

# BIOINFORMATICS AND COMPUTATIONAL BIOLOGY (BCBIO)

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*Any experimental courses offered by BCBIO can be found at:*

registrar.iastate.edu/faculty-staff/courses/explistsings/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

## **BCBIO 110: BCBIO Orientation**

(1-0) Cr. 0.5. F.

First 8 weeks. Orientation to the area of bioinformatics and computational biology. For students considering a major in BCBIO. Specializations and career opportunities. Offered on a satisfactory-fail basis only.

## **BCBIO 322: Introduction to Bioinformatics and Computational Biology**

(Cross-listed with BIOL, GEN). (3-0) Cr. 3. F.

*Prereq: BIOL 212*

Genome sequencing, assembly, structural and functional annotation, and comparative genomics. Investigating these topics will develop skills in programming and scripting (Perl and/or Python), the use of biological databases, sequence alignment, similarity search, identification of sequence patterns, construction of phylogenetic trees, and comparative genomics.

## **BCBIO 401: Fundamentals of Bioinformatics and Computational Biology**

(3-0) Cr. 3. F.

*Prereq: BCBIO 322 and basic programming experience (e.g. COM S 207, COM S 227 or permission of instructor)*

Application of computer science and engineering to molecular biology. String algorithms, sequence alignments, data structures, homology search methods, pattern recognition, fragment assembly, genome annotation, construction of bioinformatics databases, and gathering and distribution of biological information with the Internet.

## **BCBIO 402: Fundamentals of Systems Biology and Network Science**

(3-0) Cr. 3. S.

*Prereq: BIOL 212*

Technologies: transcriptome, proteome, metabolome; Networks: Gene regulatory network, Protein-protein interaction network, Literature network; Theories: Graph theory, random network, scale-free network, evolving network, network robustness; Tools: Jmol, MeV, Cytoscape, Citespace.

## **BCBIO 442: Bioinformatics and Computational Biology Techniques**

(0.2-0.5) Cr. 0.5. Repeatable, maximum of 2 credits. S.SS.

*Prereq: BIOL 314 recommended*

Modular minicourses consisting of guided tutorials and hands-on computer software exercises focused on fundamental problems, approaches, and software applications in bioinformatics and computational biology. Offered on a satisfactory-fail basis only.

## **BCBIO 442A: Bioinformatics and Computational Biology Techniques: Sequence Database Searching**

(0.2-0.5) Cr. 0.5. Repeatable, maximum of 2 credits. S.SS.

*Prereq: BIOL 314 recommended*

Modular minicourses consisting of guided tutorials and hands-on computer software exercises focused on fundamental problems, approaches, and software applications in bioinformatics and computational biology. Offered on a satisfactory-fail basis only.

## **BCBIO 442B: Bioinformatics and Computational Biology: Protein Structure Databases, Visualization, and Prediction**

(0.2-0.5) Cr. 0.5. Repeatable, maximum of 2 credits. S.SS.

*Prereq: BIOL 314 recommended*

Modular minicourses consisting of guided tutorials and hands-on computer software exercises focused on fundamental problems, approaches, and software applications in bioinformatics and computational biology. Offered on a satisfactory-fail basis only.

## **BCBIO 442C: Bioinformatics and Computational Biology Techniques: Phylogenetic Analysis**

(0.2-0.5) Cr. 0.5. Repeatable, maximum of 2 credits. S.SS.

*Prereq: BIOL 314 recommended*

Modular minicourses consisting of guided tutorials and hands-on computer software exercises focused on fundamental problems, approaches, and software applications in bioinformatics and computational biology. Offered on a satisfactory-fail basis only.

## **BCBIO 442D: Bioinformatics and Computational Biology Techniques: Microarray Analysis**

(0.2-0.5) Cr. 0.5. Repeatable, maximum of 2 credits. S.SS.

*Prereq: BIOL 314 recommended*

Modular minicourses consisting of guided tutorials and hands-on computer software exercises focused on fundamental problems, approaches, and software applications in bioinformatics and computational biology. Offered on a satisfactory-fail basis only.

**BCBIO 444: Bioinformatic Analysis**

(Cross-listed with BCB, BIOL, COM S, CPR E, GEN). (4-0) Cr. 4. F.

*Prereq: MATH 165 and Introductory Statistics (STAT 101, STAT 104, STAT 105, STAT 201, or STAT 330).*

Broad overview of bioinformatics with a significant problem-solving component, including hands-on practice using computational tools to solve a variety of biological problems. Topics include: bioinformatic data processing, Python programming, genome assembly, database search, sequence alignment, gene prediction, next-generation sequencing, comparative and functional genomics, and systems biology.

**BCBIO 490: Independent Study**

Cr. 1-5. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: BCBIO 322, junior or senior classification, permission of instructor*

Independent research projects for undergraduate students in bioinformatics and computational biology. Students in the College of Liberal Arts and Sciences may use no more than 9 credits of BCBIO 490 and 491 toward graduation.

**BCBIO 491: Team Research Projects.**

Cr. 1-5. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: BCBIO 322, junior or senior classification, permission of instructor*

Research projects in bioinformatics and computational biology done by teams of students. Students in the College of Liberal Arts and Sciences may use no more than 9 credits of BCBIO 490 and 491 toward graduation.