UNO COLLEGE OF INFORMATION SCIENCE & TECHNOLOGY

BIOINFORMATICS

EST. 2004

UNO COLLEGE OF IS&T

1110 S 67th St | Omaha, NE 68182 | 402.554.3819 | www.ist.unomaha.edu | Requirements Correspond to 2015-2016 Catalog

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UNDERGRADUATE ADVISING

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PKI 170
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www.mavtrack.unomaha.edu

PKI Building

The College of Information Science and Technology (IS&T) is housed in the Peter Kiewit Institute (PKI), located approximately one mile south of the UNO Dodge Street campus, separated by a city park and golf course. The facility provides laboratory, office, research, and classroom space, as well as computer facilities for both the College of Engineering and the College of IS&T. The computer networks and labs in this building consist of the latest fiber optic design. The PKI building opened its doors to students in August 1999, and the Bioinformatics degree was established in June 2004.

THE COLLEGE OF INFORMATION SCIENCE AND TECHNOLOGY

OBJECTIVE

The principal goal of the College of Information Science & Technology (IS&T) is to produce the next generation of information specialists. The College is committed to providing comprehensive, current, and quality education to students as illustrated by its motto: "***No student will go unchallenged or unassisted.***" Students graduating from our programs are technically prepared to enter the information industry, apply technology in organizational environments, embrace life-long learning, and contribute to their community. IS&T is utilizing some of the following methods to achieve its objectives:

- Forming partnerships with the business community
- Assisting students in finding internships
- Offering challenging courses, including seminars and special topics courses
- Faculty and executive-in-residence program
- Providing the latest in curriculum, programs and computer technology
- Identifying future needs in business and information technology, and preparing students to meet those needs
- Aiding students with career planning and job searching

DEGREES

Bachelor of Science in Bioinformatics (BSBI)

Bioinformatics is an exciting and rapidly-growing field that uses techniques from the computer and information sciences to study biological information and structure. Specifically, it is the science of developing computer databases and algorithms to facilitate and expedite biological research, particularly in the area of genomics. Bioinformatics is an interdisciplinary science, bringing together aspects of computer science, molecular biology, chemistry and mathematics. In order to capitalize on the growing body of genetic information, there is an immense and growing need for experts in this field. A graduate of the College of IS&T Bioinformatics program will have the background to pursue a wide variety of positions in the biomedical and biotechnology industries, graduate studies in bioinformatics or related areas, or, with the addition of only a couple of courses, medical school.

INTERNSHIP PROGRAM

The College of IS&T has a unique opportunity to match students and businesses together through its internship program, which is structured for junior and senior students who desire a work environment where they can implement the knowledge they acquire in the classroom to a work situation. Arrangements are made for the experience to be full or part-time, and academic credit can also be determined depending on the opportunities involved in the work assignment. Through internships, businesses have the opportunity to assess an individual's performance level, problem solving skills, and ability to work in a group, and students are prepared for the best jobs because they are challenged to learn the skills needed to become the leaders of tomorrow.

CAREER FIELDS

A degree in Bioinformatics from UNO's College of Information Science and Technology prepares students for bioinformatics-related positions in industry and research institutes, and graduate programs in bioinformatics or related areas. The bioinformatics program also provides strong training for students interested in health professions or further education in allied areas of biomedical research/molecular biology.

Due to a great demand for experts in bioinformatics, the job outlook for those with appropriate training is excellent. Jobs are available in programming and data analysis to positions as senior level scientists and research directors; employment is available with private and public industry, research institutions, government institutions, and universities around the globe.

The Bioinformatics degree complements two pre-existing graduate programs in Bioinformatics: the Bioinformatics Specialty Track offered jointly by the Department of Pathology-Microbiology at the University of Nebraska Medical Center (UNMC) and the College of IS&T, and the Ph.D. in Information Technology offered by the College of IS&T.

UNO's College of IS&T's undergraduate Bioinformatics degree is one of the first of its kind in the country and has been developed jointly by faculty in the University's Departments of Computer Science, Chemistry, Biology and Mathematics. This guide provides basic information about the Bioinformatics degree. All potential Bioinformatics majors are encouraged to see an academic advisor to determine a suggested program schedule. To obtain a BSBI degree, a student must fulfill certain university, college and departmental requirements.

UNIVERSITY REQUIREMENTS FOR THE BSBI DEGREE

GENERAL REQUIREMENTS

1. A minimum of 120 credit hours is required for the degree.
2. Students may follow the UNO catalog requirements in effect at the time of their first enrollment, provided continuous enrollment is maintained (fall, spring, fall, spring....).
3. **Thirty of the last 36 hours must be University of Nebraska at Omaha courses.**
4. Registering for courses without having taken the stated prerequisites could result in administrative withdrawal.
5. Courses such as English 1050, 1090, and 1100 and orientation courses in other colleges or divisions may not be counted as part of the minimum 120 credit hours in the degree program. University Seminar 1010 may be applied as an elective if taken in the first 30 hours of the degree program.
6. No more than four semester hours of physical education may count toward the degree.
7. No more than a maximum of 12 semester credit hours of approved courses may be taken in any one department outside of the College of IS&T with the exception of foreign languages. A maximum of 16 semester credit hours in any one foreign language may be applied to the degree. More than one foreign language is allowed.
8. A repeated course may count only once for graduation. (Exceptions are internships, independent studies, physical education activity courses, and special topic courses).
9. Students must see a College of IS&T advisor regarding the specific requirements for their major. Advising appointments can be scheduled online at http://mavtrack.unomaha.edu or by contacting the College of IS&T Academic Advising Office at 402/554-3819.
10. **Students must obtain a grade of "C-" or better in each class for the purpose of meeting general education, Departmental, and College requirements. A minimum cumulative GPA of 2.5 is required by the College of Information Science and Technology.**
11. Students must complete an online Application for Degree form through Mavlink on or before the deadline during the semester in which they plan to graduate. An Application for Degree fee is payable at the time the application is submitted. Students should visit the UNO Bookstore as soon as possible after submitting the degree application to order a cap and gown and graduation announcements. Deadlines to order graduation items vary depending on the ceremony in which the student plans to participate. Please contact the UNO Bookstore at 402/554-2336 with any questions.

UNIVERSITY GENERAL EDUCATION REQUIREMENTS FOR THE BSBI DEGREE
Fundamental Academic Skills, Distribution, and Diversity Requirements

Fundamental Academic Skills - 15 hours (Grade of C- or better required)

See an IS&T advisor regarding placement requirements in English and Math courses.

English and Writing **9 Credit Hours**

- ENGL 1150* English Composition I (or equivalent) 3 credit hrs
- ENGL 1160* English Composition II (or equivalent) 3 credit hrs
- CIST 3000 Advanced Comp for IS&T 3 credit hrs

* For students testing into ENGL 1150, the nine-hour requirement is satisfied by completing ENGL 1150 or 1154; ENG 1160 or 1164 and CIST 3000. For students testing into ENGL 1160, the nine-hour requirement is satisfied by completing ENGL 1160, CIST 3000 and applying for retroactive credits for ENG 1150. For students testing proficient on the English Placement Examination, the nine-hour requirement is satisfied by completing CIST 3000 and applying for retroactive credits for ENG 1150 and ENG 1160.

Public Speaking

- CMST 1110 Public Speaking Fundamentals OR **3 Credit Hours**
  CMST 2120 Argumentation and Debate

Mathematics **3 Credit Hours**

- MATH 1310 Intermediate Algebra (may test out)

University Distribution Requirements – 25 hours (Grade of C- or better is required)

See UNO's general education website for a list of approved courses http://gened.unomaha.edu/approvedcourses.php

Natural & Physical Sciences (7 hours from at least two disciplines)

Understanding the nature of scientific inquiry and the operation of the natural, physical, and technological world is essential for making personal and public policy decisions. Students must complete 8 credit hours of course work representing at least two different disciplines in this category with at least one laboratory course.

Successful students shall be able to do the following:

- demonstrate a broad understanding of the fundamental laws and principles of science and interrelationships among science and technology disciplines
- demonstrate a broad understanding of various natural phenomena that surround and influence our lives
- describe how scientists approach and solve problems including an understanding of the basic components and limitations of the scientific method
- solve problems and draw conclusions based on scientific information and models, using critical thinking and qualitative and quantitative analysis of data and concepts in particular to distinguish reality from speculation.

Humanities/Fine Arts (9 hours from at least two disciplines)*

Understanding the meaning, value, and history of human existence is an essential skill for living in contemporary society. One must have an understanding and appreciation of the various forms of humanistic/artistic expression and the role these artifacts play across various cultures. Students must complete 9 credit hours of coursework representing at least two different disciplines in this category.

Successful students shall be able to do the following:

- analyze representative texts, artifacts, and/or essential elements of the relevant discipline
- recognize and articulate the diversity of human experience across a range of historical periods and global societies
- describe and evaluate ways in which humanistic/artistic expression throughout the ages expresses the culture and values of time and place

- demonstrate an understanding of the value and role of literature, history, language, philosophy and/or the arts as they impact academic career or community life.

** CIST 3110 IT Ethics applies to both College of IS&T Core and Humanities requirements*

Social Sciences (9 hours from at least two disciplines)

The goal of the social sciences is to help students understand the social dynamics that make up the world, particularly the relationships between individuals, groups, societies and social institutions. Students must complete 9 credit hours of coursework representing at least two different disciplines in this category.

Successful students shall be able to do the following:

- understand the diversity of human motivations and institutional forces that influence social behavior
- develop analytical and critical thinking skills as applied to the study of the social sciences
- recognize multiple methods and modes of inquiry used in the social sciences and their appropriate application
- communicate ideas and explain concepts and analyses using the language of the social sciences.

University Diversity requirements - 6 hours (Grade of C- or better is required)

See UNO's general education website for a list of approved courses http://gened.unomaha.edu/approvedcourses.php

Global Diversity (3 hours)

Courses in this category focus on significant cultural, economic, geographical, historical, political, and/or sociological aspects of one or more countries or nations (including indigenous nations) other than or in comparison to the United States. Students must complete 3 credit hours of coursework.

Successful students shall be able to do the following:

- recognize the environmental and historical circumstances that produce different social and cultural systems
- demonstrate specific knowledge of the cultural, historical, social, economic, and/or political aspects of one or more countries other than the United States
- explain the interrelations among global economic, political, environmental and social systems
- explain ways in which identity is developed and how it is transmitted within and by members of the group or groups.

United States Diversity (3 hours)

This requirement develops students' awareness and appreciation of the history, society, and/or culture of one or more underrepresented groups in the United States. Students must complete 3 credit hours of coursework.

Successful students shall be able to do the following:

- demonstrate knowledge of the role and contributions of one or more underrepresented groups in the development of the United States
- recognize and articulate differences, expectations, and/or challenges experienced by one or more underrepresented groups
- demonstrate specific knowledge of the cultural, historical, social, economic, and/or political factors that shape the interaction of a diverse group or groups within society
- explain ways in which identity is developed and how it is transmitted within and by members of the group or groups.

BIOINFORMATICS Major Requirements

GENERAL REQUIREMENTS

A minimum of 93 credit hours must be taken including:

- 24 hours of College of IS&T Core courses
- 24 hours of Bioinformatics courses
- 11 hours of Mathematics courses
- 16 hours of Biology courses
- 17 hours of Chemistry courses
- I hour of an elective/prerequisite course

IS&T CORE COURSES (24 hours)

CIST	1400	Introduction to Computer Programming
CIST	1404*	Introduction to Computer Programming Lab
CSCI	1620	Introduction to Computer Science II
CIST	2500	Introduction to Applied Statistics for IS&T
CIST	3110*	IT Ethics
CSCI	3320	Data Structures
CSCI	4830	Introduction to Software Engineering
CSCI	4850	Database Management Systems
CSCI/ MATH	4150	Graph Theory and Applications **OR**
ISQA/ CSCI	4890	Data Warehousing and Mining

** CIST 1404 is optional; CIST 3110 IT Ethics applies to both College of IS&T Core and Humanities requirements*

BIOINFORMATICS COURSES (24 hours)

BIOI	1000	Introduction to Bioinformatics
BIOI	2000	Bioinformatics Foundations
BIOI	3000*	Applied Bioinformatics
BIOI	3500**	Advanced Bioinformatics Programming
BIOI	4860*	Bioinformatics Algorithms
BIOI	4870**	Database Search and Pattern Discovery
BIOI	4890	Genetic Sequence Analysis
BIOI	4970	Senior Project in Bioinformatics I
BIOI	4980	Senior Project in Bioinformatics II

** Offered Fall semester only; ** Offered Spring semester only*

MATHEMATICS COURSES (11 hours)

MATH	1950	Calculus I
CSCI	2030	Mathematical Foundations of Computer Science **OR**
MATH	2030	Discrete Math
ISQA	4150	Advanced Statistical Methods

BIOLOGY COURSES (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 (Spring semester only)

CHEMISTRY COURSES (17 hours)

CHEM	1180	General Chemistry I
CHEM	1184	General Chemistry I Lab
CHEM	1190	General Chemistry II
CHEM	1194	General Chemistry II Lab
CHEM	2210	Foundations of Organic Chemistry
CHEM	2214	Foundations of Organic Chemistry Lab
CHEM	3650	Foundations of Biochemistry
CHEM	3654	Foundations of Biochemistry Lab

Students majoring in both Bioinformatics and Pre-Med substitute the following CHEMISTRY COURSES (26 hours) and earn a minor in Chemistry:

CHEM	1180	General Chemistry I
CHEM	1184	General Chemistry I Lab
CHEM	1190	General Chemistry II
CHEM	1194	General Chemistry II Lab
CHEM	2250	Organic Chemistry I
CHEM	2260	Organic Chemistry II
CHEM	2274	Organic Chemistry II Lab
CHEM	4650*	Biochemistry I
CHEM	4654*	Biochemistry I Lab
CHEM	4660*	Biochemistry II
CHEM	4664*	Biochemistry II Lab
PHYS	1110	General Physics I
PHYS	1154	General Physics I Lab
	OR	
PHYS	2110	Calculus Based Physics I
PHYS	2154	Calculus Based Physics I Lab
PHYS	1120	General Physics II
PHYS	1154	General Physics II Lab
	OR	
PHYS	2110	Calculus Based Physics II
PHYS	2154	Calculus Based Physics II Lab

** In place of CHEM 4650/4654 **or** CHEM 4660/4664, students can take CHEM 4610 Biochemistry of Metabolism to satisfy the pre-med Biochemistry requirement*

BACHELOR OF SCIENCE IN BIOINFORMATICS (BSBI)
SUGGESTED COURSE SEQUENCE

FRESHMAN YEAR				Summer Semester		SOPHOMORE YEAR			
Fall Semester		**Spring Semester**				**Fall Semester**		**Spring Semester**	
ENGL 1150	3	ENGL 1160	3			BIOL 1450	5	CIST 3000	3
BIOI 1000	3	MATH/CS 2030	3			BIOI 3000	3	BIOI 3500	3
CIST 1400	3	CSCI 1620	3			CSCI 3320	3	BIOL 2140	4
MATH 1950	5	BIOI 2000	3			CHEM 1180	3	CHEM 1190	3
		CMST 1110	3			CHEM 1184	1	CHEM 1194	1
TOTAL	**14**	**TOTAL**	**15**			**TOTAL**	**15**	**TOTAL**	**14**

JUNIOR YEAR				Summer Semester		SENIOR YEAR			
Fall Semester		**Spring Semester**				**Fall Semester**		**Spring Semester**	
BIOI 4860	3	CIST 2500	3			BIOI/ISQA 4150	3	BIOI 4890	3
BIOL 3020	3	BIOI 4870	3			BIOI 4970	1	BIOI 4980	2
CHEM 2210	4	CHEM 3650	3			Humanities/US Div.	3	BIOL 4130/ 4140	4
CHEM 2214	1	CHEM 3654	1			Soc Science	3	Soc Sci/GL Div	3
CSCI 4850	3	Humanities	3			ISQA 4890 CSCI 4830	3 3	Soc Science	3
Elective	1	CIST 3110	3						
TOTAL	**15**	**TOTAL**	**16**			**TOTAL**	**16**	**TOTAL**	**15**

SECOND BS DEGREE IN BIOINFORMATICS
General Requirements

Students who have satisfied the requirements for a first baccalaureate degree other than Bioinformatics at the University of Nebraska at Omaha must complete a minimum of 30 additional semester hours at the University for a second baccalaureate degree.

Bioinformatics Requirements (92 hours)

To obtain Bioinformatics as a second bachelor's degree, students must complete academic requirements for the degree which include:

- 24 hours of College of IS&T Core courses
- 24 hours of Bioinformatics courses
- 11 hours of Mathematics courses
- 16 hours of Biology courses
- 17 hours of Chemistry courses

Students must consult an academic advisor prior to starting this program. Some transfer coursework may apply; however, 30 of the last 36 hours for the degree must be University of Nebraska at Omaha courses. Students are responsible for all prerequisite courses.

NAME: STUDENT ID#: LAST UPDATED:

UNIVERSITY OF NEBRASKA AT OMAHA
COLLEGE OF INFORMATION SCIENCE & TECHNOLOGY

General Education Requirements

ENGLISH COMPOSITION (9 CREDIT HRS)

Course #	Course Name	Grade	Cr	Notes
ENGL 1150	Composition I			
ENGL 1160	Composition II			
CIST 3000	Adv Comp for IS&T			
Remaining:	9	Compl:	0	

MATHEMATICS (3 CREDIT HRS)

Course #	Course Name	Grade	Cr	Notes
MATH 1310 or test out				
Remaining:	3	Compl:	0	

PUBLIC SPEAKING (3 CREDIT HRS)

Course #	Course Name	Grade	Cr	Notes
CMST 1110	Public Speaking			
CMST 2120	-OR- Debate			
Remaining:	3	Compl:	0	

HUMANITIES (9 CREDIT HRS)

Course #	Course Name	Grade	Cr	Notes
CIST 3110	IT Ethics	*	*	
Remaining:	6	Compl:	0	

SOCIAL SCIENCE (9 CREDIT HRS)

Course #	Course Name	Grade	Cr	Notes
Remaining:	9	Compl:	0	

NATURAL/PHYSICAL SCIENCE (7 CREDIT HRS)

Course #	Course Name	Grade	Cr	Notes
BIOI 1000	Intro to BIOI	*	*	
CHEM 1180	General Chem	*	*	
CHEM 1184	Lab	*	*	
Include 2 different areas; 1 with a lab				
Remaining:	0	Compl:	0	

GLOBAL DIVERSITY COURSE (3 CREDIT HRS)

Course #	Course Name	Grade	Cr	Notes

US DIVERSITY COURSE (3 CREDIT HRS)

Course #	Course Name	Grade	Cr	Notes
Remaining:	6	Compl:	0	

Bioinformatics Curriculum Requirements

IS&T CORE COURSES (24 CREDIT HRS)

Course #	Course Name	Grade	Cr	Notes
CIST 1400	Intro to Comp Prgrm			
CSCI 1620	Intro to Comp Science II			
CIST 2500	Intro to Applied Stats for IST			
CIST 3110	IT Ethics			
CSCI 3320	Data Structures			
CSCI 4830	Intro to SW Engineering			
CSCI 4850	Database Mgmt Systems			
CSCI 4150**	Graph Theory & Appl -OR-			
ISQA 4890*	Data Warehouse & Mining			
Remaining:	24	Compl:	0	

MATHEMATICS COURSES (11 CREDIT HRS)

Course #	Course Name	Grade	Cr	Notes
MATH 1950	Calculus I			
CSCI/MATH 2030	Discrete Math			
BIOI/ISQA 4150	Adv Statistical Methods			
Remaining:	11	Compl:	0	

BIOLOGY COURSES (16 CREDIT HRS)

Course #	Course Name	Grade	Cr	Notes
BIOL 1450	Biology I			
BIOL 2140	Genetics			
BIOL 3020	Molecular Biology			
BIOL 4130	Molecular Genetics - OR -			
BIOL 4140**	Cellular Biology			
Remaining:	16	Compl:	0	

CHEMISTRY COURSES (17 CREDIT HRS)

Course #	Course Name	Grade	Cr	Notes
CHEM 1180	General Chemistry I			
CHEM 1184	General Chemistry I Lab			
CHEM 1190	General Chemistry II			
CHEM 1194	General Chemistry II Lab			
CHEM 2210	Found of Organic Chem			
CHEM 2214	Organic Chemistry Lab			
CHEM 3650	Fund of Biochemistry			
CHEM 3654	Biochemistry Lab			
Remaining:	17	Compl:	0	

TOTAL CREDITS (Including in-progress classes): 0

Last update: March 2015 **GPA:**

Matriculation form corresponds to UNO Catalog 2015-2016.

BIOINFORMATICS REQUIREMENTS (24 CREDIT HRS)

Course #	Course Name	Grade	Cr	Notes
BIOI 1000	Intro to Bioinformatics			
BIOI 2000**	Bioinformatics Foundations			
BIOI 3000*	Applied Bioinformatics			
BIOI 3500**	Adv Bioinformatics Pgmg			
BIOI 4860*	BIOI Algorithms			
BIOI 4870**	DB Search & Pattern Disc			
BIOI 4890	Comp Genetic Seq Analysis			
BIOI 4970	Sr Project in BIOI I			
BIOI 4980	Sr Project in BIOI II			
Remaining:	24	Compl:	0	

ELECTIVE COURSES (1 CREDIT HR)

Course #	Course Name	Grade	Cr	Notes
CSCI 1200*	Comp Science Principles			* If not
CIST 1300*	-OR- Intro to Web Devel			waived
Remaining:	1	Compl:	0	

* Fall Only ** Spring Only

BSBI ACADEMIC RULES

1. A minimum of 120 credit hours and a 2.5 GPA are required to graduate from the College of IS&T with a Bachelor's Degree.
2. All courses must be "C-" or higher.
3. Students must see an IS&T academic advisor regarding the specific requirements for their major.
4. Students may follow the UNO catalog requirements in effect at the time of their first enrollment, provided continuous enrollment is maintained (fall, spring, fall, spring....).
5. Students are accountable for prerequisites of all courses listed.
6. Thirty of the last 36 hours must be University of Nebraska at Omaha courses.
7. Up to 4 semester hours of different physical education activity courses may count toward the degree.
8. A repeated course may count only once for graduation. (Exceptions are internships, independent studies, physical education activity courses, and special topic courses, provided each course is a new topic.)

NOTES

NAME: STUDENT ID#: LAST UPDATED:

Pre-Med Requirements

UNIVERSITY OF NEBRASKA AT OMAHA
COLLEGE OF INFORMATION SCIENCE & TECHNOLOGY

This matriculation form corresponds with UNO Catalog 2015-2016.
Last updated: March 2015

PRE_MED REQUIREMENTS					
Course #	Course Name	Cr	Grade	Cr	Notes
CHEM 2250	Organic Chemistry I	3			
Substitute for CHEM 2210/2214					
CHEM 2260/	Organic Chemistry II/Lab	3			
CHEM 2274	Organic Chemistry II Lab	2			
Substitute for CHEM 2210/2214					
CHEM 4650/	Biochemistry I	3			
CHEM 4654	Biochemistry I Lab	1			
Substitute for CHEM 3650/3654					
CHEM 4660/	Biochemistry II	3			
CHEM 4664	Biochemistry II Lab	1			
Offered Spring Only					
PHYS 1110/	General Physics I	4			
PHYS 1154	General Physics I Lab	1			
	-OR-				
PHYS 2110/	Calculus Based Physics I	4			
PHYS 2154	Calc-Based Physics I Lab	1			
PHYS 1120/	General Physics II	4			
PHYS 1164	General Physics II Lab	1			
	-OR-				
PHYS 2120/	Calculus Based Physics II	4			
PHYS 2164	Calc-Based Physics II Lab	1			
Remaining:	26		Compl:	0	

For Pre-Med requirements, students can take CHEM 4610 Biochemistry of Metabolism in place of CHEM 4650/4654 or CHEM 4660/4664