Department of Biology

(updated 3/18)

Mechanisms of Disease (MD) Concentration:

Among the most important and interesting areas of scientific investigation are the mechanisms that underlie human disease. The understanding and study of this topic are of interest for medicine, science, biotechnology, engineering, law, and public and health policy. This concentration from the Department of Biology encompasses a range of courses to provide an outstanding foundation in the basic principles and topics of human disease, providing exposure to the concepts, science and methods employed in this area. The concentration is of interest to those considering careers that require or include an understanding of medical, scientific, and biotechnology for human health, positioning majors with an exceptional foundation for the future.

Requirements for the concentration (17.5 - 19.5 cu)

Introductory Biology (1.5 – 3 CU):

- Track 1: BIOL 121 with 123: Molecular Biology of Life with lab (1.5 cu)
- Track 2: BIOL 101 and BIOL 102 (3 CU)

Introductory Chemistry (3 CU):

- CHEM101 and 102 with CHEM 053 & 054: Intro Chemistry with lab (3.0 CUs) **OR**
- CHEM115 and 116 with CHEM 053 & 054: Honors Intro Chemistry with lab (3.0 CUs)

Organic Chemistry (1 CU):

- CHEM241: Principles of organic chemistry I (1 CU)
- CHEM242: Principles of organic chemistry II (1 CU)
- CHEM245: Experimental organic chemistry Lab (1 CU)

Calculus (1 CU):

- MATH104: Calculus I (1 CU)
- MATH114 or 115: Calculus II (1 CU)

Statistics (1 CU):

- BIOL446: Statistics for Biologists (1 CU)
- STAT111: Introductory Statistics (1 CU)

Intermediate Biology (3 CU): Fundamentals of biological pathways and processes

- BIOL204: Biochemistry (1 CU) (spring) – *Can be satisfied with CHEM 251 "Biochemistry"*
- BIOL205: Cell Biology (1 CU) (fall)
- BIOL221: Molecular Biology and Genetics (1 CU) (fall and spring)

One additional Intermediate Biology elective (1-1.5 CU):
Choose one of the following three courses:

- BIOL215: Vertebrate Physiology (1 CU) (fall and spring)
- BIOL251: Molecular and Cellular Neurobiology (1.5 CU) (fall)
- BIOL404: Immunobiology (1CU) (fall and spring)

ADVANCED ELECTIVES (5 CU):

***Take 1 course on Microbes and Infectious Disease (1 CU)*:**

- BIOL375: Microbial Diversity and Pathogenesis (1 CU) (spring, lecture course)
- BIOL406: Molecular Mechanisms of Infectious Disease (1 CU) (spring, seminar course)
- BIOL475: Topics in Prokaryotic Biology: From Molecules to Microbes (1 CU) (spring)

Take 2 courses on Genetic Underpinnings of Disease (2 CU):

- BIOL466: Molecular Genetics of Neurological Disease (1 CU) (fall, not offered 2018)
- BIOL482: Cell signaling (1 CU) (fall, not offered 2018)
- BIOL483: Epigenetics (1 CU) (fall, lecture course)
- BIOL484: Cell motility and cytoskeleton (1 CU, fall)
- BIOL540: Genetic Systems (1 CU) (spring even, lecture course)

Take 1 course on Molecular Genetics & Genomic (1 CU):

- BIOL422: Genomics of Human Disease and Evolution (1 CU) (spring odd)
- BIOL431: Genome Sciences and Genomic Medicine (1 CU) (spring)
- BIOL485: The RNA world: A Functional and Computational Analysis (1 CU) (spring even)

Additional 1 elective from courses listed above or below (1 CU):

Fundamental Biological Processes:

- BIOL230: Evolutionary Biology (1 CU) (spring, lecture course)
- BIOL448: Principles of Drug Action (1 CU) (fall, lecture course)

Microbes and Infectious Disease:

- BIOL376: Microbial Diversity and Pathogenesis Laboratory (1 CU) (spring, laboratory course)

Genetics and Genetic diseases:

- BIOL493: Epigenetics of Human Health and Disease (1 CU) (spring even)

Molecular Genetics and Genomics:

- BIOL437 Introduction to Computational Biology & Biological Modeling (1 CU) (spring)
- BIOL522: Human Evolutionary Genomics (1 CU) (spring even).

Other courses may be appropriate as the additional elective; however, the course requires prior approval by an MD advisor to be credited toward the concentration.

Research Experience (1 CU):

1 CU of independent study (BIOL399) is required for the concentration.

How to Apply for the concentration:

The Director for this concentration is Dr. Bonini. Advisors are Dr. Bonini, Dr. Brisson, and Dr. Gregory. After submitting an information form for the major and a worksheet for the concentration to the Academic Office (Leidy Labs, Room 102), a student intending to apply for the MD Concentration must meet with their assigned advisor to approve her/his selected course program from this list.