Course Description

BIOL/GNET 621 is an upper-level genetics course intended for graduate students and advanced undergraduates. Undergraduates must have taken BIOL 202 or the equivalent; there are no prerequisites for graduate students. The course covers genetic principles and tools through lectures, reading of research articles, problem solving, and discussion.

Course Goals

1. Understand fundamental aspects of genetics, including the structure, function, and behavior of genes and chromosomes.
2. Become familiar with the use of genetics as a tool for analysis, including complementation, pathway elucidation, and mosaic analysis.
3. Learn about non-Mendelian areas of genetics, such as transposable elements, RNA interference, etc.
4. Gain experience in reading and assessing the scientific literature of genetics.

Staff

Instructors:  
Dr. Greg Copenhaver  gcopenhaver@bio.unc.edu  
Dr. Jeff Sekelsky  sekelsky@unc.edu  
Dr. Shawn Ahmed  shawn@med.unc.edu

Teaching Assistant:  
Riya Gohil  riyagohil@unc.edu

See Sakai site for office hours.

Course meetings

11:00 – 12:45 pm Tues & Thurs; Recitation: 2:40 – 3:30 pm Fridays  
128 Wilson Hall

Attendance and participation are strongly recommended during lectures and required in recitations.

SARS-COV-2 (COVID-19) Special Circumstances

This semester, while we are in the midst of a global pandemic, all enrolled students are required to wear a mask covering your mouth and nose at all times in our classroom. This requirement is to protect all of us as we learn together. If you choose not to wear a mask, or wear it improperly, we will ask you to leave immediately, and we will submit a report to the Office of Student Conduct. At that point you will be disenrolled from this course for the protection of our educational community. Students who have an authorized accommodation from Accessibility Resources and Service have an exception. For additional information, please see Carolina Together.

Grading

Final grades will be based on:

- 36% Exams: two midterms and a comprehensive final
- 40% Problem sets
- 24% Recitation (participation and paper presentation)
**Exams**

There will be three exams. The first two will each be worth 100 points and count for 8% of your final grade. There will also be a comprehensive final exam that will have 150 points from the final third of the course and 50 points from each of the 1st and 2nd parts; it will be 20% of the final grade. Exams are intended to emphasize conceptual understanding of genetics and ability to solve problems like those on problem sets.

**Paper presentation**

One or two original research papers will be assigned as reading to accompany each lecture. Each week, a group of 2-3 students will present one of these papers during recitation. Dates will be assigned/chosen at the first recitation meeting. Your presentation counts as 12% of your grade.

When other students are presenting, you will be expected to pay attention and contribute to discussion by asking or answering questions, responding to comments by other students, explaining figures or text from the article being discussed, etc. We encourage you to ask questions about parts of the reading you may not have understood – this is one of the best ways to learn.

**Problem Sets**

Each instructor will assign approximately two problem sets. These will include questions about the material and problems to be solved based on lecture material and readings. You are encouraged to work collaboratively to solve the problems, but each student must write and turn in their own answers. We will use either the Sakai Assignment tool or Gradescope (accessible through Sakai). Problem sets will be graded and returned. Late problem sets will not be accepted. Problem sets count as 40% of your grade.

**Other Policies**

- Students are bound by the Honor Code in taking exams and in written work. The Honor Code of the University is in effect at all times, and the submission of work signifies understanding and acceptance of those requirements. Plagiarism will not be tolerated. Please consult with me if you have any questions about the Honor Code.

- We make various course materials available to you, including PowerPoint files, lecture notes, problem sets, and exams. These materials are copyrighted. **It is a violation of the honor code to distribute course materials outside of the classroom without written permission from the instructors. This includes posting or sharing of recorded lectures.** This also includes depositing in fraternity or sorority files or contributing to online repositories. **It is also a violation of the honor code to access or consult any course documents that may have been deposited by others.**

- Re-grade requests must be made in writing within one week of receiving a grade (returned problem set, exam, etc.). Only errors in grading are considered, not requests for additional partial credit. We reserve the right to regrade the entire exam or problem set.

- The University of North Carolina at Chapel Hill facilitates the implementation of reasonable accommodations, including resources and services, for students with disabilities, chronic medical conditions, a temporary disability or pregnancy complications resulting in barriers to fully accessing University courses, programs and activities. Accommodations are determined through the Office of Accessibility Resources and Service (ARS) for individuals with documented qualifying disabilities in accordance with applicable state and federal laws. See the ARS Website for contact information: [https://ars.unc.edu](https://ars.unc.edu) or email ars@unc.edu.

- Counseling and Psychological Services (CAPS) is strongly committed to addressing the mental health needs of a diverse student body through timely access to consultation and
connection to clinically appropriate services, whether for short or long-term needs. Go to their website: https://caps.unc.edu/ or visit their facilities on the third floor of the Campus Health Services building for a walk-in evaluation to learn more.

- Any student who is impacted by discrimination, harassment, interpersonal (relationship) violence, sexual violence, sexual exploitation, or stalking is encouraged to seek resources on campus or in the community. Please contact the Director of Title IX Compliance (Rebecca Gibson), Report and Response Coordinators in the Equal Opportunity and Compliance Office (reportandresponse@unc.edu), Counseling and Psychological Services (confidential), or the Gender Violence Services Coordinators (gvsc@unc.edu; confidential) to discuss your specific needs. Additional resources and anonymous reporting are available at http://safe.unc.edu.

- This course values the perspectives of individuals from all backgrounds reflecting the diversity of our students. We broadly define diversity to include race, gender identity, national origin, ethnicity, religion, social class, age, sexual orientation, political background, and physical and learning ability. We strive to make this classroom an inclusive space for all students.
GNET/BIOL 621 Fall 2019

Schedule of class meetings

Part I: Genetic Principles (Copenhaver)

Aug 19 Thurs Introduction, DNA & chromosome structure

20 Fri Discussion (TAs present first paper)

24 Tues Meiosis & mitosis

26 Thurs Mendelian basics
Tory et al. (2014) Mutation-dependent recessive inheritance of NPHS2-associated steroid-resistant nephrotic syndrome. Nature Genetics 46(3) 299-304. doi:10.1038/ng.2898

27 Fri Discussion (TAs present first paper)

31 Tues Molecular biology basics

Sept 2 Thurs Recombination


3 Fri Discussion

7 Tues Chromosome aberrations

9 Thurs Linkage and mapping
Kirby et al. (2013) Mutations causing medullary cystic kidney disease type 1 lie in a large VNTR in MUC1 missed by massively parallel sequencing. Nature Genetics 45(3) 299-305. doi:10.1038/ng.2543

10 Fri Discussion

14 Tues Pedigrees, tetrads & LODs

16 Thurs Association mapping

17 Fri Discussion

21 Tues Exam I
### Pat II: Genetic Analysis (Sekelsky)

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### Oct 20 Thurs Exam 2
Part III: Non-Mendelian Genetics (Ahmed)

Nov 2 Tues DNA transposons

Cell 128: 1089-1103.

4 Thurs Retrotransposons

5 Fri Discussion

9 Tues Gene targeting

11 Thurs RNAi I

12 Fri Discussion

16 Tues RNAi II

18 Thurs Non-Mendelian inheritance

19 Fri Discussion

23 Tues Epigenetics I

26 Fri No discussion – Thanksgiving break

30 Tues Epigenetics II


Dec 9 Thurs CUMMULATIVE FINAL EXAM, 12 pm – 3 pm