Course Syllabus

ACN/HCS 7372.001 · Fall 2026 · UT Dallas

Course Information

Course	ACN/HCS 7372.001
Course Title	Seminar in Neuroscience - Neurogenomics & Bioinformatics
Professor	Diana Tavares Ferreira, PhD
Term	Fall 2026
Days and Times	Monday & Wednesday, 4:00 – 5:15 PM
Classroom	AD 3.218

Professor's Contact Information

Office Location	BSB 14.609
Email Address	diana.tavaresferreira@utdallas.edu
Office Hours	Thursdays, 2:00 – 3:00 PM. By appointment – send request via email.
Other Information	Please use your UTD email for all correspondence.

General Course Information

Pre-requisites	No pre-requisites.
Course Description	This course provides theoretical and practical training in applying bioinformatics tools to analyze bulk, single-cell and spatial RNA-sequencing data, covering key topics such as RNA-sequencing principles, data processing, visualization, differential gene expression, pathway analysis, and real-world applications in neuroscience.
Learning Outcomes	By the end of this course, students will be able to: 1. Understand the principles behind RNA-sequencing and the different types including bulk, single-cell and spatial transcriptomics. 2. Evaluate RNA-seq data quality by interpreting QC reports. 3. Understand the data structure and analysis pipelines. 4. Describe and analyze how RNA-seq tools can lead to scientific advancements in neuroscience and their limitations. 5. Develop skills in applying bioinformatics tools to analyze RNA-seq data.

Career readiness	Career readiness competencies are linked to the learning objectives in this course. By enrolling in ACN/HCS 7372.002, you are not just taking a course, you are acquiring skills that will prepare you for your career. Skills gained prepare students for careers in bioinformatics, computational biology, genomics, academic or industry research, and clinical or pharmaceutical sciences.
Required Texts & Materials	No textbook required. Please check eLearning for materials and slides uploaded by the Professor.
Suggested Texts, Readings & Materials	Additional materials may be uploaded by the Professor – please check eLearning.

Lecture Schedule

Note: The timelines below are subject to change at the discretion of the Professor. Any changes will be communicated via eLearning.

Date	Topic	Activities
August 24	Introduction and course overview; basic concepts and history of RNA-seq	
August 26	RNA-sequencing principles and quality control	
August 31	RNA-sequencing pipelines and quality control: FASTQ files; basic R commands and functions	Hands-on: FastQC reports; R/RStudio setup and practice
September 2	Bulk RNA-seq data analysis workflows and differential expression using DESeq2. Advanced concepts	Package/library installation
September 7	Labor Day – *No Class*	
September 9	Bulk RNA-seq data processing and analysis with DESeq2	Hands-on practice with demo data
September 14	Bulk RNA-seq data analysis: visualization; pathway and gene set enrichment analysis	Hands-on practice with demo data
September 16	Review and journal club	
September 21	**EXAM 1**	
September 23	Single-cell RNA-seq overview	
September 28	Single-cell RNA-seq data structure and Seurat workflow	
September 30	Single-cell RNA-seq data analysis, part 1	Hands-on practice with demo data
October 5	Single-cell RNA-seq data analysis, part 2	Hands-on practice with demo data
October 7	Single-cell RNA-seq data analysis, part 3	Hands-on practice with demo data

Date	Topic	Activities
October 12	Single-cell RNA-seq data analysis, part 4	Hands-on practice with demo data
October 14	Review and journal club	
October 19	**EXAM 2**	
October 21	Spatial transcriptomics overview, data structure, and workflow	
October 26	Spatial transcriptomics data analysis	Hands-on practice with demo data
October 28	Review and journal club	
November 2	RNA-seq experimental design considerations, limitations, and other omics technologies	
November 4	Overview of publicly available databases and final project discussion	Dataset exploration for final project
November 9	*No class*	
November 11	**EXAM 3**	
November 16	In-class assignment #1: Choose appropriate datasets, define biological question	Work on final project
November 18	In-class assignment #2: Experimental design and analysis plan. Preliminary QC and data exploration	Work on final project
November 23	Thanksgiving Break – *No Class*	
November 25	Thanksgiving Break – *No Class*	
November 30	In-class assignment #3: Analysis and biological interpretation	Final project due
December 2	Final project presentation	Peer review
December 7	Final project presentation	Peer review
December 9	**EXAM 4 – Cumulative (Optional)**	

■ *Amber rows indicate exam dates.*

Course Policies and Information

Class Materials

The instructor may provide class materials available to all registered students to supplement the classroom experience. These materials may be downloaded during the course for registered students' use only. Materials may not be reproduced or shared with those not in class or uploaded to other online environments except to implement an approved AccessAbility Resource Center accommodation. Failure to comply is a violation of the Student Code of Conduct.

Class Attendance

Regular and punctual class attendance is expected. Students who fail to attend class regularly are inviting scholastic difficulty.

Please be on time. Lectures, discussions, and hands-on practice begin promptly. Lateness is disrespectful to your Professor and fellow students. Excused absences for sessions with graded activities will be given only if:

- You are seriously ill and have verifiable documentation from a physician, or
- You were detained by law at the exam time, or
- You made prior arrangements to attend a verified religious or family event.

In all cases except detention by law, you must notify the Professor in advance by email. Otherwise, you will receive a zero (0) for that evaluation.

Class Participation

Regular class participation is expected and a portion of the grade is directly tied to participation. This includes engaging in group or other activities during class that solicit feedback on assignments, readings, or lecture materials. Successful participation means consistently adhering to University requirements as presented in this syllabus. Failure to comply is a violation of the Student Code of Conduct.

Exams

There will be 3 exams during the course excluding an optional cumulative final exam. These may include true or false, multiple choice, choose all that apply, fill in the blank and short answer type questions. Exams 1 through 3 will cover the material preceding the exam, while the Final comprehensive exam will cover any material presented throughout the course. The comprehensive final can be taken to make up any missed exam or graded activity or replace lowest scores of one of the three exams. Excused absences for exams require both appropriate documentation and advance notice (by email).

Exam grades will be posted in eLearning. Following exams, you have one week to review your exam for grading errors, after which no changes will be made to any grade.

Peer Review

Students will review final project presentations and are graded on the quality of the review. Rubrics will be provided. Final project presentations will be graded based on clarity of the research question, quality of data analysis and interpretation, organization, and the average score received from peer reviewers.

Final Project

The final project challenges students to define a biological question, identify relevant public datasets, and design, analyze, and interpret a multi-modal RNA-seq study. Students will apply analytical tools, exercise experimental reasoning, and demonstrate fluency in transcriptomics. Assessment criteria include:

- Clarity of the research question and context
- Strength of dataset selection and experimental design
- Integration of multiple RNA-seq modalities
- Quality of data analysis and interpretation
- Critical reflection
- Presentation and organization
- Average peer review grade

Class Recordings

Students must follow appropriate University policies and maintain security of passwords for recorded lectures. Unless the AccessAbility Resource Center has approved recording, students are prohibited from recording any part of this course. Recordings may not be published, reproduced, or shared with those outside the class except to implement an approved accommodation. Failure to comply is a violation of the Student Code of Conduct. If the instructor or a UTD office plans other uses for recordings, consent of identifiable students is required prior to such use unless an exception is allowed by law.

Communication

This course utilizes online tools for interaction and communication. External tools such as email and web conferencing may also be used. For details, visit the Student eLearning Tutorials webpage. Student emails and discussion board messages will be answered within 3 business days under normal circumstances.

Grading Criteria

Grade Scale

100–97%	96.9–94%	93.9–90%	89.9–87%	86.9–84%	83.9–80%	79.9–77%	76.9–74%	73.9–70%	69.9–67%	66.9–64%	63.9–60%	<60%
A+	A	A−	B+	B	B−	C+	C	C−	D+	D	D−	F

Grade Breakdown

Component	Weight
In class assignments	**10%**
Exams	**30%**
Journal Club	**5%**
Peer review	**5%**
Final Project (total)	**40%**
– *Peer Feedback*	10%
– *Code*	10%
– *Oral Presentation*	20%

University Policies and Resources

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

"As a Comet, I pledge honesty, integrity, and service in all that I do."

Accommodations for Students with Disabilities

Please review the Accommodations for Disabilities section within the UT Dallas Syllabus Policies and Procedures webpage.

Academic Support Resources

Please visit the Academic Support Resources page to view the University's academic support resources for all students.

UT Dallas Syllabus Policies and Procedures

Please visit the Syllabus Policies page. Please also review the catalog sections regarding the credit/no credit or pass/fail grading option and withdrawal from class.

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