



## BIOINFORMATICS

Do you like natural sciences and computers? Want to make a difference in the future well-being of humanity? Bioinformatics is an emerging, rapidly-expanding scientific discipline that addresses problems related to the collection, processing, analysis and retrieval of data on the structure and function of biological systems. With the vast amounts of data produced by ongoing genomic DNA sequencing and mapping projects (e.g. the Human Genome Project), Bioinformatics analysis is expected to uncover new relationships between genes and diseases, have a profound impact on drug development and clinical trials, and affect medical diagnostics, pharmacogenomics and agricultural and industrial biotechnology.

### THE BIOINFORMATICS PROFESSION

#### What is Bioinformatics?

Bioinformatics is a growing scientific discipline that addresses problems related to the storage, retrieval and analysis of information about biological structure, sequence and function

#### What do Bioinformatics Professionals do?

- Solve interesting problems
- Improve human health
- Build new tools
- Bridge the gap
- Work with powerful computers
- Generate knowledge

#### How do they do it?

- By working on problems fundamental to the understanding of life
- By determining how biological systems work with the goal of improving human health
- By devising new ways to analyze the flood of data generated by the Human Genome (and similar) projects
- By combining aspects of computer science, biology, mathematics and chemistry
- By bridging the gaps between computer science and molecular biology
- By utilizing powerful computers (or cluster computing) to analyze complex data
- By generating new knowledge from biological data

#### Example Job Titles

- Bioinformatics Scientist
- Scientific Curator
- Computational Biologist
- Database Programmer
- Database Administrator
- Software Developer
- Consultant
- Network Analyst
- Structural Analyst
- Biostatistician
- Network Administrator
- Data Scientist
- Software Engineer
- Research Scientist
- Professor
- Biotech Entrepreneur

#### Resources

- National Center for Biotechnology Information | [ncbi.nih.gov](http://ncbi.nih.gov)
- The International Society of Computational Biology | [iscb.org](http://iscb.org)
- Life Sciences Society (LSS) | [lifesciencessociety.org](http://lifesciencessociety.org)
- Institute of Electrical and Electronics Engineers | [lifesciences.ieee.org](http://lifesciences.ieee.org)
- Open Bioinformatics Foundation | [open-bio.org/wiki/main\\_page](http://open-bio.org/wiki/main_page)
- Bioinformatics Organization | [bioinformatics.org](http://bioinformatics.org)

## BACHELOR OF SCIENCE IN BIOINFORMATICS

### What courses do I need?

The College of Information Science & Technology requires completion of a minimum of 120 credit hours which include the following courses:

#### General Education Requirements

|                             |                |
|-----------------------------|----------------|
| English                     | 9 credit hours |
| Public Speaking             | 3 credit hours |
| College Algebra or test out | 3 credit hours |
| Natural Science             | 7 credit hours |
| Humanities                  | 9 credit hours |
| Social Sciences             | 9 credit hours |
| US and Global Diversity*    | 6 credit hours |

#### IS&T Requirements - 24 hours

|               |                                      |
|---------------|--------------------------------------|
| CIST 1400     | Intro to Computer Science I          |
| CSCI 1620     | Intro to Computer Science II         |
| CIST 2500     | Intro to Applied Statistics for IS&T |
| CIST 3110     | IT Ethics**                          |
| CSCI 3320     | Data Structures                      |
| CSCI 4830     | Intro to Software Engineering        |
| CSCI 4850     | Database Management Systems          |
| CSCI/ISQA4890 | Data Warehousing & Data Mining       |
| OR            |                                      |
| CSCI 4150     | Graph Theory & Applications          |

#### Math Requirements\*\*\* - 11 hours

|           |                                       |
|-----------|---------------------------------------|
| MATH 1950 | Calculus I                            |
| CSCI 2030 | Math Foundations of Computer Science  |
| ISQA 4150 | Advanced Statistical Methods for IS&T |

#### Chemistry Requirements – 14 hours

|           |                                       |
|-----------|---------------------------------------|
| CHEM 1140 | Fundamentals of College Chemistry     |
| CHEM 1144 | Fundamentals of College Chemistry Lab |
| CHEM 2210 | Fundamentals of Organic Chemistry     |
| CHEM 2214 | Fundamentals of Organic Chemistry Lab |
| CHEM 3650 | Fundamentals of Biochemistry          |
| CHEM 3654 | Fundamentals of Biochemistry Lab      |

#### Bioinformatics Requirements - 24 hours

|           |  |
|-----------|--|
| BIOI 1000 | Intro to Bioinformatics                |
| BIOI 2000 | Foundations of Bioinformatics          |
| BIOI 3000 | Applied Bioinformatics                 |
| BIOI 3500 | Adv. Bioinformatics Programming        |
| BIOI 4860 | Bioinformatics Algorithms              |
| BIOI 4870 | Database Search & Pattern Discovery    |
| BIOI 4890 | Computerized Genetic Sequence Analysis |
| BIOI 4970 | Senior Project in Bioinformatics I     |
| BIOI 4980 | Senior Project in Bioinformatics II    |

#### Biology Requirements - 16 hours

|           |                               |
|-----------|-------------------------------|
| BIOL 1450 | Biology I                     |
| BIOL 2140 | Genetics                      |
| BIOL 3020 | Molecular Biology of the Cell |
| BIOL 4130 | Molecular Genetics            |
| OR        |                               |
| BIOL 4140 | Cellular Biology              |

Bioinformatics students interested in fulfilling pre-med requirements should see an advisor for specific information.

\* US and Global Diversity courses can also satisfy Humanities and Social Science requirements.

\*\* CIST 3110 also applies toward a Humanities requirement.

\*\*\* A math placement exam is recommended if no ACT score is available or if a higher placement than indicated is desired