

General Genetics BIOB 375
Monday - Thursday 5:00-7:00 PM, Online
Summer 2023 May 15 – June 23, 2023

Course Description:

Introduction to classical and molecular genetics of eukaryotes, with emphasis on transmission genetics, the structure and regulation of genes, and mechanisms of genetic change.

Prerequisites: Principles of Biology (BIOB 160) or Cellular and Molecular Biology (BIOB 260) or equivalent and willingness to work hard.

Instructor: Dr. Fernando Henrique Correr

Plant Sciences and Plant Pathology

Office: Plant Bioscience Building

Office Hours: Thursday 2-4 PM

Please email to set up an appointment if you cannot make the office hours.

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Teaching Assistant: Mei Ling Wong

Plant Sciences and Plant Pathology

Office: Plant Bioscience Building

Office Hours: Thursday 2-4 PM

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Textbook: Genetics: A Conceptual Approach” by B. A. Pierce (7th edition)

Lectures follow the book to a large extent, and thus you will find the book to be a valuable resource. A lower cost “loose leaf version and an electronic version of the textbook are available from the MSU bookstore. The electronic version of the text comes with “Sapling” or “SAP PLUS” features at no additional cost, but you will not need these features for this class. Complementary material can be used during the semester, but they will be made available to all students.

Mode of Teaching: This class would be taught fully online via WebEx/Zoom MTWR from 5 -7 PM. Live class session attendance is **required**. Invitations to classes would be sent in advance. You should download and install both WebEx and Zoom on your computer and/or phone if you do not have them.

Online Resources: All course information will be posted on the D2L system; **you need to check the D2L system daily for notices, homework assignments, and quizzes.**

Lecture notes will be posted on D2L. The notes are intended to help you spend less time writing during class period, but they do not provide all the information that will be covered in class or on tests. (You may download the lecture notes and take notes on a laptop computer during class).

| General Genetics BIOB 375 | | | |
|---------------------------|-----------------|--|--|
| Date | Lectures | Topics | Textbook Chapters |
| 5/15 | Lecture 1 | Introduction - Genetics Overview; Model Systems Organisms, Chromosomes, Cell Division, Meiosis | Ch. 1 pp 1-12 (for fun), Ch. 2 Appendix A1-A13 |
| 5/16 | Lecture 2 | Principles of Genetics: Heredity, Mendelian Genetics, Chi-Squared Test | Ch. 3 |
| 5/17 | Lecture 3 | Genetic Analysis, Chi-Squared Test | Ch. 5, Ch. 3 |
| 5/18 | Lecture 4 | Continuation: Genetic Analysis, Chi-Squared Test | Ch. 5, Ch. 3 |
| 5/22 | Lecture 5 | Non-Mendelian ratios; Practical class | Ch. 5, Ch. 3 |
| 5/23 | Lecture 6 | Sex Determination, X-Linkage, Dosage, Pedigree Analysis, Genetic Testing | Ch. 4, Ch. 5, Ch. 6 |
| 5/24 | Lecture 7 | Linkage, Recombination, Eukaryotic Gene Mapping | Ch. 7 - Guest Lecturer? |
| 5/25 | Lecture 8 | Review and practical class | |
| 5/29 | No class | Memorial Day | |
| 5/30 | Lecture 9 | Quantitative Genetics | Ch. 24 |
| 5/31 | Lecture 10 | Population Genetics | Ch. 25 |
| 6/1 | Lecture 11 | Evolution | Ch. 26 |
| 6/5 | Exam #1 | Exam 1 | Exam 1 focuses on Lectures 1-10 |
| 6/6 | Lecture 12 | DNA: The chemical Nature of a Gene, the central dogma | Ch. 10, Ch. 11 |
| 6/7 | Lecture 13 | DNA replication, Transcription, RNA Molecules and RNA Processing | Ch. 12, Ch. 13, Ch. 14 |
| 6/8 | Lecture 14 | The Genetic Code and Translation | Ch. 15 |
| 6/12 | Lecture 15 | Regulation of gene expression | Ch. 16, Chr. 17 |
| 6/13 | Lecture 16 | Regulation of gene expression | Ch. 16, Chr. 17 |

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|------|----------------|---|--|
| 6/14 | Lecture 17 | Mutations and Repair, Chromosomal Variation, Transposable Elements | Ch. 18, Ch. 8 |
| 6/15 | Lecture 18 | Mutations and Repair, Chromosomal Variation, Transposable Elements | Ch. 18, Ch. 8 |
| 6/19 | Exam #2 | Exam 2 | Exam 2 focuses on Lectures 9-18 |
| 6/20 | Extra | Genetics - Biotechnology, Stem Cells and Cloning, Genetically Modified Organisms CRISPR / Genome Engineering | Ch. 19 - Guest Lecturer? |
| 6/21 | Exam #3 | Exam 3 | Exam 2 focuses on Lecture 1-19 |
| 6/22 | | Final Presentation | |
| 6/25 | | FINAL GRADES | |

Expectations:

I expect that you (1) be on time and prepared for lectures when you attend, (2) be respectful of all lectures and fellow students, (3) ask questions and seek additional assistance when needed, and (4) have fun learning about Genetics. Realize that learning the fundamentals well now, will help you in the future. **This is your course; you should take responsibility for learning the material – I will help facilitate your learning experience.**

If you have a documented disability for which you are or may be requesting an accommodation(s), you are encouraged to contact me and the Office of Disability Services as soon as possible.

Course Structure and Grading:

There will be two exams worth 100 points each, and a cumulative final exam worth 150 points. Additionally, there will be online quizzes each worth 10 points and homework assignments each worth 10 points. Also, there will be one student research paper or online PowerPoint presentation worth 50 points, see additional details below. There will be bonus homework assignments and quizzes varying from 1 up to 10 points. All exams and assignments will include Short Answer/Essay, written legibly as instructed. Online quizzes will be given in D2L except the last week and will include True/False, Multiple-Choice Questions (scantron) and Essays. Note, there are numerous important topics and concepts that will be covered that are important for your education in Genetics, of course not all of them will appear on the exams (or the exams would be too long). Additional activities as forum discussions, extra quizzes and bonus activities can be included during the semester. We can discuss date, content and assessment method changes during the semester if everyone agrees.

| Percent | Letter Grade |
|----------|--------------|
| 94 - 100 | A |
| 90 - 93 | A- |
| 87 - 89 | B+ |
| 83 - 86 | B |
| 80 - 82 | B- |
| 77 - 79 | C+ |
| 73 - 76 | C |
| 70 - 72 | C- |
| 67 - 69 | D+ |
| 63 - 66 | D |
| 60 - 62 | D- |
| < 60 | F |

All exams and assignments can be typed or handwritten and scanned and sent to me in D2L. Exams and assignments that require academic writing of any sort must follow the writing and citation format described later under details of student research paper.

Your grade will be calculated based on the percentage of the total points you earned relative to the total points offered during the semester; the grading scale is beside. **Please note that besides some bonus activities, there are no extra credit points available, and this class is not curved.**

Grading / Review

I will post your scores on D2L after everyone has taken the exam, quiz/submitted their assignment and I have graded them. After every exam, quiz/assignment the student responses for each question are evaluated and score corrections are made, if necessary.

Post-exam review is encouraged, please call-in during office hours and/or schedule an appointment to review your exams. Answer keys will not be posted online since this may provide future students with an unfair advantage in the course.

Grading – in general I give you the benefit of the doubt while grading. If you find a mathematical mistake, please let me know. If you want to “make your case” for additional points, you can do that – but I will look over your entire exam again and make any/all corrections necessary.

When you look at your exam, you are free to take notes, but not pictures. You make not bring your exams home.

Thanks for respecting the grading and exam review policies.

Presentation – Additional Details

Goal: To review major concepts in Genetics and further develop your presentation skills.

Potential topics for the presentation required for this class should be **anything that interests you that relates to General genetics**. The topic should ideally be one that interests you and should not be a reiteration of a topic covered in class.

Such as: The genetics protocol and procedures for a crop/animal improvement, human diseases. Could be a paper describing a success in Genetics (Plant or animal). What was tried and what worked?

Should also be: An original paper (not one used by yourself or someone else previously in a previous class). The presentation should also be based on your interpretation of the research papers you have read and your opinion. It also should be your own work.

Requirements:

You will need one **visual aid** and give a **10-minute presentation** on your assigned topic. The visual aids can be an electronic Presentation. You need to submit your presentation and the file name must include your last name, first initial, and presentation topic as your title.

The presentation should follow a simple outline of; introduction, objectives, discussion, conclusion and/or future recommendations and references cited. You should use photos for illustrations and have fair knowledge of the things on your slides. Points will be awarded based on the outline, content **(20)**, quality of your slides **(5)**, presentation skills and response to questions regarding to your presentation **(15)**, citation and references **(10)**.

You need to submit your presentation visual aids a day prior to your presentation date.

You will use your visual aid to help you give a 10-minute presentation to the class. Depending on the class size, we may divide into groups, and we will adjust the presentation time accordingly.

You must be present to earn credit for this exercise.

Presentation dates: June 21 and June 22

Citation Format:

A good way to find journal articles and compile a reference list is using EndNote Web, Zotero and Mendeley. Endnote Web is free to MSU students - see <http://guides.lib.montana.edu/endnote> - and the guidelines for Zotero and Mendeley can be found here: <https://guides.lib.montana.edu/citationmanagement/zotero> and <https://guides.lib.montana.edu/citationmanagement/mendeley>. With these software, you can cite as you write. Discuss with me if you have difficulty using any of them. Each reference in your list should include authors, date of publication, journal volume and page numbers, and title of the article. You can choose either an APA or MLA citation formatting style but be consistent.

Examples of in-text citation

Nuclear accumulation of NPR1 is needed for basal defense gene expression and resistance, whereas its subsequent turnover is required for establishing SAR (Spoel et al., 2009). Two NPR1 paralogues, NPR3 and NPR4, are required to be the SA receptors (Fu et al., 2012). Both NPR3 and NPR4 contain the BTB domain and ankyrin repeats, which are typical adaptors for CUL3 substrate. Either NPR3 or NPR4 directly bind with SA thus modulating their interactions with NPR1 that result in NPR1 degradation through CUL3 mediated ubiquitination (Fu et al., 2012; Moreau, Tian, & Klessig, 2012).

Example reference list: (Note difference in information required for a book chapter reference (Hannah) versus a scientific journal article.)

Fu, Z. Q., Yan, S. P., Saleh, A., Wang, W., Ruble, J., Oka, N., . . . Dong, X. N. (2012). NPR3 and NPR4 are receptors for the immune signal salicylic acid in plants. *Nature*, 486(7402), 228. doi:10.1038/nature11162.

Moreau, M., Tian, M., & Klessig, D. F. (2012). Salicylic acid binds NPR3 and NPR4 to regulate NPR1-dependent defense responses. *Cell Res.*, 22(12), 1631.

Spoel, S. H., & Dong, X. (2012). How do plants achieve immunity? Defense without specialized immune cells. *J Nature reviews immunology*, 12(2), 89.

Hannah, LC (1997). Starch synthesis in the maize seed. In: Larkins, BA, Vasil, IK (eds) *Cellular and Molecular Biology of Plant Seed Development*. Kluwer, Dordrecht, The Netherlands, pp 375-405.

Study Tips / Advice for Success in BIOB 375

Below are some tips from students that have done well in the course previous semesters.

1. Attend class and ask questions when the lecture is ongoing.
2. Print and look over notes prior to class helps you prepare questions ahead of class if any
3. Look over / read sections of the textbook before class.
4. Using the D2L notes as your guide, use the textbook to do focus reading and studying on the material covered in lecture.
5. Ask questions / seek help (Instructor, your peers).
6. Study homework and exams; attend the review session prior to the exam.
7. Please get in touch with me if you need additional help.

8. Study at least 3 hrs per week (*remember you are expected to spend as much or more time studying as you spend in class).
9. Be engaged in the material (i.e., study) during lecture.
10. Use the book and other media to review concepts
11. Lectures will include Q&A between myself and all the students in the class. Please note that these questions are to stimulate discussion, emphasize main points, and keep everyone alert during class. It is o.k., if you don't know the answer (just tell me) and I will either provide the answer or ask another student.

Class rules

1. ***Show up on time to lectures.***
2. ***Treat your instructors and fellow students with respect.***
In addition to being on time, this includes no cell phone use in class (not even for texting and Googling!).

Montana State University is committed to creating a culture of intellectual and personal growth. Because learning is enhanced when topics are examined from diverse perspectives and because individuals possess unique outlooks which reflect the world around us, Montana State University is dedicated to creating an inclusive community that embraces a rich mix in the composition of its student body, staff, and faculty. The distinction in viewpoints that comes from differences in race, gender, age, language, socioeconomic status, religion, political affiliation, and geographical background are appreciated and valued at MSU as important aspects of the campus community at every level and in every sector of the campus.

3. **Be prepared to be asked questions during class, this helps facilitate a more interactive learning environment.** These questions are meant to “keep you thinking during class” and serve as an indicator of concepts that are important for the exams. **It is ok, if you don't know the answer, please just let me know that by saying “pass or I don't know”, I always quickly move on to the next student.**
4. Bring *lecture* notes to class if you like. It is a good idea to take additional notes on the D2L posted notes, either in paper form and/or electronic format.
5. Recorded lectures will be available upon request, with a formal justification from the student for missing the class.
6. *Exams will be given **only** at the scheduled times.* Alternative arrangements will require a written excuse from your doctor, the Dean of Students office, a coach, or faculty advisor for a club who's activities conflict with an exam, and prior arrangements with me. Make-up exams (if we agree to give one) maybe more difficult.
7. You will be able to use a calculator only in exams.
8. **You must comply with the guidelines for academic integrity in MSU's Student Academic and Conduct Guidelines and Grievance Procedures (if you are not familiar with these, see http://www2.montana.edu/policy/student_conduct/cg600.html).**
9. **If I have even the slightest suspicion that you are cheating on any exam, I will**

give you a zero for the exam.

10. Ask questions during and after class. That's the best way to make sure that you understand the material if you are confused.
11. If you have a documented disability for which you are or may be requesting an accommodation(s), you are encouraged to contact your instructor and Disabled Student Services as soon as possible.