COMPUTATIONAL BIOLOGY BA/BS

Computational Biology is a discipline that applies Computer Science as a tool to solve problems in molecular biology. The degree has been developed in collaboration between Computer Scientists and Biologists. Mathematics course work is also represented, as an understanding of statistics is necessary when working as a bioinformatics scientist. This is truly a unique and interdisciplinary degree. This degree is designed as a gateway for students who will pursue graduate programs (MS and PhD) in Bioinformatics and Computational Biology. Students will also have the training to enter the work force as system analysts working with large data sets in clinical research, government research labs, biotechnology and pharmaceutical companies. Our faculty conduct bioinformatics research with a focus on image processing (MRI and histology images), and also genomics and molecular genetics (for example, studying genes associated with behavior/neural processing in mammals or genes involved in regulation drought-tolerance in crops).

The goals of the Computational Biology program are to provide students with learning experiences in both the classroom and laboratory so that they are **well-prepared** to:

- Think critically and apply knowledge in novel contexts;
- Understand the computational analysis of biological systems;
- Understand cell and genome structures, function, and reproduction;
- Understand algorithms and data structures;
- Perform basic laboratory procedures in a safe manner.

General Education Requirements

Code	Title	Credits
Written Communication		
Select one of the following:		6.00
ENGL-101 & ENGL-102	WRITING AND RHETORIC I and WRITING AND RHETORIC II	
ENGL-109	COLLEGE WRITING AND RESEARCH	
Oral Communication		
Select one from the following:		3.00
COMM-101	FUNDAMENTALS OF ORAL COMMUNICATION	
COMM-203	SMALL GROUP COMMUNICATION	
COMM-204	PUBLIC SPEAKING	
Mathematical Ways of Knowing		
MATH-170	CALCULUS I	4.00
Humanistic & Artistic Ways of Knowing		
Select two courses from two different categories (Literature, Arts, Language):		6.00-7.00
Literature		
ENGL-175	LITERATURE AND IDEAS	
ENGL-257	WORLD CLASSICS	
ENGL-258	INTERNATIONAL LITERATURE	
ENGL-260	NATIVE AMERICAN LITERATURE	
ENGL-261	MYTHOLOGIES	
Arts		
ART-100	INTRODUCTION TO ART	
HUM-101	THE ART AND HISTORY OF THE MOTION PICTURE	
HUM-150	INTRODUCTION TO THE ARTS	
MUS-101	SURVEY OF MUSIC	
MUS-102	MUSIC IN AMERICA	
MUS-150	WORLD MUSIC	
MUS-151	HISTORY OF MUSICAL THEATER	
MUS-152	HISTORY OF JAZZ AND POPULAR MUSIC STYLES	
THEA-101	SURVEY OF THE THEATER	
Language		
NP-101	NEZ PERCE LANGUAGE AND CULTURE	

NP-102	NEZ PERCE LANGUAGE AND HISTORY	
SPAN-101	ELEMENTARY SPANISH I	
SPAN-102	ELEMENTARY SPANISH II	
Scientific Ways of Knowing		
BIOF-100	INTRODUCTION TO BIOINFORMATICS	3.00
CHEM-111	PRINCIPLES OF CHEMISTRY I	4.00
Social & Behavioral Ways of Knowing		
Select one course from two disciplines:		6.00
ANTH-102	CULTURAL ANTHROPOLOGY	
ANTH-120	WORLD PREHISTORY	
ANTH-170	INTRODUCTION TO NATIVE AMERICAN STUDIES	
ECON-201	PRINCIPLES OF MACROECONOMICS	
ECON-202	PRINCIPLES OF MICROECONOMICS	
GEOG-102	INTRODUCTION TO GEOGRAPHY	
HIST-101	WORLD HISTORY I	
HIST-102	WORLD HISTORY II	
HIST-111	UNITED STATES HISTORY I	
HIST-112	UNITED STATES HISTORY II	
HRPT-184	DIVERSITY IN ORGANIZATIONS	
HRPT-185	HUMAN RELATIONS IN ORGANIZATIONS	
POLS-101	AMERICAN NATIONAL GOVERNMENT	
POLS-237	INTERNATIONAL POLITICS	
POLS-285	COMPARATIVE GOVERNMENT	
PSYC-101	INTRODUCTION TO GENERAL PSYCHOLOGY	
PSYC-205	LIFESPAN DEVELOPMENTAL PSYCHOLOGY	
SOC-101	INTRODUCTION TO SOCIOLOGY	
SOC-102	SOCIAL PROBLEMS	
SS-184	DIVERSITY IN ORGANIZATIONS	
SS-185	HUMAN RELATIONS IN ORGANIZATIONS	
Global Perspectives		
Select one of the following:		3.00-4.00
ANTH-102	CULTURAL ANTHROPOLOGY	
ANTH-120	WORLD PREHISTORY	
ANTH-170	INTRODUCTION TO NATIVE AMERICAN STUDIES	
ANTH-360	RACE AND ETHNICITY	
COMM-345	INTERCULTURAL COMMUNICATION	
ENGL-258	INTERNATIONAL LITERATURE	
ENGL-474	NATIVE AMERICAN WRITTEN LITERATURE	
GEOG-102	INTRODUCTION TO GEOGRAPHY	
HIST-101	WORLD HISTORY I	
HIST-102	WORLD HISTORY II	
HIST-111	UNITED STATES HISTORY I	
HIST-112	UNITED STATES HISTORY II	
HRPT-184	DIVERSITY IN ORGANIZATIONS	
ID-300C	ETHICS AND IDENTITY	
KIN-220	SOCIAL-CULTURAL ASPECTS OF SPORTS	
NP-101	NEZ PERCE LANGUAGE AND CULTURE	
NP-102	NEZ PERCE LANGUAGE AND HISTORY	
POLS-285	COMPARATIVE GOVERNMENT	
SOC-101	INTRODUCTION TO SOCIOLOGY	
SPAN-101	ELEMENTARY SPANISH I	
SPAN-102	ELEMENTARY SPANISH II	

SPAN-201	INTERMEDIATE SPANISH I	
SPAN-202	INTERMEDIATE SPANISH II	
SS-184	DIVERSITY IN ORGANIZATIONS	
Integrative Seminar: Ethics & Values		
Select one of the following:		3.00
ID 300A - 300Z (see course descriptions for options)		
ID-301A	HELLS CANYON INSTITUTE	
Total Credits		**38.00**

Program Requirements

Code	Title	Credits
Major Requirements		
BIOF-350	IMAGE ANALYSIS	4.00
BIOL-181	ORGANISMAL BIOLOGY	4.00
BIOL-182	CELLULAR BIOLOGY	4.00
BIOL-331	ECOLOGY	3.00
BIOL-341	GENETICS	4.00
BIOL-355	GENERAL MICROBIOLOGY	4.00
or BIOL-362	CELLULAR AND MOLECULAR BIOLOGY	
BIOL-372	COMPUTATIONAL BIOSTATISTICS	4.00
BIOL-460	EVOLUTION	4.00
BIOL-490	DIRECTED STUDY IN BIOLOGY	3.00
CHEM-112	PRINCIPLES OF CHEMISTRY II	4.00
CS-108	INTRODUCTION TO COMPUTER SCIENCE	3.00
CS-111	COMPUTER SCIENCE 1	4.00
CS-211	COMPUTER SCIENCE II	4.00
CS-226	SQL: STRUCTURED QUERY LANGUAGE	3.00
CS-253	INTRO TO SYSTEMS PROGRAMMING	4.00
CS-311	ALGORITHMS AND DATA STRUCTURES	4.00
GIS-271	GEOGRAPHIC INFORMATION SYSTEMS	4.00
WEB-111	FOUNDATIONS OF WEB DEVELOPMENT	3.00
Select five from the following courses:		**15.00**
BIOF-301	COMPUTATIONAL GENOMICS	
BIOL-227	HUMAN ANATOMY AND PHYSIOLOGY I	
BIOL-228	HUMAN ANATOMY AND PHYSIOLOGY II	
BIOL-312	BIOLOGY OF HUMAN DISEASE	
BIOL-401	MAMMALOGY	
BIOL-355	GENERAL MICROBIOLOGY	
or BIOL-362	CELLULAR AND MOLECULAR BIOLOGY	
BIOL-402	ORNITHOLOGY	
BIOL-404	ENTOMOLOGY	
BIOL-443	IMMUNOLOGY	
BIOL-450	FIELD BOTANY	
CS-250	COMPUTER ORGANIZATION AND ARCHITECTURE	
CS-360	SOFTWARE ENGINEERING	
CS-430	OPERATING SYSTEMS	
CS-435	COMPUTER NETWORKS	
CS-445	DATABASES AND KNOWLEDGE MANAGEMENT	
GIS-471	ADVANCED GEOGRAPHIC INFORMATION SCIENCE	
MATH-175	CALCULUS II	
Total Credits		**82.00**

Sequential Plan of Study

Course	Title	Credits
First Year		
Fall		
BIOF-100	INTRODUCTION TO BIOINFORMATICS	3.00
CORE	Social & Behavioral Ways of Knowing	3.00
ENGL-101	WRITING AND RHETORIC I	3.00
MATH-170	CALCULUS I	4.00
CHEM-111	PRINCIPLES OF CHEMISTRY I	4.00
	Credits	**17.00**
Spring		
BIOL-181	ORGANISMAL BIOLOGY	4.00
CORE	Oral Communication	3.00
CS-108	INTRODUCTION TO COMPUTER SCIENCE	3.00
ENGL-102	WRITING AND RHETORIC II	3.00
CHEM-112	PRINCIPLES OF CHEMISTRY II	4.00
	Credits	**17.00**
Second Year		
Fall		
CORE	Humanistic & Artistic Ways of Knowing	3.00
CORE	Social & Behavioral Ways of Knowing	3.00
CS-111	COMPUTER SCIENCE 1	4.00
WEB-111	FOUNDATIONS OF WEB DEVELOPMENT	3.00
CS-226	SQL: STRUCTURED QUERY LANGUAGE	3.00
	Credits	**16.00**
Spring		
BIOL-182	CELLULAR BIOLOGY	4.00
CORE	Humanistic & Artistic Ways of Knowing	3.00
CS-211	COMPUTER SCIENCE II	4.00
CS-253	INTRO TO SYSTEMS PROGRAMMING	4.00
	Credits	**15.00**
Third Year		
Fall		
BIOL-331	ECOLOGY	3.00
BIOL-355 or BIOL-362	GENERAL MICROBIOLOGY or CELLULAR AND MOLECULAR BIOLOGY	4.00
Program Requirement	Computational Biology Electives [1]	3.00
GIS-271	GEOGRAPHIC INFORMATION SYSTEMS	4.00
	Credits	**14.00**
Spring		
BIOL-341	GENETICS	4.00
CORE	Global Perspectives	3.00
BIOF-350	IMAGE ANALYSIS	4.00
CS-311	ALGORITHMS AND DATA STRUCTURES	4.00
	Credits	**15.00**
Fourth Year		
Fall		
BIOL-372	COMPUTATIONAL BIOSTATISTICS	4.00
Program Requirement	Computational Biology Electives [1]	3.00
Program Requirement	Computational Biology Electives [1]	3.00
Program Requirement	Computational Biology Electives	3.00
	Credits	**13.00**

Spring		
BIOL-460	EVOLUTION	4.00
BIOL-490	DIRECTED STUDY IN BIOLOGY	3.00
CORE	Integrative Seminar: Ethics & Values	3.00
Program Requirement	Computational Biology Electives [1]	3.00
	Credits	**13.00**
	Total Credits	**120.00**

[1] Program Requirement: Select 15 credits from the following, BIOF-301, BIOL-227, BIOL-228, BIOL-312, BIOL-355 or BIOL-362, BIOL-401, BIOL-402, BIOL-404, BIOL-443, BIOL-450, CS-250, CS-360, CS-430, CS-435, CS-445, GIS-471, MATH-175.

Graduates with a BA/BS in Computational Biology go on to obtain careers in a variety of fields:

- Research Assistant
- Data Collection/Analysis
- Computer Science