Genetics 133
3 credits
Spring 2018
MWF 11:00-11:50 AM
121 Brogden Psychology Building

Course Description

Welcome to Genetics 133! This is a genetics course that is designed to reach and teach those interested in how genetics affects our everyday lives, providing the foundational scientific knowledge to allow you to be informed and up-to-date on current genetic topics that are relevant to you and those around you. The science of genetics is at the heart of many issues facing our society, and as such, genetics is often in the news. This course explores the underlying genetics and methodologies to gain a deeper understanding of the science behind the headlines so that we can make more informed decisions as citizens, and you can be part of a movement to help educate those around you.

Upon completion of this course students should be able to critically evaluate genetics in the news for credibility, validity and merit. You should have a basic understanding of fundamental genetic concepts and the modern experimental and clinical genetic approaches and procedures that directly impact society. You should be able to understand and interpret the results of genetic studies that shape ethical, societal and medical genetic issues relevant to your life.

What's In the Syllabus?

Course Details:

Website: https://canvas.wisc.edu/courses/80244

Course materials will be posted in Canvas at the website listed above, including the syllabus, assigned articles and the slides for each lecture. There will be active discussion boards in Canvas for posting questions and comments. You have the option of posting anonymously.

Course Objectives:

Critical evaluation of genetics in the news: Students will be able to evaluate genetics in the news for credibility, validity and merit.

Bioethics: Students will be able to discuss the ethical concerns regarding genetic testing, three-parent babies, genetic engineering, etc.

Three-Parent Babies: Students will be able to describe the biology of fertilization, molecular structure of DNA, and how DNA is passed from generation to generation.

100,000 Genomes Project: Students will be able to describe the central dogma of biology, how genes influence inherited traits, and how genetic variation alters genes leading to specific diseases.

Epigenetics: Students will be able to explain how reversible gene silencing mimics the effect of mutation without alteration of DNA sequence, and its important role in human development.

Genetic disorders: Students will be able to define and identify the various types of mutations, where and when these mutations occur, and how these mutations lead to genetic diseases and disorders.

Genetic testing: Students will be able to explain the methods used for analyzing DNA sequence, and how genetic variations in DNA sequences give us information about ancestry, and disease susceptibility. Students will also become familiar with direct-to-consumer genetic testing, and the societal and bioethical implications of widely available genetic information.

Figuring out the effects of mutations: Students will learn how geneticists decipher gene function and figure out how mutations disrupt normal gene function to cause disease.

Gene therapy: Students will be able to explain the basic techniques used in gene therapy, along with the challenges, successes, and emerging application of this technology to the clinic.

Genome engineering: Students will understand recent advances in genome engineering, how it differs from gene therapy, and how it is or may be used in clinical, agricultural and other settings. Students will also learn about the technical

obstacles and potential risks associated with this technology.

Bacterial genetics: Students will be able to explain how genes are exchanged between bacteria and why this leads to the evolution of antibiotic-resistant pathogens.

Recombinant DNA: Students will be able to explain how individual genes can be amplified and isolated for study as recombinant DNA molecules.

Genetics of domestication: Students will be able to describe experimental approaches to understanding how corn was domesticated from teosinte and how dramatic changes in animal behavior have been selected over a surprisingly small number of generations.

Flies, worms and yeast: Students will explore examples of how genetic analysis using model organisms has revealed genes and processes at work in humans.

Time, love and memory: We will explore the genetic basis of behavior, as revealed by mutations affecting sleep, courtship and the ability to form and retain memories.

Genetics of aging/stem cells: Students will be able to explain how chromosome ends erode as we age and why this and other types of DNA damage are inevitable.

Genomes & precision medicine: Students will be able to describe the range of methods currently used in diagnosing inherited disease and cancer.

Course Format:
In this course, you will read popular press news articles related to genetics. These articles will be available on Canvas, and should be read prior to coming to class. Lectures will cover the basic biological and genetic concepts that will provide the basis for understanding and evaluating assigned news articles. In addition to lectures, we will have TA and/or instructor-led interactive class discussions that may include in-class assignments. Students are expected to come to class prepared with questions related to the articles and lectures. These discussions will also serve as the review session prior to each quiz or exam. There will be three quizzes and three exams throughout the semester. In addition, there will be an optional cumulative final exam. The lowest exam grade will be dropped. If you are unable to attend a quiz or exam please notify the instructor as soon as possible. Refer to the class schedule below for topics, reading assignments, quiz and exam dates. This is a 3-credit course, so in addition to lecture an additional 3 hours of time outside of class will be expected per lecture, including reading news articles, assignments, studying, etc.

Grading:

Quizzes (3)	
25 points each	75 points
Student article assignments	
15 points each section	45 points
Participation	15 points
Exams	
Best 3 of 4 @ 75 points each	225 points
Total	360 points

Grading Scale:

A	100-90%
B	89-80%
C	79-70%
D	69-60%
F	Below 60%

Diversity Statement:
Students in this class are encouraged to speak up and participate during class meetings. Because this class will represent a diversity of individual beliefs, backgrounds, and experiences, every member of this class must show respect for every other member of this class.

Students with Disabilities:
Students that require learning support should meet with the instructor to ensure that student needs are appropriately met. Students with disabilities who believe they may need accommodations in this class are encouraged to contact the instructor as soon as possible to ensure that such accommodations are implemented in a timely fashion.

Instructors

Allen Laughon
3432 Genetics/Biotech
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Katie Vermillion Kalmon
1430 Genetics/Biotech
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Kate O'Connor-Giles
227D Bock Labs
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Teaching Assistant

Dean Sanders
Room: 2114 WID
Telephone: 920-207-6953
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Office hours: Monday 12:15-1:15 pm and Wednesday 9-10 am in 1421 Genetics/Biotech

Course Schedule:

Date:	Topic or Activity:	Instructor:
Wed, Jan 24	1. Critical evaluation of Genetics in the News	Vermillion
Fri, Jan 26	2. Discussion– student articles	Vermillion/Sanders
Mon, Jan 29	3. Intro to bioethics	Vermillion
Wed, Jan 31	4. Discussion	Vermillion/Sanders
Fri, Feb 2	5. Three-parent babies	Vermillion
Mon, Feb 5	6. Three-parent babies	Vermillion
Wed, Feb 7	7. Discussion – review & **Quiz 1**	Vermillion/Sanders
Fri, Feb 9	8. Iceland genomes/100,000 Genomes Project	Vermillion
Mon, Feb 12	9. Iceland genomes/100,000 Genomes Project	Vermillion
Wed, Feb 14	10. Epigenetics	Sanders
Fri, Feb 16	11. Epigenetics	Sanders
Mon, Feb 19	12. Origins of human mutations	Vermillion

Wed, Feb 21	13. Discussion and review	Vermillion/Sanders
Fri, Feb 23	14. **Exam 1**	Vermillion/Sanders
Mon, Feb 26	15. Genetic disorders	O'Connor-Giles
Wed, Feb 28	16. Genetic testing	O'Connor-Giles
Fri, Mar 2	17. Discussion - student articles	O'Connor-Giles/Sanders
Mon, Mar 5	18. Direct-to-consumer genetic testing	O'Connor-Giles
Wed, Mar 7	19. Figuring out the effects of mutations	O'Connor-Giles
Fri, Mar 9	20. Discussion - ethical implications of testing	O'Connor-Giles/Sanders
Mon, Mar 12	21. Discussion – review & **Quiz 2**	O'Connor-Giles/Sanders
Wed, Mar 14	22. Gene therapy	O'Connor-Giles
Fri, Mar 16	23. Genome engineering – How?	O'Connor-Giles
Mon, Mar 19	24. Genome engineering – Why?	O'Connor-Giles
Wed, Mar 21	25. Discussion and review	O'Connor-Giles
Fri, Mar 23	26. **Exam 2**	O'Connor-Giles/Sanders
March 26-30	**Spring Break**	
Mon, Apr 2	27. Antibiotic resistance	Sanders
Wed, Apr 4	28. Bacterial genetics; horizontal gene transfer	Sanders
Fri, Apr 6	29. Discussion - student articles	Laughon
Mon, Apr 9	30. Genetically modified organisms	Laughon
Wed, Apr 11	31. Recombinant DNA	Laughon
Fri, Apr 13	32. Genetics of domestication	Laughon
Mon, Apr 16	33. Discussion, Review & **Quiz 3**	Laughon/Sanders
Wed, Apr 18	34. Flies, worms and yeast?	Laughon
Fri, Apr 20	35. Time, love and memory	Laughon
Mon, Apr 23	36. Aging	Laughon
Wed, Apr 25	37. Cancer	Laughon/Sanders
Fri, Apr 27	38. Precision medicine	Laughon
Mon, Apr 30	39. Discussion and Review	Laughon/Sanders
Wed, May 2	40. **Exam 3**	Laughon/Sanders
Fri, May 4	41. Genetics: where are we headed?	Laughon
Sun, May 6	**12:25 PM Optional Cumulative Final Exam, room to be announced**	