be integrated into the overviews.

Course rationale

Human molecular genetics establishes cause-effect connections between mutations and variants within the human genome and changes in proteins, metabolites, traits and disease phenotypes. Understanding of the molecular and cellular basis of human inherited diseases informs their diagnosis, management and treatment. Rapid development of genomic technologies has greatly accelerated the discovery of disease genes and led to the appreciation of the complex interactions between genes. This course will introduce you to the historical core of human molecular genetics and the latest breakthroughs in this rapidly developing discipline.

Learning Objectives

By the end of this course, each student will be able to:

- Explain the structural components of genes, the organization of the human genome, and how gene expression is regulated.
- Apply knowledge of cell biology, signaling pathways, and model systems to perform or understand research relating to human genetic diseases.
- Interpret pedigrees, explain how disease genes are identified, and predict how mutations affect protein function.
- Distinguish select inherited diseases based on the molecular mechanisms and clinical manifestations
- Evaluate different treatment approaches to select inherited diseases
- Recognize unique human populations that harbor alleles for select inherited disorders
- Compile and disseminate clinical, molecular, diagnostic, and treatment information on inherited diseases

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Prerequisites

There are no prerequisites, but students will find the course easier if they had some prior undergraduate or graduate coursework in Molecular and Cell Biology and Genetics. For English as a Second Language students, a general academic writing course is also recommended.

Teaching Philosophy

This is a core course for Human Genetics graduate students that emphasizes active participation, critical thinking, and problem solving. We value your ability to think independently, creatively, and critically and to make connections between seemingly disparate topics. The classes will include lectures, discussions, problem solving exercises, and peer-to-peer teaching.

Required Textbooks/Articles/Readings

- Strachan T and Read A (2019). Human Molecular Genetics 5th Ed. ISBN 0815345895
  We strongly recommend this text. It nicely complements Module 1 and part of the Module 2. You can purchase this text in hardcover, paperback, or eTextbook via online retailers.

Supplemental Resources

- Metabolic and Molecular Bases of Inherited Disease (MMBID) – 8th Edition – http://ommbid.mhmedical.com, on Pitt campus or through Pulse Secure VPN
- Molecular Biology of the Cell (Alberts)
  4th edition available from NCBI Bookshelf, https://www.ncbi.nlm.nih.gov/books/NBK21054/
- Online Mendelian Inheritance in Man, OMIM: https://www.omim.org/
- Genetics Home Reference: https://ghr.nlm.nih.gov/
- Gene Reviews: https://www.ncbi.nlm.nih.gov/books/NBK1116/

Canvas Organization

All readings and course material will be found on the Canvas site for this class.

The course is divided into 3 Modules. Within each Module, each lecture has its own Page within which you will find all relevant material, including PowerPoint presentations, lecture notes, supplemental readings, pre-recorded material, and captured live lectures. Homework can be found in the Assignments section. Quizzes can be accessed through the Quiz section or Assignments section.

Please use the Canvas calendar to keep track of due dates! We will not send reminders!

Ground Rules for Class

PowerPoint previews and accompanying notes will be available before class. Rarely, some material may be pre-recorded. We strongly encourage everyone to access and review these materials before class.

Live class sessions will be recorded with accompanying slides. The recorded lecture may be used by the instructor and the registered students for internal class purposes and only during the term in which the course if being offered.

Student Performance Evaluation (Assessments and Weights)

Midterm exams: There will be three midterm exams, which will be taken during class time. Exams are open notes; you may consult any course material during the exam, but you may not consult the internet or other outside sources. Exams will require you to problem solve, so you must study if you hope to score well and complete the exam well in a timely fashion. Each exam is worth 100 points. No exams can be dropped.

Homework: Homework assignments will each cover two lectures and must be uploaded to Canvas before **Sunday at 11:59 PM**. Homework will require synthesis of lecture information and problem solving and will be graded for completion only. Each homework is worth 6 points, and 1 homework will be dropped. Late homework will be docked: up to 24 hrs late, worth 5 points; 24-48 hrs late, worth 4 points; later, no credit. The homework key will become available **at midnight on Sunday night/Monday morning**. This gives you at least 1.5 days to review the key prior to taking the associated short quiz (see below).

Quizzes: Quizzes will consist of 1-3 questions and will cover the same material as the homework assignments but will be presented in multiple choice or very short answer format. If you did the homework, checked the answer key, and consulted an instructor or TA to clear up any confusion, the quiz should be quick and easy. Quizzes must be completed on Canvas during the period allotted: **quizzes will open at midnight on Sunday night/Monday morning and close at 2 PM on Tuesday**. Once started, you will have 20 minutes to complete each quiz. Each quiz is worth 6 points and will be graded for correctness. One quiz will be dropped. *We rely on the honor system; please DO NOT discuss the quiz with your classmates if they have not yet taken it.*

Group Project: As part of a group of ~5-6 students, you will investigate cutting-edge therapies for a specific disease or disease class. You will generate two written documents (one for a technical audience, one for a lay audience) and present your project orally to your peers. ***You will receive a separate handout detailing this assignment***, including due dates and grading rubric. The project is worth 80 points. Late submissions will be docked: up to 24 hrs late, docked 5%; 24-48 hrs late, docked 10%; 2-7 days late, docked 25%; later, no credit.

	Number	**Points (each)**	**Points (total)**	**Percent of grade**
Midterm exams	3	100	300	60
Homework	10 (of 11; can drop 1)	6	60	12
Quizzes	10 (of 11: can drop 1)	6	60	12
Project	1	80	80	16
Total for course			**500**	100

Grading Scale

If the class mean for all completed work at the end of the semester is below 85% (B), the mean will be linearly adjusted to 85% and individual grades recalculated accordingly. *Grades on individual exams or assignments will not be adjusted.* The grading scale (below) will then be used to determine final grades.

A+	97-100%	A	93-96.99%	A-	90-92.99%
B+	87-89.99%	B	83-86.99%	B-	80-82.99%
C+	77-79.99%	C	73-76.99%	C-	70-72.99%
D+	67-69.99%	D	63-76.99%	D-	60-62.99%
F	59.99% and below				

Accommodation for Students with Disabilities

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services, 140 William Pitt Union, 412-648-7890 as early as possible in the term.

Academic Integrity

All students are expected to adhere to the school's standards of academic honesty. Cheating/plagiarism will not be tolerated. The Graduate School of Public Health's policy on academic integrity, which is based on the University policy, is available online in the Pitt Public Health Academic Handbook www.publichealth.pitt.edu/home/academics/academic-requirements. The policy includes obligations for faculty and students, procedures for adjudicating violations, and other critical information. Please take the time to read this policy.

(See https://www.publichealth.pitt.edu/home/academics/academic-requirements/academic-integrity-and-plagiarism for specific information on academic integrity.)

Sexual Misconduct, Required Reporting, and Title IX Statement

The University is committed to combatting sexual misconduct. As a result, you should know that University faculty and staff members are required to report any instances of sexual misconduct, including harassment and sexual violence, to the University's Title IX office so that the victim may be provided appropriate resources and support options. What this means is that as your professor, I am required to report any incidents of sexual misconduct that are directly reported to me, or of which I am somehow made aware.

There are two important exceptions to this requirement about which you should be aware:

A list of the designated University employees who, as counselors and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: https://www.diversity.pitt.edu/civil-rights-title-ix/make-report/report-form

An important exception to the reporting requirement exists for academic work. Disclosures about sexual misconduct that are shared as part of an academic project, classroom discussion, or course assignment, are not required to be disclosed to the University's Title IX office.

If you are the victim of sexual misconduct, Pitt encourages you to reach out to these resources:

Title IX Office: 412-648-7860
SHARE @ the University Counseling Center: 412-648-7930 (8:30 A.M. TO 5 P.M. M-F) and 412-648-7856 (AFTER BUSINESS HOURS)

If you have a safety concern, please contact the University of Pittsburgh Police, 412-624-2121.

Other reporting information is available here: https://www.diversity.pitt.edu/civil-rights-title-ix-compliance/make-report

Diversity Statement

Pitt Public Health Diversity Statement | Effective Academic Year 2021-22

The University of Pittsburgh Graduate School of Public Health considers the diversity of its students, faculty, and staff to be a strength and critical to its educational mission. Pitt Public Health is committed to creating and fostering inclusive learning environments that value human dignity and equity and promote social justice. Every member of our community is expected to be respectful of the individual perspectives, experiences, behaviors, worldviews, and backgrounds of others. While intellectual disagreement may be constructive, no derogatory statements, or demeaning or discriminatory behavior will be permitted.

If you feel uncomfortable or would like to discuss a situation, please contact any of the following:
the course director or course instructor;

- the Pitt Public Health Associate Dean responsible for diversity and inclusion;
- the University's Office of Diversity and Inclusion at 412-648-7860 or https://www.diversity.pitt.edu/civil-rights-title-ix/make-report/report-form (anonymous reporting form)

Accessibility

Canvas is ADA Compliant and has fully implemented the final accessibility standards for electronic and information technology covered by Section 508 of the Rehabilitation Act Amendments of 1998. Please note that, due to the flexibility provided in this product, it is possible for some material to inadvertently fall outside of these guidelines.

Copyright Notice

Course material may be protected by copyright. United States copyright law, 14 USC section 101, et sec., in addition to University policy and procedures, prohibit unauthorized duplication or retransmission of course materials. See Library of Congress Copyright Office and the University Copyright Policy.

Statement on Classroom Recording

To ensure the free and open discussion of ideas, students may not independently record breakout room discussions and/or activities without the permission of all participants, and any such recording properly approved in advance can be used solely for the student's own private use.

Library and Writing Center Services

As a University of Pittsburgh student, a wealth of resources for researching your project is available through the Health Sciences Library (www.hsls.pitt.edu) and the school's dedicated librarian (Helena VonVille - https://www.hsls.pitt.edu/staff/helena-vonville). In addition, writing assistance is available through the University Writing Center (www.writingcenter.pitt.edu/).

Health and Safety Statement

During this pandemic, it is extremely important that you abide by the public health regulations , the University of Pittsburgh's health standards and guidelines, and Pitt's Health Rules. These rules have been developed to protect the health and safety of all of us. Universal face covering is required in all classrooms and in every building on campus, without exceptions, regardless of vaccination status. This means you must wear a face covering that properly covers your nose and mouth when you are in the classroom. If you do not comply, you will be asked to leave class. It is your responsibility have the required face covering when entering a university building or classroom. For the most up-to-date information and guidance, please visit coronavirus.pitt.edu and check your Pitt email for updates before each class.

If you are required to isolate or quarantine, become sick, or are unable to come to class, contact me as soon as possible to discuss arrangements.

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MODULE 1: BASICS OF MOLECULAR GENETICS					
Date	**Lecture**	**Topic**	**Reading**	**Assignment**	**Lecturer**
8/31/21 (Tu)	1	Nucleic acids, genes, and proteins	Strachan Ch. 1		Roman
9/2/21 (Th)	2	Genome organization	Strachan Ch. 9.1-9.3		Roman
9/5/21 (Su)		*(Lectures 1-2)*		*HW 1 11:59 PM*	
9/7/21 (Tu)	3	Technical approaches to molecular analysis	Strachan Ch. 6.2, 6.3, 7.2, 7.3, 15.1	*Quiz 1 2:00 PM*	Roman
9/9/21 (Th)	4	Mutational mechanisms and consequences	Strachan Ch. 11.1-11.4, 16.1		Roman
Deadline for add/drop 9/10/21					
9/12/21 (Su)		*(Lectures 3-4)*		*HW 2 11:59 PM*	
9/14/21 (Tu)	5	Gene Regulation I	Strachan 2.4, 10.1-10.3. 10.5	*Quiz 2 3:00 PM*	Roman
9/16/21 (Th)	6	Gene Regulation II	Strachan 10.1-10.3, 10.6	***Project topic choice due 11:59 PM***	Roman
9/19/21 (Su)		*(Lectures 5-6)*		*HW 3 11:59 PM*	
9/21/21 (Tu)	7	Technical approaches to gene regulation	7.3, 7.4, 9.4,10.1	*Quiz 3 2:00 PM*	Roman
9/23/21 (Th)	8	Laboratory models of genetic disease	Strachan Ch. 8, 21		Roman
9/26/21 (Su)		*(Lectures 7-8)*		*HW 4 11:59 PM*	
9/28/21 (Tu)	9	Application: Therapy for hemoglobinopathies		*Quiz 4 2:00 PM*	Roman
9/30/21 (Th)		**EXAM 1**			

MODULE 2: MECHANISTIC BASIS OF MENDELIAN DISEASES					
Date	**Lecture**	**Topic**	**Reading**	**Assignment**	**Lecturer**
10/5/21 (Tu)	10	Intro to Mendelian Genetics	Strachan Ch. 5.1-5.3		Urban
10/7/21 (Th)	11	Disease gene discovery	Strachan Ch. 17		Urban
10/10/21 (Su)		*(Lectures 10-11)*		*HW 5 11:59 PM*	
10/12/21 (Tu)	12	Cell Bio I	See Alberts or basic Cell bio text if needed	*Quiz 5 3:00 PM*	Roman
10/14/21 (Th)	13	Cell Bio II	See Alberts or basic Cell bio text if needed		Roman
10/17/21 (Su)		*(Lectures 12-13)*		*HW 6 11:59 PM*	
10/19/21 (Tu)	14	Intracellular trafficking diseases (e.g. CF, lysosomal storage diseases)		*Quiz 6 3:00 PM*	Urban
10/21/21 (Th)	15	Mitochondrial diseases		***Research notes due 11:59 PM***	Urban
10/24/21 (Su)		*(Lectures 14-15)*		*HW 7 11:59 PM*	
10/26/21 (Tu)	16	Repeat expansion diseases (e.g. Huntington's, Friedrich's ataxia)		*Quiz 7 3:00 PM*	Urban
10/28/21 (Th)	17	Splicing error diseases (e.g. MD)			Urban
Deadline for monitored withdrawal 10/29/21					
10/31/21 (Su)		*(Lectures 16-17)*		*HW 8 11:59 PM*	
11/2/21 (Tu)	18	Application: TBA		*Quiz 8 3:00 PM*	Urban
11/4/21 (Th)		**EXAM 2**			

MODULE 3: MENDELIAN DISEASES OF METABOLISM AND ORGAN SYSTEM FUNCTION					
Date	**Lecture**	**Topic**	**Reading**	**Assignment**	**Lecturer**
11/9/21 (Tu)	19	PKU and amino acidurias			Finegold
11/11/21 (Th)	20	Glycogen storage disorders		***Draft papers exchanged within group 11:59 PM***	Finegold
11/14/21 (Sun)		*(Lectures 19-20)*		*HW 9 11:59 PM*	
11/16/21 (Tu)	21	Kidney diseases		*Quiz 9 3:00 PM*	Subramanya
11/18/21 (Th)	22	Neurological disorders			Padiath
11/23/21 (Tu)		*Thanksgiving*			*No class*
11/25/21 (Th)		*Thanksgiving*			*No class*
11/28/21 (Su)		*(Lectures 21-22)*		*HW 10 11:59 PM*	
11/30/21 (Tu)	23	Heart disorders		*Quiz 10 3:00 PM*	Finegold
12/2/21 (Th)	24	Vascular disorders		***Written project due 11:59 PM***	Roman
12/5/21 (Su)		*(Lectures 23-24)*		*HW 11 12:00 PM*	
12/7/21 (Tu)	25	Connective tissue disorders		*Quiz 11 3:00 PM*	Urban
12/9/21 (Th)		**EXAM 3**			
12/14/21	26	Student presentations I		***Presentations I***	Finegold/Urban/Roman
12/16/21	27	Student presentations II		***Presentations II***	Finegold/Urban/Roman