

Syllabus - Advanced Genetics - PCB 5065 - Fall 2019

Section 2191; 4 credits; 2318 Fifield Hall; MTWR 5th Period

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 that they 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 closed 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 sum of 5 exam scores, but the scores will be weighted for the number of classes covered by each exam. Exams 1-3 are effectively worth 85

points each, exam 4 is worth 105 points and exam 5 is worth 140 points. The grading scale is: <325 points = C+ or lower; 325-374 = B; 375-424 = B+; 425-500 = A. Class attendance and participation will be considered in assigning grades to students with exam averages falling near a cut-off point. Information on current UF grading policies for undergraduate and graduate students can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

<http://gradcatalog.ufl.edu/content.php?catoid=2&navoid=762#grades>

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>

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

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

<http://plantpath.ifas.ufl.edu/faculty/dean-gabriel/profile/#d.en.311865>

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

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

<http://sfrc.ufl.edu/people/faculty/kirst/>

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

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

<http://hos.ufl.edu/faculty/drmccarty>

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. 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
<http://hos.ufl.edu/faculty/amsettles>

Research interests: Maize genetics and genomics; Seed development; Seed phenomics

Online Course Evaluation Process: Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. These evaluations are conducted online at: <https://evaluations.ufl.edu>
Evaluations are typically open for students to complete during the last two or three weeks of the semester; students will be notified of the specific times when they are open. Summary results of these assessments are available to students at: <https://evaluations.ufl.edu/results>

Academic Honesty: As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity." You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit 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." It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <https://www.dso.ufl.edu/sccr/process/student-conduct-honor-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.

Services for Students with Disabilities: The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation. 0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc.

Campus Helping Resources: Students experiencing crises or personal problems that interfere with their general well - being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for

currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

University Counseling and Wellness Center, 3190 Radio Road, 352-392-1575, www.counseling.ufl.edu/cwc/. The center offers counseling services, groups and workshops, outreach and consultation, a self help library, training programs, and a community provider database.

Career Resource Center, First Floor JWRU, 392-1601, www.crc.ufl.edu/.

Schedule – Advanced Genetics, PCB 5065, Fall 2018

Section 2191, MTWR 5th Period, 2318 Fifield Hall

Optional help sessions will be held most Fridays 5th Period, 2318 Fifield Hall

Day	Date	Instructor	Topic
Tues	20-Aug	ALL	Course introduction
Wed	21-Aug	Settles	The gene in molecular terms
Thurs	22-Aug	Settles	The gene in Mendelian terms
Mon	26-Aug	Settles	The gene as a unit of function - the complementation test
Tues	27-Aug	Settles	The gene as a unit of mutation and recombination
Wed	28-Aug	Settles	Allelic interactions – cistrons and operons
Thurs	29-Aug	Settles	Genic interactions - suppressors, enhancers and epistasis
Mon	2-Sep	NO CLASS	LABOR DAY HOLIDAY
Tues	3-Sep	Settles	Forward and reverse genetics approaches I
Wed	4-Sep	Settles	Forward and reverse genetics approaches II
Thurs	5-Sep	Settles	Transmission bias – life cycles, organelles
Mon	9-Sep	Settles	Transmission bias – organelles, cont.
Tues	10-Sep	Settles	Transmission bias – meiotic drive & gametophytic effects Expression effects – early development & maternal effect genes
Wed	11-Sep	Settles	Expression effects – epigenetics
Thurs	12-Sep	Settles	Expression effects – epigenetics, cont
Mon	16-Sep	Settles	Discussion paper I
Tues	17-Sep	Gabriel	Meiosis - segregation, assortment, chromosome mechanics and nondisjunction
Wed	18-Sep	6:15-8:10 PM	Exam 1 – genes, mutations, genetic interactions & transmission
Wed	18-Sep	Gabriel	Genes & chromosomes
Thurs	19-Sep	Gabriel	Linkage - gene order, linearity, crossing-over & recombination
Mon	23-Sep	Gabriel	Tetrad analysis & sister-strand exchange
Tues	24-Sep	Gabriel	Recombination mechanisms I – gene conversion & Holiday structures
Wed	25-Sep	Gabriel	Recombination mechanisms II – DSB, SDSA & early decision models
Thurs	26-Sep	Gabriel	Parasexuality & mitotic recombination
Mon	30-Sep	Gabriel	Recombination & genome editing
Tues	1-Oct	Gabriel	Discussion paper 2
Wed	2-Oct	Resende	Chromosome variation – polyploidy, aneuploidy
Thurs	3-Oct	6:15-8:10 PM	Exam 2 – linkage & recombination
Thurs	3-Oct	Resende	Genome features - implications for markers, mapping & gene identification

Mon	7-Oct	Resende	Molecular markers and genotype by sequencing
Tues	8-Oct	Resende	Multipoint linkage mapping - populations
Wed	9-Oct	Resende	Linkage mapping - human pedigrees and LOD scores
Thurs	10-Oct	Resende	Multipoint Linkage mapping software demonstration
Mon	14-Oct	Resende	Map-based applications – positional cloning qualitative traits
Tues	15-Oct	Resende	Map-based applications – QTL mapping and cloning
Wed	16-Oct	Resende	Discussion paper 3
Thurs	17-Oct	McCarty	Developmental genetics overview
Mon	21-Oct	6:15-8:10 PM	Exam 3 – genomes, chromosomes, markers and mapping
Mon	21-Oct	McCarty	Developmental genetics – drosophila
Tues	22-Oct	McCarty	Developmental genetics – drosophila
Wed	23-Oct	McCarty	Developmental genetics – drosophila
Thurs	24-Oct	McCarty	Developmental genetics – plants
Mon	28-Oct	McCarty	Developmental genetics – plants
Tues	29-Oct	McCarty	Developmental genetics – plants
Wed	30-Oct	6:15-8:10 PM	Exam 4 – Developmental genetics
Wed	30-Oct	Kirst	Hardy-Weinberg Equilibrium and introduction to population genetics
Thurs	31-Oct	Kirst	Population genetics – segregation, recombination & linkage disequilibrium
Mon	4-Nov	NO CLASS	FL GENETICS SYMPOSIUM
Tues	5-Nov	NO CLASS	FL GENETICS SYMPOSIUM
Wed	6-Nov	Kirst	Population genetics – Evolutionary forces that contribute to linkage disequilibrium
Thurs	7-Nov	Kirst	Forces that change gene frequencies: Mutation
Mon	11-Nov	NO CLASS	VETERANS DAY HOLIDAY
Tues	12-Nov	Kirst	Forces that change gene frequencies: Random genetic drift
Wed	13-Nov	Kirst	Forces that change gene frequencies: Natural selection
Thurs	14-Nov	Kirst	Population genetic structure, genetic distance & effective population size
Mon	18-Nov	Kirst	Exercise on population genetic structure - bring laptop
Tues	19-Nov	Kirst	Introduction to quantitative genetics (quantitative genetic models)
Wed	20-Nov	Kirst	Introduction to quantitative genetics (genetic variance and heritability)
Thurs	21-Nov	Kirst	Genomic dissection of quantitative variation – genome-wide association studies (GWAS)
Mon	25-Nov	Kirst	Genomic dissection of quantitative variation – genomic prediction
Tues	26-Nov	Settles	Instructor evaluations - bring laptop - box lunches will be available
Wed	27-Nov	NO CLASS	THANKSGIVING HOLIDAY
Thurs	28-Nov	NO CLASS	THANKSGIVING HOLIDAY
Mon	2-Dec	Kirst	Genomic dissection of quantitative variation – integrating GWAS & genomic prediction with multiple layers of genomic data
Tues	3-Dec	Kirst	Discussion paper 4
Wed	4-Dec	Kirst	Review / question-answer session
Wed	4-Dec	6:15-8:10 PM	Exam 5 – Population & quantitative genetics