

BIOL 5112/3112: Fundamentals of Genomic Evolutionary Medicine

Dr. Sudhir Kumar	602A SERC	s.kumar@ temple.edu
LECTURE	BioLife Science 332	Wednesday: 5:30-8:00 pm
OFFICE HOURS	By appointment	Offered in the Spring semester

BIOL 5112 SECTION 001 [26318] (For graduate students)

BIOL 3112 SECTION 001 [27340] (For undergraduate students)

(Graduates and undergraduate attend the lectures together at the same time in the same room. However, undergraduate students will work in small groups in the semester-long student case study projects. Graduate students will work individually on case-study projects.)

Prerequisite: Biology 2112 with a grade of C or better.

Course Description: Modern evolutionary theory offers a conceptual framework for understanding human health and disease. In this course we will examine human disease in evolutionary contexts with a focus on modern techniques and genome-scale datasets. We ask: What can evolution teach us about human populations? How can we understand disease from molecular evolutionary perspectives? What are the relative roles of negative and positive selection in disease? How do we apply evolutionary principles in to diagnose diseases and develop better treatments? Students will become familiar with current research through guided case studies. This course focuses on discovery-based learning.

Course Learning Objectives

1. Explain key concepts of evolutionary biology and medicine from a genomic perspective
2. Integrate key evolutionary concepts and principles to explain various aspects of human health and disease
3. Develop familiarity with current research relevant to evolutionary and genomic medicine
4. Evaluate how genomics and phylomedicine fit into the broader context of modern healthcare
5. Explain the many applications of evolutionary biology, in research and in solving real-world problems

Text: Principles of Evolutionary Medicine by Peter Gluckman; Alan Beedle; Mark Hanson.

REFERENCE BOOKS

Why we Get Sick: The New Science of Darwinian Medicine by NESSE, WILLIAMS
Evolutionary Medicine by TREVATHAN, SMITH, MCKENNA
Evolution in Health and Disease by STEARNS, KOELLA
Survival of the Sickest by MOALEM, PRINCE
Personal Genomics and Personalized Medicine by BOLOURI
The Neutral Theory of Molecular Evolution by KIMURA
Molecular Evolution and Phylogenetics by NEI, KUMAR
Evolutionary Medicine by STEARNS, MEDZHITOV

Course Segments

What can evolution teach us about human populations?

1. Introduction to Human Disease & Evolution
2. Evolutionary Mechanisms Refresher
3. Genomic Diversity in Human Populations
4. Evolution and Development

How do we apply evolutionary/genomics principles in medicine?

5. Evolutionary Principles in Medicine
6. Evolution, Medicine & Society
7. Student Research Presentations

Student Research Presentations

With guidance from the instructor, students will prepare a 20-30 minute presentation summarizing current research on a topic in Evolutionary Genomic Medicine, or a proposal for how evolutionary principles could be applied to a relevant medical genomics research field. Students enrolled in the undergraduate version of the class will work in small groups and those enrolled in the graduate class will work individually.

Grading:

The grading components will be as follows:

[1] Classroom Participation (200 points; 10 @ 20 points each, 10 best performances are counted). Classroom participation will be evaluated each class period and points assigned. Therefore, attendance is very important to pass this class.

[2] Case Study Update Papers (400 points). Students will be given a specific Example topic from the textbook, which you will expand upon based on new relevant findings published in the last two years and additional analysis. With instructor's permission, they may also select a case study from the literature. Students will submit the initial literature review version of the article within eight weeks and the final report with additional data analysis at twelve weeks. Both of them will carry 200 points each.

[3] Mid-term Exam (200 points). It will be a take home exam, which will contain five essay type questions (200 words per answer). Students will have 24 hours to complete it.

[4] Research Presentation (200 points). Students will be asked to present their Case Study Update to the whole class.

Civility & Temple's Code of Conduct (CoC): Violations of the CoC include, but are not limited to: academic dishonesty and impropriety, including plagiarism and academic cheating; interfering or attempting to interfere with or disrupting the conduct of classes or any other normal or regular activities of the University (see: http://policies.temple.edu/getdoc.asp?policy_no=03.70.12).

Disability Disclosure: Any student who has need for accommodation based on the impact of a disability should contact the instructor privately to discuss the specific situation as soon as possible. In addition, Disability Resources should be contacted at 215-204-1280.

Student/Faculty Academic Rights and Responsibilities: The University's policy can be accessed through the following link: http://policies.temple.edu/getdoc.asp?policy_no=03.70.02.