Advanced Genetics - PCB 5065 Section 2191; 4 credits

MTWR, 5th Period, 11:45 am – 12:35 pm, via Zoom videoconference

Fall 2020

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

Dr. A. Mark Settles (Course Coordinator) - Vasil-Monsanto Professor of Plant Cell and Molecular Biology, Horticultural Sciences Dept., PMCB Program, Graduate Program in Genetics and Genomics
Ph.D. State University of New York at Stony Brook
Office: Room 3, Plant Cell and Molecular Biology Laboratory, 352-392-7571
e-mail: settles@ufl.edu
https://hos.ifas.ufl.edu/settleslab/
Research interests: Maize genetics and genomics; Seed development; Seed phenomics

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.

Mode of Delivery: This course will be delivered synchronously online via Zoom videoconferencing. The Zoom meeting identification and password will be available through the course Canvas site at https://elearning.ufl.edu/.

Students will need internet access and are expected to log on prior to scheduled class times. Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

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. Students will need to take exams using the University of Florida proctoru portal (https://www.proctoru.com/portal/ufl).

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	Settles	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.

Schedule – Advanced Genetics, PCB 5065, Fall 2020
Section 2191, MTWR 5th Period, Zoom Videoconferencing
Optional help sessions will be held most Fridays 5th Period

Date	Day	Instructor	Topic
31-Aug	Mon	All	Course introduction
1-Sep	Tues	Settles	The gene in molecular terms
2-Sep	Wed	Settles	The gene in Mendelian terms, Linkage
3-Sep	Thurs	Settles	The chi-square test, Intro to the complementation test
4-Sep	*Fri*	*Settles*	*Optional - Help Session*
7-Sep	Mon	No Class	Labor Day Holiday
8-Sep	Tues	Settles	Complementation test design and exceptions
9-Sep	Wed	Settles	A locus is not a gene: Intragenic recombination
10-Sep	Thurs	Settles	A locus is not a gene: Allele interactions in cistrons & operons
11-Sep	*Fri*	*Settles*	*Optional - Help Session*
14-Sep	Mon	Settles	Genetic interactions - Double mutants & epistasis
15-Sep	Tues	Settles	Forward genetic screens
16-Sep	Wed	Settles	Reverse Genetics
17-Sep	Thurs	Settles	Organelle transmission
18-Sep	*Fri*	*Settles*	*Optional - Help Session*
21-Sep	Mon	Settles	Maternal and gametophyte effects
22-Sep	Tues	Settles	Epigenetic effects on expression
23-Sep	Wed	Settles	Meiotic drive and Prions
24-Sep	Thurs	Settles	Discussion paper, Section 1
25-Sep	*Fri*	*Settles*	*Optional - Help Session*
28-Sep	Mon	Gabriel	Meiosis - segregation, assortment, chromosome mechanics and nondisjunction
29-Sep	Tues	Gabriel	Genes & chromosomes
29-Sep	Tues	6:15-8:10 PM	Exam 1 – Mendelian and Non-Mendelian Genetics
30-Sep	Wed	Gabriel	Linkage - gene order, linearity, crossing-over & recombination
1-Oct	Thurs	Gabriel	Tetrad analysis & sister-strand exchange
2-Oct	*Fri*	*No Class*	*Homecoming*
5-Oct	Mon	Gabriel	Recombination mechanisms I – gene conversion & Holiday structures
6-Oct	Tues	Gabriel	Recombination mechanisms II – DSB, SDSA & early decision models
7-Oct	Wed	Gabriel	Parasexuality & mitotic recombination
8-Oct	Thurs	Gabriel	Recombination & genome editing
9-Oct	*Fri*	*Gabriel*	*Optional - Help Session*
12-Oct	Mon	Gabriel	Discussion paper, Section 2
13-Oct	Tues	McCarty	Developmental genetics overview
13-Oct	Tues	6:15-8:10 PM	Exam 2 – Recombination mechanisms & Gene editing
14-Oct	Wed	McCarty	Developmental genetics – drosophila
15-Oct	Thurs	McCarty	Developmental genetics – drosophila
16-Oct	*Fri*	*McCarty*	*Optional - Help Session*
19-Oct	Mon	McCarty	Developmental genetics – drosophila
20-Oct	Tues	McCarty	Developmental genetics – plants
21-Oct	Wed	McCarty	Developmental genetics – plants
22-Oct	Thurs	McCarty	Developmental genetics – plants

23-Oct	Fri	McCarty	Optional - Help Session
26-Oct	Mon	Resende	Chromosome variation – polyploidy, aneuploidy
27-Oct	Tues	Resende	Genome features - implications for markers, mapping & gene identification
27-Oct	Tues	6:15-8:10 PM	Exam 3 – Developmental genetics
28-Oct	Wed	Resende	Molecular markers and genotype by sequencing
29-Oct	Thurs	Resende	Multipoint linkage mapping - populations
30-Oct	Fri	Resende	Optional - Help Session
2-Nov	Mon	Resende	Linkage mapping - human pedigrees and LOD scores
3-Nov	Tues	Resende	Multipoint Linkage mapping software demonstration
4-Nov	Wed	Resende	Map-based applications – positional cloning qualitative traits
5-Nov	Thurs	Resende	Map-based applications – QTL mapping and cloning
6-Nov	Fri	Resende	Optional - Help Session
9-Nov	Mon	Resende	Discussion paper, Section 3
10-Nov	Tues	Kirst	Hardy-Weinberg Equilibrium and introduction to population genetics
10-Nov	Tues	6:15-8:10 PM	Exam 4 - Genomes, chromosomes, markers and mapping
11-Nov	Wed	No Class	Veterans Day Holiday
12-Nov	Thurs	Kirst	Population genetics – segregation, recombination & linkage disequilibrium
13-Nov	Fri	Kirst	Optional - Help Session
16-Nov	Mon	Kirst	Population genetics – Evolutionary forces that contribute to linkage disequilibrium
17-Nov	Tues	Kirst	Forces that change gene frequencies: Mutation
18-Nov	Wed	Kirst	Forces that change gene frequencies: Random genetic drift
19-Nov	Thurs	Kirst	Forces that change gene frequencies: Natural selection
20-Nov	Fri	Kirst	Optional - Help Session
23-Nov	Mon	Kirst	Population genetic structure, genetic distance & effective population size
24-Nov	Tues	Kirst	Exercise on population genetic structure - bring laptop
25-Nov	Wed	No Class	Thanksgiving Break
26-Nov	Thurs	No Class	Thanksgiving Break
27-Nov	Fri	No Class	Thanksgiving Break
30-Nov	Mon	Kirst	Introduction to quantitative genetics (quantitative genetic models)
1-Dec	Tues	Kirst	Introduction to quantitative genetics (genetic variance and heritability)
2-Dec	Wed	Kirst	Genomic dissection of quantitative variation – genome-wide association studies (GWAS)
3-Dec	Thurs	Kirst	Genomic dissection of quantitative variation – genomic prediction
4-Dec	Fri	Kirst	Optional - Help Session
7-Dec	Mon	Kirst	Genomic dissection of quantitative variation – integrating GWAS & genomic prediction with multiple layers of genomic data
8-Dec	Tues	Kirst	Discussion paper, Section 5
9-Dec	Wed	Kirst	Review / question-answer session
9-Dec	Wed	6:15-8:10 PM	Exam 5 – Population & quantitative genetics