Advanced Genetics - PCB 5065 4 credits

MTWR, 5th Period, 11:45 am – 12:35 pm Fifield 2318

Fall 2021

Instructors: Contact information for all course instructors is provided below; Instructors are available to assist students on an individual basis by appointment.

Dr. L. Curtis Hannah, Course Coordinator/Professor - Plant Cell and Molecular Biology, Horticultural Sciences Dept., PMCB Program, Graduate Program in Genetics and Genomics

Ph.D. University of Wisconsin (Genetics), Madison

Office: Room 2119, Fifield Hall, 352-392-6957

e-mail: lchannah@ufl.edu

Research interests: Maize biochemical/molecular genetics, starch biosynthesis, biotechnology

Dr. Dean Gabriel, Professor - Plant Pathology, PMCB Program

Ph.D. Michigan State University

Office: 2559 Fifield Hall, (352)392-7239

e-mail: dgabr@ufl.edu

https://plantpath.ifas.ufl.edu/people/faculty-pages/dean-gabriel/

Research interests: Functional genomics and genetics of host/parasite interactions

Dr. Don McCarty, Professor - Horticultural Sciences, PMCB Program, Graduate Program in Genetics & Genomics

Ph.D. University of Wisconsin

Office: 2237 Fifield Hall, 352-273-4846

e-mail: drm@ufl.edu

https://hos.ifas.ufl.edu/people/on-campus-faculty/donald-r-mccarty/

Research interests: Physiological and molecular aspects of development in seeds

Dr. Márcio F R Resende, Assistant Professor - Horticultural Sciences Dept., PMCB Program, Graduate Program in Genetics and Genomics

Ph.D. University of Florida Graduate Program in Genetics and Genomics

Office: 2135 Fifield Hall, 352-273-4772

e-mail: mresende@ufl.edu

https://www.resendelab.com/

Research interests: Quantitative genetics; Genomics; Molecular breeding

Dr. Matias Kirst, Professor - Forest Resources & Conservation, PMCB Program, Graduate Program in Genetics & Genomics

Ph.D. North Carolina State University

Office: 367 Newins-Ziegler Hall, 352-846-0900

e-mail: mkirst@ufl.edu

https://www.forestgenomics.org/contact-us

Research interests: Fundamental and applied genomic research; Technology and genomic tool

Development

Course Description/Objectives: Genetic analysis is explored with a team of instructors who use genetic approaches in their research programs. The objective of PCB 5065 is to strengthen students' comprehension of genetic concepts, so that they can read and interpret classical and current literature in the field of genetics and apply genetic analysis to their own research problems. PCB 5065 is designed to establish a strong foundation for advanced specialty courses in genetics and to complement advanced courses in molecular biology.

Prerequisite: Undergraduate general genetics. We assume students are familiar with basic Mendelian genetics and understand the nature and functions of DNA, RNA and proteins.

Reading: There is no required text for the course. No one book covers everything we will discuss in class. Required reading in the form of review and research articles from the primary literature will be provided in electronic format. Each section of the course concludes with a discussion paper from the current literature and/or a computer exercise. Discussion papers, along with questions for class discussion, will be provided one week prior to the scheduled discussion. Students are expected to read the paper in advance and to actively participate in the class discussions.

Recommended book helpful for the first two sections of the course:

Title: ADVANCED GENETIC ANALYSIS: FINDING MEANING IN A GENOME

Author: R Scott Hawley and Michelle Y Walker ISBN: 1405103361

Publisher: John Wiley & Sons Cover: paperback book Edition: 1

Optional books that students might find helpful for the final section of the course:

Title: PRINCIPLES OF POPULATION GENETICS

Author: Daniel L Hartl, Andrew G Clark ISBN: 0878933085

Publisher: Sinauer Associates, Inc Cover: hardback book Edition: 4

or

Title: INTRODUCTION TO QUANTITATIVE GENETICS

Author: David S Falconer and Trudy Mackay ISBN: 0582243025

Publisher: Prentice Hall Cover: paperback book Edition: 4

Exams: The course is divided into five sections with an exam following the completion of each section (see schedule). Exams are scheduled for evening periods 11 and E1 (6:15-8:10 PM) to allow adequate time for solution of problem-based questions. Exams are closed book and notes.

If you have another exam or will be attending a scientific conference scheduled at the same time as a PCB 5065 exam, or if a PCB 5065 exam falls on a religious holiday that you traditionally observe, an alternate time will be arranged for your exam. Please notify the instructor of these conflicts well in advance of the exam! Students who cannot take a scheduled exam due to illness or last-minute emergencies should contact the instructor prior to the exam if at all possible!

Grades: Final grades will be based upon the weighted sum of 5 section scores, based on the number of classes taught by each instructor. Each class is weighted with 10 points and the instructor breakdown is:

Section	Instructor	Points
Section 1	Hannah	140
Section 2	Gabriel	90
Section 3	McCarty	70
Section 4	Resende	90
Section 5	Kirst	150
Total		540

The grading scale is:

A   460-540
B+   405-459
B   350-404
C+   295-349
C   <295

Class attendance and participation will be considered in assigning grades to students with scores falling near a cut-off point. More information on UF grading policy may be found at:
https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/
https://catalog.ufl.edu/graduate/

Absences and Make-Up Work: Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

Students Requiring Accommodations: Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center (https://disability.ufl.edu/students/get-started/). It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Online Course Evaluation Process: Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations (https://gatorevals.aa.ufl.edu/). Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students on the GatorEvals page.

Academic Honesty: UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with an instructor in this class.
(https://sccr.dso.ufl.edu/process/student-conduct-code/)

Software Use: All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Student Privacy: There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see the Notification to Students of FERPA Rights (https://registrar.ufl.edu/catalog0910/policies/regulationferpa.html).

Campus Resources:

U Matter, We Care: If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.

Counseling and Wellness Center: counseling.ufl.edu/cwc, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS): Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or police.ufl.edu.

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.

In-Class Recording: Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third-party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student

Schedule – Advanced Genetics, PCB 5065, Fall 2021

MTWR 5th Period, Fifield 2318

Optional help sessions will be held most Fridays 5th Period

Date	Day	Instructor	Topic
23-Aug	Mon	All	Course introduction
24-Aug	Tues	Hannah	The gene in molecular terms
25-Aug	Wed	Hannah	The gene in Mendelian terms
26-Aug	Thurs	Hannah	Model organisms and mutant screens
27-Aug	Fri	Hannah	Optional help session
30-Aug	Mon	Hannah	The gene as a unit of function - the complementation test
31-Aug	Tues	Hannah	The gene as a unit of mutation and recombination
1-Sep	Wed	Hannah	Allelic interactions - cistrons and operons
2-Sep	Thurs	Hannah	Genic Interactions - suppressors, enhancers, and epistasis
3-Sep	Fri	Hannah	Optional help session
6-Sep	Mon	No class	Labor Day
7-Sep	Tues	Hannah	Transposable elements as tools of forward and reverse genetics
8-Sep	Wed	Hannah	Additional reverse genetics approaches
9-Sep	Thurs	Hannah	Organelle transmission
10-Sep	Fri	Hannah	Optional help session
13-Sep	Mon	Hannah	Maternal and gametophyte effects
14-Sep	Tues	Hannah	Epigenetic effects on expression
15-Sep	Wed	Hannah	Meiotic drive and prions
16-Sep	Thurs	Hannah	Discussion paper, section 1
17-Sep	Fri	Hannah	Optional help session
20-Sep	Mon	Gabriel	Meiosis - segregation, assortment, chromosome mechanics, and nondisjunction
21-Sep	Tues	Gabriel	Meiotic Recombination & Mapping
21-Sep	Tues	6:15-8:10pm	Exam 1 - Mendelian and non-Mendelian Genetics
22-Sep	Wed	Gabriel	Linkage - gene order, linearity, crossing-over, and recombination
23-Sep	Thurs	Gabriel	Tetrad analysis & sister-strand exchange
24-Sep	Fri	Gabriel	Optional help session
27-Sep	Mon	Gabriel	Gene conversion, Crossover Models and Holliday structures
28-Sep	Tues	Gabriel	Double strand break repair
29-Sep	Wed	Gabriel	Synthesis Dependent Strand Annealing & Consensus Models
30-Sep	Thurs	Gabriel	Parasexuality & mitotic recombination
1-Oct	Fri	Gabriel	Optional help session
4-Oct	Mon	Gabriel	Integration, mutagenesis, nonhomologous recombination
5-Oct	Tue	Gabriel	Genome editing--CRISPR, TALENs & nucleases
6-Oct	Wed	Gabriel	Discussion paper, section 2
7-Oct	Thurs	McCarty	Developmental genetics overview
7-Oct	Thurs	6:15-8:10pm	Exam 2 - Recombination mechanisms & gene editing
8-Oct	Fri	No class	UF Homecoming

11-Oct	Mon	McCarty	Developmental genetics - drosophila
12-Oct	Tues	McCarty	Developmental genetics - drosophila
13-Oct	Wed	McCarty	Developmental genetics - drosophila
14-Oct	Thurs	McCarty	Developmental genetics - plants
15-Oct	Fri	McCarty	Optional help session
18-Oct	Mon	McCarty	Developmental genetics - plants
19-Oct	Tues	McCarty	Developmental genetics - plants
20-Oct	Wed	McCarty	TBD
21-Oct	Thurs	McCarty	Discussion paper, section 3
22-Oct	Fri	McCarty	Optional help session
25-Oct	Mon	Resende	Chromosome variation - polyploidy, aneuploidy
26-Oct	Tues	Resende	Genome features - implications for markers, mapping, and gene identification
26-Oct	Tues	6:15-8:10pm	Exam 3 - Developmental Genetics
27-Oct	Wed	Resende	Molecular markers and genotype by sequencing
28-Oct	Thurs	Resende	Multipoint linkage mapping - populations
29-Oct	Fri	Resende	Optional help session
1-Nov	Mon	Resende	Linkage mapping - human pedigrees and LOD scores
2-Nov	Tues	Resende	Multipoint linkage mapping software demonstration
3-Nov	Wed	Resende	Map-based applications - positional cloning qualitative traits
4-Nov	Thurs	Resende	Map-based applications - QTL mapping and cloning
5-Nov	Fri	Resende	Optional help session
8-Nov	Mon	Resende	TBD
9-Nov	Tues	Resende	Discussion paper, Section 4
10-Nov	Wed	Kirst	Hardy-Weinberg equilibrium and introduction to population genetics
10-Nov	Wed	6:15-8:10pm	Exam 4 - Genomes, chromosomes, markers, and mapping
11-Nov	Thurs	No class	Veterans Day
12-Nov	Fri	Kirst	Optional help session
15-Nov	Mon	Kirst	Population genetics - segregation, recombination, and linkage disequilibrium
16-Nov	Tue	Kirst	Forces that change gene frequencies: mutation
17-Nov	Wed	Kirst	Forces that change gene frequencies: random genetic drift
18-Nov	Thurs	Kirst	Forces that change gene frequencies: natural selection
19-Nov	Fri	Kirst	Optional help session
22-Nov	Mon	Kirst	Population genetic structure, genetic distance, and effective population size
23-Nov	Tues	Kirst	Take home exercise on population genetic structure
24-Nov	Wed	No class	Thanksgiving Break
25-Nov	Thurs	No class	Thanksgiving Break
26-Nov	Fri	No class	Thanksgiving Break
29-Nov	Mon	Kirst	Introduction to quantitative genetics (quantitative genetic models)

30-Nov	Tues	Kirst	Introduction to quantitative genetics (genetic variance and heritability)
1-Dec	Wed	Kirst	Genomic dissection of quantitative variation - genome wide association studies
2-Dec	Thurs	Kirst	Genomic dissection of quantitative variation - genomic prediction
3-Dec	Fri	Kirst	Optional help session
6-Dec	Mon	Kirst	Genomic dissection of quantitative variation - integrating GWAS & genomic prediction with multiple layers of genomic data
7-Dec	Tues	Kirst	Discussion paper, Section 5
8-Dec	Wed	Kirst	Review session
8-Dec	Wed	6:15-8:10pm	Exam 5