

## **UM Minor Programs in Bioinformatics**

(course prerequisites follow courses, except for electives;  
program prerequisites are on the right)

Bioinformatics is an interdisciplinary research area that applies computer and information science to solve biological problems. The graduate minor in bioinformatics includes core coursework in computer and biological sciences and opportunities to interact with others interested in bioinformatics. The curriculum encourages interdisciplinary interaction, communication, and synthesis. Enrollment in the minor is contingent upon enrollment in a major offered by the UM Graduate School. More information is found on the Graduate Program in Bioinformatics website: <http://www.binf.umn.edu/>

The core courses in bioinformatics are *Computational Techniques for Genomics* covering algorithms and data structures useful in the field and one from a selection of courses in applied genomics or sequence analysis. The third core course is *Genetics* or *Molecular Evolution* (for computer science majors); or *Principles of Database Systems* or *Practice of Database Systems* (for non-computer-science majors).

The masters minor program has the three core courses (9 cr). The doctoral minor program has five courses: the core courses plus one of two courses in statistical genomics and one course not in the student's major field from a list of relevant electives or another course with DGS approval (15 cr minimum).

Depending on a student's background, one or more designated prerequisite courses may be recommended prior to starting the minor program. Prerequisite courses may not be used to fulfill minor field requirements.

### **Recommended Prerequisites**

*For students deficient in computer science:*

#### **CSci 4041.**

Algorithms and Data Structures

4 cr - staff

(CSci 1902 and 2011 or instr consent)

*For students deficient in biology, one of the following courses:*

#### **BioC 6021.**

Biochemistry

3 cr - staff

(general biology, organic chemistry, instr consent)

#### **BME n 5501.**

Biology for Biomedical Engineering

3-4cr - staff

*For doctoral students deficient in statistics, one of the following 4 cr courses:*

#### **PubH 6450.**

Biostatistics I – staff

([[Math 1111 or Math 1201], hlth sci grad student] or instr consent)

#### **Stat 5021.**

Statistical Analysis – staff

(College algebra or instr consent)

## Core Courses

### Fall - CSci 5481.

Computational Techniques for Genomics, 3 cr -  
G. Karypis  
(CSci 4041 or instr consent)

### AND one 3 cr course from the following:

#### Fall - PBio/PIPa 5301.

Plant Genomics - N. Young  
([Intro course in genetics, intro course in  
biochemistry] or instr consent)

#### Spring - Phcl 5111.

Pharmacogenomics - C. Campbell  
(Grad student or instr consent)

#### Fall - BioC 5361.

Microbial Genomics and Bioinformatics -  
L. Wackett and A. Khodursky  
(College-level courses in [organic chemistry,  
biochemistry, microbiology])

*AND one 3 cr course from the following:  
(non-computer-science majors, one course  
from the following; can follow cs-major  
branch with DGS approval)*

#### CSci 4707.

Practice of Database Systems – staff  
(CSci 4041 or instr consent)

#### CSci 5707.

Principles of Database Systems – staff  
(CSci 4041 or instr consent)

*(computer-science majors, one  
course from the following)*

#### Biol 4003.

Genetics – staff  
(Biol/BioC 3021 or BioC 4331)

#### spring - EEB 5221.

Molecular and Genomic Evolution –  
G. May and A. Dean  
(Biol 4003, GCD 3022, or instr consent)

**Total:** 9 credits

For **Doctoral** students, the core courses  
plus:

*One course from the following:*

#### Fall – AnSc/MVB 5200.

Statistical Genetics and Genomics  
4 cr - Y. Da, L. Alexander, S. Fahrenkrug  
([Stat 3021 or equiv], [GCD 3022 or Biol 4004 or  
equiv])

#### Spring – PubH 7445.

Statistics for Human Genetics and Molecular  
Biology - 3 cr - C. Reilly  
([PubH 6450 or equiv] or instr consent; bkgd in  
mol. biol. desired)

*AND one 3 or 4 cr elective not in a student's  
major field from the following (course  
prerequisites, not listed, must be met) or others  
with DGS approval:*

**BioC 4950.** Computer Simulation & Data  
Analysis in Biochemistry. V. Bloomfield

**ChEn 8754.** Systems Analysis of Biological  
Processes. W-S. Hu

**Chem 5021/8021.** Computational Chemistry.  
J. Gao

**CSci 5521.** Pattern Recognition. staff

**CSci 5523.** Intro to Data Mining. V. Kumar

**CSci 8725.** Databases for Bioinformatics.  
J. Carlis

**EEB 5033.** Population & Quantitative Genetics.  
R. Shaw, J. Curtsinger

**EEB/Ent 5371.** Principles of Systematics.  
R. Zink, S. Weller

**EEB 5963.** Modeling Nature & the Nature of  
Modeling. C. Neuhauser

**Math 8540.** Topics in Math Biology. H. Othmer

**NSc 5201.** Membranes & Channels. J.  
Fohlmeister

**NSc 5202.** Systems & information processing.  
A.D. Redish

**Phys 5081.** Intro to Biopolymer Physics. A.  
Grosberg

**PubH 6381.** Genetics in Public Health (2 cr) *and*

**PubH 6385.** Computational Methods in Genetic  
Epidemiology (2 cr). M. Miller

**PubH 7475.** Stat Learning & Data Mining. W. Pan

**Total:** 15 - 17 credits.