

# BIOMEDICAL DATA SCIENCE (CERTIFICATE)

## Overview

Biomedical Data Science has become an integral part of biomedical research. As a result, biomedical scientists with data science knowledge are advantaged on multiple fronts. This one-year BioMedical Data Science (BMDS) Certificate Program is designed to provide students with the basic data science skillset in the context of biomedical research data. At the completion of this certificate the students will be able to:

1. Communicate constructively with Data scientists
2. Can analyze their own dataset
3. Can explore the large datasets available in the public domain, therefore missing an important opportunity to mine big data resources.

Therefore, training researcher the basics of data science is crucial to advance scientific discovery.

## Admissions Requirements

To apply for admission applicants must submit the following:

- Online Graduate School application
  - Personal Statement: A one-page personal statement describing the applicant's career goals and purpose for studying palliative care.
  - Resume: The applicant's current resume or curriculum vitae, including professional work/practice since graduating with a bachelor's degree (or equivalent).
- Application Fee: A nonrefundable application fee of \$50.00 (U.S. dollars). Checks or money orders should be made out to the University of Colorado.
- Transcripts: Unofficial transcripts from all post-secondary colleges and/or universities should be sent directly to:

University of Colorado Denver Graduate Admissions  
Campus Box 163  
PO Box 173364  
Denver, CO 80217-3364

OR Electronic Transcripts should be sent  
to: [graduateadmissions@ucdenver.edu](mailto:graduateadmissions@ucdenver.edu)

International students must meet ALL of the requirements above and those required by International Admissions.

## Certificate Requirements

Course	Title	Hours
<b>Year 1</b>		
<b>Fall</b>		
BSBT 6110	Introduction to Biocomputing	3
BSBT 6111	Introduction to Biomedical Data Practices	2
	Hours	5
<b>Spring</b>		
Select at least 7 credit hours from the following:		
BSBT 6310	Practical Clinical Research Informatics	3

MOLB 7900	Practical Computational Biology for Biologists: Python	2
MOLB 7910	Practical Computational Biology for Biologists: R	2
BIOL 6764	Biological Data Analysis	4
BIOS 6642	Introduction to Python Programming	3
	Hours	14
<b>Summer</b>		
BSBT 6939	Internship - Technology and Innovation	3-6
	Hours	3-6
	Total Hours	22-25

## Learning Objectives

- Learn the basics of computer programming.
- Locate, access, analyze and visualize biomedical data set using appropriate tools and programs.
- Understand and apply various machine learning techniques and data analytics for solving real world biological problems.
- Communicate effectively with biomedical researchers and computational data analysts in a team science environment.

## Courses

BIOL 6764 - Biological Data Analysis (4 Credits)

Addresses quantitative aspects of research design, data collection and analysis in the biological sciences. Emphasizes relationships among probability theory, estimation, testing, inference, and interpretation. Includes intensive computer lab using the statistical programming software R to demonstrate both traditional analytical and contemporary simulation based (permutation, bootstrap, and Bayesian) approaches for inference in biology. Restriction: Restricted to degree-granting graduate programs. Max hours: 4 Credits.

Grading Basis: Letter Grade

Restriction: Restricted to degree-granting graduate programs

BIOS 6642 - Introduction to Python Programming (3 Credits)

This first course in programming using Python covers basic concepts such as variables, data types, iteration, flow of control, input/output, and functions and advanced concepts such as object oriented programming. Statistics related examples, homework and projects may be used.

Grading Basis: Letter Grade

A-PUBH1 Graduate students and public health certificate students only.

Typically Offered: Spring.

BSBT 6110 - Introduction to Biocomputing (3 Credits)

This course provides students with hands on experience in basic computation, database, and programming skills set as a pre-requisite for a higher level data analysis course. The students will use example in the context of biomedical and genomic data set. Prerequisite: Undergraduate degree in science, technology, business, engineering or math.

Grading Basis: Letter Grade

A-GRAD Restricted to graduate students only.

Typically Offered: Fall.

BSBT 6111 - Introduction to Biomedical Data Practices (2 Credits)

This course provides students with advance knowledge and topics in every aspects of data science.

Grading Basis: Letter Grade

A-GRAD Restricted to graduate students only.

Typically Offered: Fall, Spring, Summer.

**BSBT 6310 - Practical Clinical Research Informatics (3 Credits)**

This course provides students with hands on experience in clinical research informatics involving secondary use of electronic health record (EHR) data, clinical informatics databases, and basic clinical data science as preparation for more advanced informatics or data science coursework. Requisite:008754 A-GRAD

Grading Basis: Letter Grade

Typically Offered: Spring.

**BSBT 6939 - Internship - Technology and Innovation (3-6 Credits)**

The internship provides hands-on learning opportunities for graduate students in institutions related to technology/biotechnology, computer science, engineering, innovation and entrepreneurship. Requisite: (Formerly IDPT 6939) Enrollment with permission only, contact [inge.wefes@ucdenver.edu](mailto:inge.wefes@ucdenver.edu). Instructor Consent required.

Grading Basis: Letter Grade with IP

Repeatable. Max Credits: 6.

A-GRAD Restricted to graduate students only.

Additional Information: Report as Full Time.

Typically Offered: Fall, Spring, Summer.

**MOLB 7900 - Practical Computational Biology for Biologists: Python (2 Credits)**

Comp. biology class aimed at biology PhD students. Topics covered include: basic practices for coding in python; analysis of standard high-throughput genomic data to study the regulation of gene expression; intro to modeling gene expression; data visualization; communicating computational analysis/results. 3 wks. lecture, lab & recitation

Grading Basis: Letter Grade

Typically Offered: Spring.

**MOLB 7910 - Practical Computational Biology for Biologists: R (2 Credits)**

Comp. biology class aimed at biology PhD students. Topics covered include: basic practices for coding in R; analysis of standard high-throughput genomic data to study the regulation of gene expression; intro to modeling gene expression; data visualization; communicating computational analysis/results. 3 wks. lecture, lab & recitation

Grading Basis: Letter Grade

Typically Offered: Spring.

## Policies

Please refer to the Graduate School Policies page (<http://catalog.ucdenver.edu/cu-anschutz/schools-colleges-programs/graduate-school/#policiestext>).

## Contact Us

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