

# BioS/CSE 090: Bioinformatics in the 21<sup>st</sup> Century

Location: TBD, Fridays, 1:10pm – 2:00 pm

Professor: Brian Y. Chen, Department of Computer Science and Engineering, Lehigh University

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## 0. Purpose

The purpose of this class is not to absorb every detail or fact presented in lecture, but rather to develop a better understanding of how computers are changing and accelerating modern science.

## 1. Course Description

The human genome was just the beginning. New experimental technologies are still transforming medicine and biology. One day, inexpensive genome sequencing will isolate pre-cancerous tissue before it becomes a risk, cryoelectron microscopy will reveal the intricate structures of molecular complexes, and microarray technologies will uncover a systematic picture of gene expression in health and disease.

This transformation is possible only through the emerging science of informatics, which gathers, integrates, analyzes and visualizes the new wealth of biological data to make informed decisions. Through informatics, patient histories can be analyzed; drugs can be designed; genomes can be assembled. With these fundamental innovations and those on the horizon, it remains unclear how careers in science, especially medicine, will change as a result.

This course, which expands on topics featured in “Bioscience in the 21st century”, will discuss the informatics revolution and its impact on science, ethics, and careers in medicine and biology.

## 2. Textbook

[The Machinery of Life](#), 2nd Edition

By David S. Goodsell.

Publisher: Springer

## 3. Course Structure and Assessment

	CSE/BioS 090
Participation	100%

### Class Participation

**a) Asking questions or contributing to class discussion.** The purpose of this class is not to absorb every detail or fact presented in lecture, but rather to get a better understanding of how computers and changing and accelerating modern science. I evaluate how well you are building this understanding based on your questions. Hence, the participation score, which is 100% of the class grade, is equal to the fraction of class meetings in which the student has asked a question, or contributed a comment to a class discussion. One optional “extra credit” assignment will be assigned. This assignment can substitute for not participating in one class. **No Other Exceptions Will Be Made.**

Most class sessions will begin with a lecture, and end in discussion. Never be concerned about interrupting the lecture, nor be concerned about lengthening a discussion.

b) **Cell phones and laptops** Are not to be in use during class meetings, and should be set to silent operation.

#### **4. Sample Lecture Topics (subject to change without notice)**

Lecture 01: What is Informatics?

Lecture 02: What is Bioinformatics?

Lecture 03: An Informatics of Complementarity

Lecture 04: High Throughput Sequencing

Lecture 05: Genome Assembly

Lecture 06: Gene Finding

Lecture 07: DNA and Protein Sequence Alignment

Lecture 08: Measuring Evolution in the Genome

Lecture 09: Careers in the 21st Century

Lecture 10: Careers in the 21st Century (part 2)

Lecture 11: Protein DNA Interactions

Lecture 12: Protein Protein Interactions

Lecture 13: Protein Cavities

Lecture 14: Gene Regulation and Transcription Factors

Lecture 15: Discovering Cis-Regulatory Sites

#### **5. Outcomes**

##### **By completing this course, students will:**

1. Understand the basic design and purpose of several major computational technologies in the field of bioinformatics.
2. Be aware of how computational and biological concepts can be integrated to draw meaningful conclusions from multi-faceted biological data.

##### **This course supports program missions to educate students that will:**

1. Apply their education in computer science to the analysis and solution of scientific, business, and industrial problems.
4. Engage in continued education in their field of expertise

##### **Accommodations for Students with Disabilities:**

If you have a disability for which you are or may be requesting accommodations, please contact both your instructor and the Office of Academic Support Services, University Center C212 (610-758-4152) as early as possible in the semester. You must have documentation from the Academic Support Services office before accommodations can be granted.

##### **Lehigh Student Senate Academic Integrity Statement:**

We, the Lehigh University Student Senate, as the standing representative body of all undergraduates, reaffirm the duty and obligation of students to meet and uphold the highest principles and values of personal, moral and ethical conduct. As partners in our educational community, both students and faculty share the responsibility for promoting and helping ensure an environment of academic integrity. As such, each student is expected to complete all academic course work in accordance to the standards set forth by the faculty and in compliance with the university's Code of Conduct.