

# Syllabus: CB8910 Applied Cancer Bioinformatics

Fall, 2025

## Course information

- Course title: Applied Cancer Bioinformatics
- Subject area code: CB
- Course number: 8910
- Course section: 001
- Meeting day/time: Thursday 1:30 PM – 2:20 PM (Tentative)
- Semester/year: Fall, 2026
- Course format: In-person
- Method(s) of instruction: Lecture-based instruction, discussions, case studies, and practical applications

## Faculty contact information

- Instructor: Yang Shi, Ph.D.
- Office: Biostatistics and Bioinformatics Core, 3rd floor, MidMed Lofts
- Telephone: 313-576-8703
- Email: yangsh@karmanos.org
- Office hours: The course instructor welcomes conversations with students outside of class (through Microsoft Teams, Zoom, or in person). Students may correspond with instructors by email or set up appointments.

## Course materials

### Required textbook(s)

- None. The required course materials will be distributed in class.

### Optional textbook

- Korpelainen, Tuimala, Somervuo, Huss, Wong. RNA-seq Data Analysis: A Practical Approach. 1st edition (2014). Chapman and Hall/CRC.
- Mifsud, Zarnack, Bardet. Practical Guide to ChIP-seq Data Analysis. 1st edition (2018). CRC Press.
- Heumos, Schaar, Lance. Single-cell best practices at <https://www.sc-best-practices.org>

## Course details

### Description

The objective of this course is to equip students with the knowledge and skills of the basic concepts and computational methods in the exciting interdisciplinary field of bioinformatics and their applications in biomedical and cancer research. The course will

focus on the multi-omics data generated from the next generation sequencing technology. Students will receive an introduction to the concepts, analysis and interpretation of multi-omics data and their applications in cancer research. This course is designed to instruct students having a general background in molecular biology. No coding or programming experience is required.

#### Major and minor topics to be covered

- Introduction to next generation sequencing
- RNA-Seq and gene expression data
- RNA-Seq and non-coding RNA analysis
- Single-cell sequencing and spatial transcriptomics
- DNA-Seq and genome-wide association studies
- Epigenomics: DNA methylation, ChIP-Seq and ATAT-Seq
- MS-based omics: proteomics, lipidomics and metabolomics
- Microbiomics
- Pathway and ontology analysis

#### Learning objectives/outcomes

By the end of the course, students will be able to:

- Have a practical understanding of the underlying technologies used in cancer omics research.
- Have the knowledge of publicly available omics data repositories.
- Use web accessible bioinformatics methods for data mining.
- Apply these techniques in a research project.

#### Grading policies and due dates for tests, assignments, and attendance

The components of student evaluation are weighted as follows:

1. Class Participation (40%): Regular assignments/quizzes will be given.
2. Project Presentation (30%)
3. Final Exam (Take-home 30%)

Grading is on an A-F basis.

Final Grade	Final Percent
A	90 - 100%
B	80 - 89%
C	75 - 79%
F	< 75%

Attendance at lectures is required, although exceptions will be made for reasons such as illness or family emergency. Excessive absences will result in a reduced classroom

participation score at the instructor's discretion and will negatively impact the overall course grade.

*Inclusion of [tentative] due dates for assignments, exams, and papers*

**IMPORTANT NOTE:** The schedule and topics may change as the course unfolds. Changes will be posted on Canvas

Week	Topic
1	Introduction to bioinformatics and next generation sequencing
2	RNA-Seq: gene differential expression analysis
3	Pathway and gene ontology analysis
4	RNA-Seq: non-coding RNA analysis
5	DNA-Seq and genome-wide association studies
6	Epigenomics: DNA methylation
7	Epigenomics: ChIP-Seq and ATAT-Seq
8	MS-based omics: proteomics and lipidomics
9	MS-based omics: metabolomics
10	Microbiomics
11	Single-cell sequencing
12	Spatial transcriptomics
13	Cancer related public omics databases
14	Project presentation
15	<b>Thanksgiving</b>
16	Project presentation

## Course Policies

1. Students are allowed to have group discussions on homework matters, but they must work through and write up the assignments entirely on their own without looking at the assignments of their peers. If asked, they should be able to explain fully and reproduce the answers.
2. Students are expected to complete all assignments by the due dates communicated in class. Grade penalties will be imposed on homework accepted late. Late acceptance is at the discretion of the instructor.
3. Students should check their email and the course webpage regularly for homework assignments and other course related communication.
4. Participants should read from the lecture notes given in the previous lecture and from the suggested/required textbooks prior to each.
5. Learners are expected to participate by attending every class possible and by taking responsibility for course material when attendance is impossible. Participation also means actively engaged in class discussions, assignments, and activities.
6. Participants are expected to act with integrity.

## **Late Instructor Instructions**

Students must wait 20 minutes if the instructor is late.

## **Syllabus Revision**

The course director reserves the right to modify any portion of this syllabus. A best effort is made to provide an opportunity for students to comment on a proposed change before the change takes place.

## **Inclement Weather**

This course adheres to the University's policy and decisions regarding cancellation or delayed class schedules. Adjustments are made to the class schedule as necessary to take into account any delays or cancellations of this class. Local television and radio stations broadcast University delays or closings.

## **University policies**

### **Class recordings**

Students need prior written permission from the instructor before recording any portion of this class. If permission is granted, the audio and/or video recording is to be used only for the student's personal instructional use. Such recordings are not intended for a wider public audience, such as postings to the internet or sharing with others. Students registered with Student Disabilities Services (SDS) who wish to record class materials must present their specific accommodation to the instructor, who will subsequently comply with the request unless there is some specific reason why they cannot, such as discussion of confidential or protected information. Violations of this syllabus policy may result in charges under the student code of conduct.

### **Religious holidays (from the online Academic Calendar)**

Because of the extraordinary variety of religious affiliations of the University student body and staff, the Academic Calendar makes no provisions for religious holidays. However, it is University policy to respect the faith and religious obligations of the individual. Students with classes or examinations that conflict with their religious observances are expected to notify their instructors well in advance so that mutually agreeable alternatives may be worked out.

### **Land acknowledgement**

Wayne State University rests on Waawiyaataanong (Waa-we-yaa-tih-nong), also referred to as Detroit, the ancestral and contemporary homeland of the Three Fires Confederacy. These sovereign lands were granted by the Ojibwe (Oh-jib-way), Odawa (Oh-daa-waa), Potawatomi (Pow-tuh-waa-tuhmee), and Wyandot nations, in 1807, through the Treaty of Detroit. Wayne State University affirms Indigenous sovereignty and honors all tribes with a

connection to Detroit. With our Native neighbors, WSU can advance educational equity and promote a better future for the earth and all people.

### Student Disability Services

If you have a documented disability that requires accommodations, you will need to register with Student Disability Services (SDS) for coordination of your academic accommodations. Please visit <https://studentdisability.wayne.edu/> to register your condition. Once you have accommodations in place, please inform your instructor. Student Disability Services' mission is to assist the University in creating an accessible community where students with disabilities have an equal opportunity to fully participate in their educational experience at WSU. SDS supports students with a variety of conditions, such as mental health disorders, learning disabilities, chronic health conditions, etc.

### Counseling and Psychological Services (CAPS)

It is quite common for college students to experience mental health challenges, such as stress, anxiety, and depression, that interfere with academic performance and negatively impact daily life. Help is available for any currently enrolled WSU student who is struggling with a mental health difficulty. Go to <https://caps.wayne.edu> for information on the services offered and how to access them. Other options, for students and non-students, include the Mental Health and Wellness Clinic at the College of Education (<https://education.wayne.edu/mental-health-and-wellness-clinic>). Services at all these clinics are free and confidential. Remember that getting help, before stress reaches a crisis point, is a smart and courageous thing to do – for yourself, and for those you care about. CAPS provides afterhours/weekend crisis support: students living on campus can call (313) 577-2277, and all others, call (313) 577-9982. In a life-threatening emergency, call the WSU Police at 313-577-2222.

### Sexual Misconduct and Title IX

Most faculty and staff are considered “**Responsible Employees**” and are **required to report** information they receive about incidents of sexual misconduct (including sexual assault, stalking, dating/domestic violence, and sexual harassment) to the Title IX Coordinator when it involves a student.

**Confidential support** is available 24/7 through the Rape, Abuse & Incest National Network (RAINN) (<https://www.rainn.org/>). Call **1-800-656-4673** or Chat (<https://hotline.rainn.org/online>) with a professional support specialist.

### Options for Self-Reporting Sexual Misconduct

Any student impacted by sexual misconduct or sexual harassment has the right to report to the University (i.e., Responsible Employee or Title IX Coordinator), to law enforcement (i.e., WSUPD or other jurisdiction), to both, or to neither. Every Warrior is encouraged to make the reporting decision that is right for them.

### *Reporting to the University*

The Title IX Office (<https://titleix.wayne.edu/>) is available to consult with individuals impacted by sexual violence or discrimination regarding resource referrals, supportive and protective measures, and reporting and resolution options. Where WSU has jurisdiction, the affected party may request an administrative investigation by the University.

**Phone:** 313-577-9999

**Email:** [TitleIX@wayne.edu](mailto:TitleIX@wayne.edu)

### *Reporting to Law Enforcement*

The WSU Police Department (<https://police.wayne.edu/>) is available 24/7 to assist individuals reporting criminal activity or concerns on or near campus. Report off-campus incidents to the appropriate police jurisdiction. In the event of an emergency or imminent threat, reporting to the police is highly encouraged.

**Phone:** 313-577-2222

**Every Warrior has the right to live, learn, and work at WSU – free from Harassment or Discrimination.** If you or someone you know has been impacted by sexual violence or discrimination, please visit [TitleIX.wayne.edu](https://titleix.wayne.edu) to learn more about resources and support on campus and in the community.

### *Food Pantry and Basic Needs*

Wayne State has a food pantry, a free resource available for all students. See the hours on the website <https://thew.wayne.edu/pantry>.

Learning is always more challenging when you are struggling to meet basic needs. Wayne State recognizes that you may face a number of challenges during your time here, and we are here to support you. Any student who faces challenges securing food, housing, or medical care is encouraged to contact relevant university offices noted on the Financial Aid website (<https://wayne.edu/financial-aid/>) for support. You are also encouraged to contact Care, Support, and Intervention services in the Dean of Students Office (DOSO) for assistance with connecting to resources for basic needs. Students can call DOSO at 313-577-1010 or submit a care referral form (<https://doso.wayne.edu/conduct/student-support-intervention>).

### *Academic Dishonesty – Plagiarism and Cheating*

Academic misconduct (<https://doso.wayne.edu/conduct/academic-misconduct>) is any activity that tends to compromise the academic integrity of the institution or undermine the education process. Examples of academic misconduct include:

- **Plagiarism:** To take and use another's words or ideas as your own without appropriate referencing or citation.
- **Cheating:** Intentionally using or attempting to use or intentionally providing unauthorized materials, information or assistance in any academic exercise. This includes copying from

another student's test paper, allowing another student to copy from your test, using unauthorized material during an exam and submitting a term paper for a current class that has been submitted in a past class without appropriate permission.

- **Fabrication:** Intentional or unauthorized falsification or invention of any information or citation, such as knowingly attributing citations to the wrong source or listing a fake reference in the paper or bibliography.
- **Other:** Selling, buying or stealing all or part of a test or term paper, unauthorized use of resources, enlisting in the assistance of a substitute when taking exams, destroying another's work, threatening or exploiting students or instructors, or any other violation of course rules as contained in the course syllabus or other written information.

Such activity may result in failure of a specific assignment, an entire course, or, if flagrant, dismissal from Wayne State University.

### Course drops and withdrawals

For courses running the full term, students can drop this class and receive 100% tuition and course fee cancellation for the first two weeks. After the end of the second week there is no tuition or fee cancellation. Students who wish to withdraw from the class can withdraw on Academics (<https://academics.wayne.edu/>). You will receive a mark of W at the time of withdrawal. No withdrawals can be initiated after the deadline. Students enrolled beyond the deadline will receive a grade. Because withdrawing from courses may have negative academic and financial consequences, students considering course withdrawal should make sure they fully understand all the consequences before taking this step, including speaking with your instructor or advisor. More information on course drops and withdrawals can be found on the Registrar's website (<https://wayne.edu/registrar>). For classes that are shorter than the full term, deadlines for dropping and withdrawal can be found on the section's detail in the Schedule of Classes (<https://registration.wayne.edu/>).

## Student Services

### The Academic Success Center

The Academic Success Center (1600 Undergraduate Library) assists students with content in select courses and in strengthening study skills. Visit the <https://success.wayne.edu/> for schedules and information on study skills workshops, tutoring and supplemental instruction (primarily in 1000 and 2000 level courses).

### The Writing Center & Writer's Studio

The Writing Center provides a variety of tutoring options free of charge for graduate and undergraduate students at WSU. Tutoring sessions are available in the following modes:

- In-person during our Writer's Studio open hours (to learn more, please visit our website)
- Online, synchronous sessions (up to 50-minutes)

- Online, asynchronous sessions (please review our guidelines for asynchronous tutoring)

Tutoring services are provided by trained undergraduate and graduate student tutors. Our tutors assist with writing from all disciplines and on a range of topics including but not limited to: brainstorming, drafting, revising, organization, and editing. All tutoring sessions are collaborative, so please come prepared to work with your tutor (whether online or in-person). We look forward to working with you!

To schedule a one-on-one appointment, please visit our website: <https://writing.wayne.edu>  
For in-person services or just a dedicated space to write and study, you're welcome to drop into our Writer's Studio any time during our regular business hours – no appointment necessary! You can find our current hours at our website: <https://writing.wayne.edu>

For more information about the Writing Center and Writer's Studio, please contact the Director, Amy Latawiec (email: [amy.latawiec@wayne.edu](mailto:amy.latawiec@wayne.edu))

#### Library research assistance

Working on a research assignment, paper or project? Trying to figure out how to collect, organize and cite your sources? Request an appointment with a Wayne State librarian ([https://library.wayne.edu/forms/consultation\\_request.php](https://library.wayne.edu/forms/consultation_request.php)), who can provide on- campus or online personalized help.