

**Crop Science 452 or IB478**  
**Advanced Plant Genetics**  
**Location: 317 David Morrissey Hall**  
**Times: 9:30-10:50 Tuesday, Thursday**

**Instructor:** Dr. Tiffany Jamann

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**Office hours:** Tuesday 11-12 or by appointment

**Instructor:** Julian Cooper

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**Office hours:** Thursday 11-12 or by appointment

**Course description:** Survey of selected contemporary topics in plant genetics and genomics. Topics include the nature of genes and genomes, crop domestication, selection, allelic diversity in populations, and genetic mapping. Serves as an introduction to functional genomics, population genetics, transmission genetics, quantitative genetics, and bioinformatics. Same as IB 478. 3 undergraduate hours. 3 graduate hours. Prerequisite: CPSC 352 or IB 204, or consent of instructor.

**By the end of the course you should be able to:**

1. Describe how genetic variation arises and the mechanisms by which it is fixed or lost in a population over time.
2. Explain what linkage disequilibrium is and why it is important to plant breeding, population genetics, and quantitative genetics.
3. Explain the process of plant domestication and its effect on allelic diversity.
4. Generate testable hypotheses.
5. Develop and answer experimental questions using genetics and genomics approaches.
6. Critically read and evaluate literature.
7. Communicate experimental objectives and results.

**Format:** Lectures, classroom activities, discussion of scientific literature. The course will include primary literature and review articles as reading assignments. Students are required to come to class ready to discuss the articles.

**Required readings**

You are expected to read required readings before coming to class.

Questions to be prepared to answer:

1. Why are the authors interested in this question, what is the background?
2. Are the methods appropriate to answer this question?
3. What are the major conclusions?
4. Are the conclusions justified by the results?
5. How can this work be followed up upon?

**Course website:** A course website has been developed and will be maintained on Compass (<https://compass2g.illinois.edu/>). Course-related materials including the syllabus, lectures, readings, announcements, grades, etc. will be posted on this site.

**Recommended text and references**

Zimmer & Emlen. Evolution. 2<sup>nd</sup> edition. 2016. WH Freeman and Co

Hartl and Clark. Principles of population genetics. 4<sup>th</sup> edition. 2007. Sinauer Associates

Background reading: Klug et al. Essentials of genetics. 9<sup>th</sup> edition. 2016.

These books have been placed on reserve at the Funk (ACES) library.

We will be regularly reading primary literature and review articles. These can be found on Compass. **BE SURE TO READ THESE ARTICLES BEFORE CLASS** so that you can participate in the discussions.

**Classroom policies:**

If you have questions about course material and assignments, you should post them to the discussion board as a first resource. We will check the discussion board regularly. If you have grading complaints, please submit them in writing within one week of receiving the graded exam.

**Assignments:**

<i>Points</i>	<i>Assignment</i>	<i>Due Date</i>
<i>10x10 points each=100</i>	Quizzes	Weekly
<i>2x75 points each=150</i>	Hypothesis experiments	
<i>300</i>	Exams	10/5, 10/26, 12/15
<i>250</i>	Grant proposal	11/16
<i>100</i>	Grant peer review	12/5
<i>100</i>	Participation	Every class

**Quizzes (10x10 points each) – 100 points**

Ten multiple choice/short answer/true-false quizzes will be assigned throughout the semester. The quizzes will be available beginning at 5:00pm Friday afternoon and will be due Tuesday at 9:00 AM. All quizzes will be available on the Compass course website. Questions will cover lecture materials from the previous week as well as the primary literature and review articles for the upcoming week. A total of 11 quizzes will be given throughout the semester. The lowest quiz grade will be dropped for a total of 10 quizzes, 10 points per quiz.

**Hypothesis Experiments (2x75 points each) – 150 points**

You will write three research proposals related to plant genetics to test an ORIGINAL hypothesis. These hypotheses cannot relate in any way to current research you are performing. Detailed rubrics will be distributed before the first experiment is due.

### **Grant Proposal and Peer Review Panel– 350 points**

The semester will culminate with a grant proposal assignment, meant to incorporate all the topics introduced in this course. This proposal will include all the elements of a real grant, including a Preproposal, Introduction, Objectives, Methodology, Expected Outcomes, and Future Plans. Assignments will be graded on originality, feasibility, relevance, and clarity. **YOU MAY NOT USE THE SAME TOPIC FOR YOUR GRANT PROPOSAL AND YOUR HYPOTHESIS EXPERIMENT.** Once proposals have been submitted, the class will be split into two “review panels” and each proposal will be evaluated for “funding priority”. The grant chosen by each review panel to receive “funding” will earn 5pts of extra credit. Detailed rubrics will be distributed before the preproposal is due.

**Late Policy:** Work should be turned in on the date listed on the schedule. Late assignments will be deducted 20% for each day they are late. For example, a 50-point assignment will have a maximum possible score of 40 points if turned in a day late, 30 if two days late, etc. Late assignments will not be accepted if they are more than 4 days late.

### **Grading:**

A	900-1000	C	700-799
B	800-899	D	600-699
		F	less than 600

### **Academic Integrity**

The University of Illinois at Urbana-Champaign *Student Code* should also be considered as a part of this syllabus. Students should pay particular attention to Article 1, Part 4: Academic Integrity. Read the Code at the following URL: <http://studentcode.illinois.edu/> . Academic dishonesty may result in a failing grade. Every student is expected to review and abide by the Academic Integrity Policy: <http://studentcode.illinois.edu/>. Ignorance is not an excuse for any academic dishonesty. It is your responsibility to read this policy to avoid any misunderstanding. Do not hesitate to ask the instructor(s) if you are ever in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity.

### **Students with Disabilities**

To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the as soon as possible. To insure that disability-related concerns are properly addressed from the beginning, students with disabilities who require assistance to participate in this class should contact Disability Resources and Educational Services (DRES) and see the instructor as soon as possible. If you need accommodations for any sort of disability, please speak to me after class, or make an appointment to see me, or see me during my office hours. DRES provides students with academic accommodations, access, and support services. To contact DRES you may visit 1207 S. Oak St., Champaign, call 333-4603 (V/TDD), or e-mail a message to [disability@uiuc.edu](mailto:disability@uiuc.edu). <http://www.disability.illinois.edu/>.

### **Emergency Response Recommendations**

Emergency response recommendations can be found at the following website: <http://police.illinois.edu/emergency/>. I encourage you to review this website and the campus

building floor plans website within the first 10 days of class.  
<http://police.illinois.edu/emergency/floorplans/> .

**Family Educational Rights and Privacy Act (FERPA)**

Any student who has suppressed their directory information pursuant to *Family Educational Rights and Privacy Act* (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See <http://registrar.illinois.edu/ferpa> for more information on FERPA.

This syllabus is subject to change. Any changes will be announced in class and an updated version will be posted on Compass.

<b>Week</b>	<b>Date</b>	<b>Topic</b>	<b>Paper</b>	<b>Due</b>
1	29-Aug	Introduction, laws of segregation and independent assortment		
	31-Aug	Molecular markers and DNA sequencing	Goodwin et al. 2016 Nature Reviews Genetics	
2	5-Sep	Quantitative genetics		Quiz #1
	7-Sep	Linkage, genetic map		
3	12-Sep	Linkage disequilibrium; Population structure	Garris et al. 2005 Genetics	Quiz #2
	14-Sep	QTL Mapping		
4	19-Sep	Fine-mapping; map-based cloning	Frary et al. 2000 Science	Quiz #3
	21-Sep	Association mapping		
5	26-Sep	Association mapping	Yano et al. 2016 Nature Genetics	Quiz #4
	28-Sep	Genetic screens	Candela and Hake 2008 Nature Genetics Review	Hypothesis #1
6	3-Oct	Bulked segregant analysis	Schneeberger 2015 Nature Genetics Review	Quiz #5
	5-Oct	<b>Exam</b>		
7	10-Oct	Source of genetic variation- Meiosis	Melamed-Bessudo et al. 2016 Current Opinion in Plant Bio	Quiz #6
	12-Oct	Source of genetic variation- Mutation		Hypothesis #2
8	17-Oct	Genome organization	Chandler 2010 Science	Quiz #7
	19-Oct	Transposons		
9	24-Oct	Gene expression	Boyle et al. 2017 Cell	Quiz #8
	26-Oct	<b>Exam</b>		
10	31-Oct	Intro population genetics, HWE		Quiz #9

	2- Nov	Drift		Preproposal due
11	7- Nov	Inbreeding, population subdivision, and migration	Hu et al. 2015 BMC Genomics	Quiz#10
	9- Nov	Neutral theory		
12	14- Nov	Molecular population genetics		Quiz #11
	16- Nov	Crop domestication	Myer et al. 2013 Nature Genetics Review	Proposal due
13	28- Nov	Crop domestication: Maize		
	30- Nov	Crop domestication: Rice		
14	5- Dec	Review panel 1		Written reviews due
	7- Dec	Review panel 2		
15	12- Dec	Paper discussion	Lolle et al. 2005 Nature	

Final Exam  
12/15/2017 1:30-4:30

## Run > Hide > Fight

Emergencies can happen anywhere and at any time. It is important that we take a minute to prepare for a situation in which our safety or even our lives could depend on our ability to react quickly. When we're faced with almost any kind of emergency – like severe weather or if someone is trying to hurt you – we have three options: Run, hide or fight.



### Run

**Leaving the area quickly is the best option if it is safe to do so.**

- ▶ Take time now to learn the different ways to leave your building.
- ▶ Leave personal items behind.
- ▶ Assist those who need help, but consider whether doing so puts yourself at risk.
- ▶ Alert authorities of the emergency when it is safe to do so.



### Hide

**When you can't or don't want to run, take shelter indoors.**

- ▶ Take time now to learn different ways to seek shelter in your building.
- ▶ If severe weather is imminent, go to the nearest indoor storm refuge area.
- ▶ If someone is trying to hurt you and you can't evacuate, get to a place where you can't be seen, lock or barricade your area if possible, silence your phone, don't make any noise and don't come out until you receive an Illini-Alert indicating it is safe to do so.



### Fight

**As a last resort, you may need to fight to increase your chances of survival.**

- ▶ Think about what kind of common items are in your area which you can use to defend yourself.
- ▶ Team up with others to fight if the situation allows.
- ▶ Mentally prepare yourself – you may be in a fight for your life.

Please be aware of people with disabilities who may need additional assistance in emergency situations.

## Other resources

- ▶ [police.illinois.edu/safe](https://police.illinois.edu/safe) for more information on how to prepare for emergencies, including how to run, hide or fight and building floor plans that can show you safe areas.
- ▶ [emergency.illinois.edu](https://emergency.illinois.edu) to sign up for Illini-Alert text messages.
- ▶ **Follow the University of Illinois Police Department** on Twitter and Facebook to get regular updates about campus safety.