*CMM 518 :* Fundamental Genetic Mechanisms Fall 2021

Course Administration:

Nathan A. Ellis, Ph.D. naellis@arizona.edu

 Associate Professor of Cellular and Molecular Medicine, Chair Genetics GIDP, Member Cancer Biology GIDP

Keith A. Maggert, Ph.D. kamaggert@arizona.edu

 Associate Professor of Cellular and Molecular Medicine, Vice-chair Genetics GIDP, Member Cancer Biology GIDP

Schedule: MWF, 2p – 3p

Public Calendars (subscription):

 Course meetings: iCal

 Assignments: iCal

Location: Rm. 444, Health Sciences Innovation Building (HSIB).

Format: This class is scheduled to be taught as IN-PERSON.

Zoom: Not currently planned.

Overall course objectives and expected learning outcomes:

The function of genes lies at the heart of heritability and variation in biology. Understanding genetic mechanisms and genetic interactions is essential to understanding foundational concepts like developmental biology, cell physiology, evolution, aging and disease. What is known about genetic mechanisms is well advanced over the basics enumerated by Mendel and other early luminaries, but the genetic approach – one that relies on prizing our exceptions – remains fundamentally unchanged. This course covers advanced concepts in gene function, genetic interactions, and genetic analyses and manipulations that are commonly in use in research laboratories that study genetic model organisms or biological processes that go awry in human disease.

Course progress:

The course will consist of readings, assigned for discussion or background for each class meeting. You are required to complete these readings prior to the class in which they will be discussed. Generally on Fridays, students will receive the upcoming week’s homework assignment. Homework assignments include solving problems that require various forms of genetical thinking, elaboration of alternative genetical models, and short essays on assigned papers. Students are strongly encouraged to read through these questions before lectures, so that the homework questions can help direct the discussion to those areas where they need clarification. Homework is due after the following week, generally at the beginning of the Monday class. There will be a final exam in the form of a final paper.

There are two “data blitzes” scheduled, wherein each student will – alone or in a small group – present the key findings of an assigned paper, in particular the relevance of the paper’s findings to the topic at hand.

**Course Schedule:**

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| --- | --- | --- | --- | --- | --- |
| Class | Date | Topic | Instructor | Hwk out | Hwk due |
| 1 | Aug 23, (Mon) | Introduction/meiosis | Ellis | 1 |   |
| 2 | Aug 25, (Wed) | Complementation/epistasis | Ellis |   |   |
| 3 | Aug 27, (Fri) | Mutation | Maggert | 2 |   |
| 4 | Aug 30, (Mon) | Allelomorphy | Maggert |   | 1 |
| 5 | Sep 1, (Wed) | Suppressor/synthetic lethal | Maggert |   |   |
| 6 | Sep 3, (Fri) | Gene conversion I | Ellis | 3 |   |
|   | Sep 6, (Mon) | Labor Day |   |   |
| 7 | Sep 8, (Wed) | Gene conversion II | Ellis |   | 2 |
| 8 | Sep 10, (Fri) | Double strand break repair | Ellis | 4 |   |
| 9 | Sep 13, (Mon) | Synthesis-dependent strand | Ellis |  | 3 |
| 10 | Sep 15, (Wed) | Modern mad meiosis | Ellis |   |   |
| 11 | Sep 17, (Fri) | VDJ rearrangement | Ellis | 5 |   |
| 12 | Sep 20, (Mon) | Somatic hyper-rec/class switch | Ellis |  | 4 |
| 13 | Sep 22, (Wed) | Yeast mating types | Maggert |   |   |
| 14 | Sep 24, (Fri) | Sex determination flies & worms | Maggert |  |   |
| 15 | Sep 27, (Mon) | Dosage compensation | Maggert | 6 |   |
| 16 | Sep 29, (Wed) | Tissue and temporal I | Maggert |   | 5 |
| 17 | Oct 1, (Fri) | Tissue and temporal II | Maggert |  |   |
| 18 | Oct 4, (Mon) | Enhancer traps/mosaics | Maggert | 7 |   |
| 19 | Oct 6, (Wed) | Robustness/canalization/buffering | Maggert | 8 |   |
| 20 | Oct 8, (Fri) | Sex determination in human I | Ellis |  | 6 |
| 21 | Oct 11, (Mon) | Sex determination in human II | Ellis |   |   |
| 22 | Oct 13, (Wed) | X chromosome inactivation I | Ellis |   | 7 |
| 23 | Oct 15, (Fri) | X chromosome inactivation II | Ellis |  |   |
| 24 | Oct 18, (Mon) | Data blitz Ellis style | Ellis |   | 8 |
| 25 | Oct 20, (Wed) | Chromosome structure | Maggert | 9 |   |
| 26 | Oct 22, (Fri) | Mitotic segregation | Maggert |  |   |
| 27 | Oct 25, (Mon) | Aberrations | Maggert |   |   |
| 28 | Oct 27, (Wed) | Segmental aneuploidy, Balancers | Maggert |   |   |
| 29 | Oct 29, (Fri) | Inverse Dose | Maggert | 10 |   |
| 30 | Nov 1, (Mon) | Aneuploidy | Maggert | 11 |   |
| 31 | Nov 3, (Wed) | Telomeres | Ellis |   | 9 |
| 32 | Nov 5, (Fri) | Telomeres | Ellis |   |   |
| 33 | Nov 8, (Mon) | Telomeres | Ellis |   |   |
| 34 | Nov 10, (Wed) | Experimental Day |   |   | 11 |
| 35 | Nov 12, (Fri) | Data blitz Maggert style | Maggert | 12 | 10 |
| 36 | Nov 15, (Mon) | Intro to human pop genetics | Ellis | Final Paper |   |
| 37 | Nov 17, (Wed) | Inbreeding and parental relatedness | Ellis |   |   |
| 38 | Nov 19, (Fri) | Somatic cell mosaicism | Ellis |   |   |
| 39 | Nov 22, (Mon) | Somatic mutations I | Ellis |   | 12 |
| 40 | Nov 24, (Wed) | Somatic mutations II | Ellis |   |   |
|   | Nov 26, (Fri) | Thanksgiving Recess |   |   |
| 41 | Nov 29, (Mon) | Transposable elements I | Maggert |   |   |
| 42 | Dec 1, (Wed) | Transposable elements II | Maggert |   |   |
| 43 | Dec 3, (Fri) | Transposable element regulation | Maggert |   |   |
| 44 | Dec 6, (Mon) | Heterochromatin | Maggert |   |   |
| 45 | Dec 8, (Wed) | Position effect variegation | Maggert |   |   |
|   | Dec 10, (Fri) |   |   |   | Final Paper |

Policies:

Grading:

Standard letter grades will be given. The grade will be based 50% on homework, and 25% on the final paper, 25% class participation. There will be twelve 25-point homework assignments (300 points total), 150 points for the final paper, and 150 points for class participation. Final grade will be calculated thus:

 A: 90%-100%

 B: 80%-89%

 C: 70%-79%

 D: 60%-69%

 E: 59% and below

If you have to be absent for any reason, please contact one or both of your instructors ahead of class. You will still be responsible for the readings and assigned homework and the material covered in class. Because discussion of the material in class is an important aspect of the pedagogical strategy, missing class could disadvantage you and you should make every reasonable effort to talk about the material with a peer or instructor. In certain circumstances, the instructors may be able to accommodate *ex parte* material review. Unapproved absences could affect your grade.

Group/Joint Work:

Working with others in the class is encouraged. If you work with others, either turn in a single assignment indicating co-authors, or turn in individual answers disclosing the extent of the collaboration through acknowledgement.

In-Person:

We will be meeting in-person until the University notifies us otherwise. Zoom links will not be available for in-person classes because hybrid meetings disadvantage persons on Zoom. So it will either be all in-person or all Zoom. Currently, room capacity is sufficient for all students and instructors to be present.

Classroom Safety:

Face coverings are required in the classroom until it is not required. As directed by the University of Arizona’s Administration, face coverings must cover the nose, mouth, and chin, and are required to be worn in all learning spaces at the University of Arizona (e.g., in classrooms, laboratories and studios). Any student who violates this directive will be asked to immediately leave the learning space, and will be allowed to return only when they are wearing a face covering. Subsequent episodes of noncompliance will result in a Student Code of Conduct complaint being filed with the Dean of Students Office, which may result in sanctions being applied. The student will not be able to return to the learning space until the matter is resolved.

Physical distancing is required during our in-person class meetings, consistent with CDC guidelines, including restricted seating to increase physical distancing

The Disability Resource Center is available to explore face coverings and accessibility considerations if you believe that your disability or medical condition precludes you from utilizing any face covering or mask option. Should DRC determine an accommodation to this directive is reasonable, DRC will communicate this accommodation with your instructor.

If you feel sick, or may have been in contact with someone who is infectious, stay home. Except for seeking medical care, avoid contact with others and do not travel. Notify your instructors if you will be missing an in person or online course. Campus Health is testing for COVID-19. Please call (520) 621-9202 before you visit in person. Visit the University of Arizona COVID-19 page for regular updates.

These directions and how they apply to individuals may change. The instructors are prepared to discuss reasonable modifications as they are proposed or arise. Proposed modifications will be discussed with the entire class as appropriate.

**Accessibility and Accommodations:**

At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, <https://drc.arizona.edu>) to establish reasonable accommodations.

Advising:

If you have questions about your academic progress this semester, or your chosen degree program, please note that advisors at the Advising Resource Center can guide you toward university resources to help you succeed.

If you are experiencing unexpected barriers to your success in your courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office can be reached at 520-621-2057 or DOS-deanofstudents@email.arizona.edu.

If you are facing physical or mental health challenges this semester, please note that Campus Health provides quality medical and mental health care. For medical appointments, call (520-621-9202. For After Hours care, call (520) 570-7898. For the Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334.

Final Notes:

No course content is knowingly offensive. It is, however, quite flabbergastingly awesome.

The information contained in the course syllabus, other than the grade and absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructors.