EPP 575 Introduction to RNA-Seq, Summer 2025

University of Tennessee, Knoxville

Course Section: CRN87151
Meeting Time and Place:
May 28 – 20; June 1 – 3
9:00am to 11:30am
The Agriculture & Natural Resources Building (ANRB) 124
Course Credit Hours: 1

Faculty Contact Information

Primary Instructors:
Ryan Kuster (rkuster@utk.edu) Office ANRB 353

Co-Instructors:
Holly Brabazon, EPP PhD Student
Allyson Dekovich, EPP PhD Student
Trinity Hamm, EPP PhD Student
Patrick Sisler, EPP PhD Student
Zane Smith, EPP PhD Student

Office hours are daily 12:00pm – 1:00pm (ANRB 353) or can be scheduled by email.

Course website: https://github.com/ryandkuster/EPP_575_RNA_25/wiki

Course Description/Information:

This one-credit course will cover the basics of using a command line interface on UT's Linux-based computational resources to analyze RNA-Seq data. Basic steps such as quality assessment, read mapping and differential gene expression statistical analysis will be covered. This class meets in ANRB 124.

Value Proposition:
The demand for bioinformatics skills has become a prerequisite in many modern research approaches in the biological sciences. This course will provide students with an introduction to key bioinformatic skills, including familiarity with UNIX command line, common R programming packages and use of software for processing common bioinformatics data types in relation to bulk RNA-Seq analysis.

Student Learning Outcomes/Objectives:

1. Students will be able to apply basic bioinformatic theory and tools to analyze transcriptome datasets
2. Students will be able to effectively communicate and critically assess the application of bioinformatic tools to transcriptome data
3. Students will have a basic competence of the UNIX shell and usage of bioinformatic tools from the command line

Learning Environment:
Class meets on the days listed from 9:00am to 11:30am in ANRB 124. Classes will have a combination of lectures, guided computer labs, and short group/class discussions. As we have many instructors who will be in the classroom throughout the course, please utilize them to get help if you get lost during a lab.

A classroom is a collaborative environment, and both the instructor and the students have a shared responsibility to ensure a successful learning experience. Students are encouraged to ask questions regarding the lectures, labs, and applications of skills in a research-oriented mindset.

Course Communications:
Outside of class and the website, the instructors will utilize email to communicate course information, such as changes to the syllabus, answering questions relevant to all students, etc. All students are responsible for checking their university email accounts and reading all emails regarding the class.

Students are welcome to drop in for office hours (12:00pm-1:00pm after class) or email to schedule an appointment.

For technical issues, contact the OIT HelpDesk via phone (865) 974-9900 or online at http://help.utk.edu/.

How to Be Successful in This Course:

- Follow along with the exercises during the class period. The concepts and practical exercises build on the material covered in prior lessons, so it is essential to keep up with the subject matter.
- Get help early with problems. The instructors are there to help and want you to be successful. If something is not making sense or you are unable to complete a lab exercise, seek help immediately through email and/or in-person meetings. This will prevent you from falling behind during this fast-paced class.
- Select a journal article that is of a proper scope for the writing assignment and work on it before the class ends. The scope of the article methodology should primarily be RNA-Seq. If you select an article regarding RNA-Seq of a biological system you are familiar with,

this may help with answering the questions about the hypothesis and interpretation. **If you aren't sure, you can email the article to the instructor to see if it is of proper scope.**

Texts/Resources/Materials:
The course website will be used to distribute reading materials, links to references, lecture slides, and laboratory exercises. There is not a required textbook to purchase.

Required Equipment:
Students are required to bring their own laptops (and power cord if needed) to class.

Course Resources:
The course website will be used to distribute reading materials, links to references, lecture slides, and laboratory exercises. There is not a required textbook to purchase.

Course Requirements, Assessments, and Evaluations:
Presence during lecture and lab is beneficial for students to develop an understanding of the material presented in the class. Absences due to special circumstances should be discussed with the instructor, preferably prior to the absence, via email or in person. Lectures and labs will be recorded and can be viewed remotely.

The final grade for each student will be on an A-F scale:

A	93-100 points
B+	88-92 points
B	80-87 points
C+	77-79
C	70-76
F	below 70

Points will be accrued from three assignments, with the following weight:

- Daily email of output files from lab exercises and questions (posted per day on the course website) (12 points per day, up to 60 points total for class)
- Journal article review and summary (up to 40 points)

Grading details:
Output files - At the end of each day, you will need to send a message or file via email to rkuster@utk.edu to get credit for completing the lab exercises. That exercise information will be specified through the course website on the daily agenda page.

Journal Article Writing Assignment – Each student will select a peer-reviewed journal article about RNA-Seq analysis relevant to their field of research and write a two-page summary and critical review of the experimental design and analysis methods, due the following **Tuesday, June 10th. Email to rkuster@utk.edu.**

Details of the writing assignment are listed below.

The document should cover the following topics (40 points total):

- (10 points) Overview of the study:
    - What is the experimental design?
    - What hypothesis or hypotheses is the experiment trying to address?
    - What were the technical/biological replicates, if present?
    - What software was used?
- (10 points) Critical analysis of the paper:
    - What do you think are two strengths?
    - What do you think are two weaknesses?
    - What other approaches other than RNASeq might address the hypothesis, and if none, why?
- (10 points) Pick an AI tool (ChatGPT, Claude, Perplexity, NotebookLM, etc.) and ask for a summary of your publication:
    - Which tool did you use and how did it perform?
    - What aspects of the summary do you think the tool missed?
- (10 points) Reflect on your area of research, or if you don't have one, pick an area you're interested in:
    - Could the methods used in the publication you chose be applied to your own work?
        - If yes, how?
        - If no, why not or how might the study be modified to work for you?

Course Feedback:
A final course evaluation will be provided to each student at the end of the course. Each student will receive an email toward the end of the course providing a link to the survey. **Student feedback is vital to further developing and improving the course.**

Key Campus Resources for Students:

- Center for Career Development and Academic Exploration (Career counseling and resources; Handshake job search system)
- Course Catalogs (Listing of academic programs, courses, and policies)
- Hilltopics (Campus and academic policies, procedures and standards of conduct)
- OIT HelpDesk (865) 974-9900
- Schedule of Classes/Timetable
- Student Health Center (visit the site for a list of services)
- Academic Success Center (Academic support resources)
- Undergraduate Academic Advising (Advising resources, course requirements, and major guides)
- University Libraries (Access to library resources, databases, course reserves, and services)

Course Outline/Assignments/Units of Instruction/Clinic Schedule:

The Campus Syllabus

Dear Student,

The purpose of this **Campus Syllabus** is to provide you with important information that applies to all UTK courses. Please observe the following policies and familiarize yourself with the university resources listed below. At UT, we are committed to providing you with a high-quality learning experience. I want to wish you the best for a successful and productive semester.

–Dr. John Zomchick, Provost and Senior Vice Chancellor

ACADEMIC INTEGRITY

Each student is responsible for their personal integrity in academic life and for adhering to UT's Honor Statement. The Honor Statement reads: "An essential feature of the University of Tennessee, Knoxville is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the university, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity."

YOUR ROLE IN IMPROVING THE COURSE THROUGH ASSESSMENT

At UT, it is our collective responsibility to improve the state of teaching and learning. During the semester you may be requested to assess aspects of this course, either during class or at the completion of the class, and through the TNVoice course evaluation. Please take the few moments needed to respond to these requests as they are used by instructors, department heads, deans and others to improve the quality of your UT learning experience.

STUDENTS WITH DISABILITIES – http://sds.utk.edu

The University of Tennessee, Knoxville, is committed to providing an inclusive learning environment for all students. If you anticipate or experience a barrier in this course due to a chronic health condition, a learning, hearing, neurological, mental health, vision, physical, or other kind of disability, or a temporary injury, you are encouraged to contact Student Disability Services (SDS) at 865-974-6087 or sds@utk.edu. An SDS Coordinator will meet with you to develop a plan to ensure you have equitable access to this course. If you are already registered with SDS, please contact your instructor to discuss implementing accommodations included in your course access letter.

ACCESSIBILITY POLICY AND TRAINING – http://accessibility.utk.edu

The University of Tennessee, Knoxville, provides reasonable accommodations for individual students with disabilities through its office of Student Disability Services. The university is also committed to making information and materials accessible, when possible. Resources and assistance to support these efforts can be found at http://accessibility.utk.edu/.

WELLNESS – http://wellness.utk.edu/ and http://counselingcenter.utk.edu/

The Center for Health Education and Wellness empowers all Volunteers to thrive by cultivating personal and community well-being. The Center can answer questions about general wellness, substance use, sexual health, healthy relationships, and sexual assault prevention. The Student Counseling Center is the university's primary facility for personal counseling, psychotherapy, and psychological outreach and consultation services.

The Student Health Center has a wide range of clinics and services. Their goal is to provide quality healthcare and assist you in maintaining a healthy lifestyle to support your success as a student. To schedule an appointment, call 865-974-5080. To report a health-related absence visit tiny.utk.edu/absence.

Any student who has difficulty affording hygiene products, groceries, or accessing sufficient food to eat every day is urged to contact Basic Needs for support. The Big Orange Pantry, located on the 3rd floor of the Student Union, is a free resource for all students, faculty, and staff, no matter how great or small their need is. Students who need emergency financial assistance can also request funding from the Student Emergency Fund.

Students who are experiencing non-academic difficulty or distress and need assistance should call 974-HELP or submit an online referral. The 974-HELP team specializes in aligning resources and support to students experiencing mental health distress.

EMERGENCY ALERT SYSTEM – https://prepare.utk.edu/be-ready

The University of Tennessee is committed to providing a safe environment to learn and work. When you are alerted to an emergency, please take appropriate action. Learn more about what to do in an emergency and sign up for UT Alerts. Check the emergency posters near exits and elevators for building specific information. In the event of an emergency, the course schedule and assignments may be subject to change. If changes to graded activities are required, reasonable adjustments will be made, and you will be responsible for meeting revised deadlines.