RNA Biology and Biotechnology (3 credit hours)
BIOS 4560/BIOL 8560 Syllabus, Fall 2026

Instructor: **Francesca Storici**, Professor School of Biological Sciences (storici@gatech.edu; 404 385 3339); office in Krone EBB room 5017. Prior appointment by E-mail is strongly recommended for a meeting during office hours and required for any meeting outside of office hours.

Time and location: Monday and Wednesday, 9:30AM – 10:45AM, Building: Cherry Emerson Room# 204.

Course description: This course is designed for graduate and upper-level undergraduate students and introduces the fundamental concepts and questions of RNA biology. Students will explore state-of-the-art biotechnologies that utilize RNA for medical and industrial applications. Recent discoveries have revealed that the majority of genomic DNA is transcribed into RNA, with only about 2% coding for proteins. The remaining non-coding RNA plays diverse roles in gene expression and regulation, and its malfunction is linked to various human diseases.

RNA serves as a catalyst, scaffold, and guide for sequence-specific recognition and processing of other RNA and protein molecules. The growing understanding of RNA biology has paved the way for targeting RNA molecules for therapeutic interventions and using RNA as a tool in functional studies, disease treatment, and industrial applications. Understanding RNA biology is crucial for research in basic science, biomedical fields, pharmaceuticals, agriculture, and environmental studies.

The course will cover RNA-based techniques such as RNA interference, antisense RNA, CRISPR/Cas systems, and RNA nanotechnology, which are increasingly vital in gene therapy and applied research. Through lectures, workshops, and debates, the course aims to attract students from a multidisciplinary audience, bridging the colleges of sciences and engineering.

Prerequisites: BIOL 1510/BIOL 1511, Minimum Grade of D.

Optional textbook: No textbook covers all the information in this course; however, some parts of the topics of the class are covered in the 'Molecular Biology of RNA' 2nd Edition by David Elliott and Michael Ladomery, 2016 Oxford University Press, ISBN: 978-0-19-967139-7; or 'Molecular Biology of RNA' 1st Edition by David Elliott and Michael Ladomery, 2011 Oxford University Press, ISBN: 978-0-19-928837-3; the 'Molecular Biology: Genes to Proteins, 4th edition' by Burton Tropp, 2012; ISBN: 978-1-4496-0091-4; and 'The Molecules of life – Physical and Chemical Principles' by John Kuriyan, Boyana Konforti and David Wemmer, Garland Science, Taylor and Francis Group, LLC, New York, 2013; ISBN: 978-0-8153-4188-8. These books are reserved in the library.

All the information that you will be required to know will be presented in class or assigned as research papers.

Notes: 1) Exam will be given only during class hours on the dates specified in the Syllabus.

2) There will be no early finals.

Grading: For registered attendees, the grade will be based on i) quiz tests on the material of lectures, ii) exams on the material of the lectures and presentations, iii) presentations at in-class workshops and debates, and iv) homework (homework only for BIOL 8560) on material of workshops and debates according to this proportion:

BIOS 4560-STO:
Quiz tests - 25% (average of the best N-2 out of N tests). Every missed Quiz will count as 0 points.

Exams - 50%:
Exam I – 25%
Final Examination – 25%

At least one presentation at workshops and one presentation at debates - 25%
Students will be graded individually at workshops, and as a team at debates. If an additional presentation is made at a workshop or debate, the best will be counted.

Attendance is counted as bonus points for the final exam (week 1 does not count): zero or one absence = 5 points, 2 absences = 3 points).

BIOL 8560:
Quiz tests - 20% (average of the best N-1 out of N tests). Every missed Quiz will count as 0 points.

Exams – 40%:
Exam I – 20%
Final Examination – 20%

At least one presentation at workshops and one presentation at debates - 25%
Students will be graded individually at workshops, and as a team at debates. If an additional presentation is made at a workshop or debate, the best two of the three will be counted.

Homework - 15%

Homework is only for BIOL 8560 in the form of report/questions based on materials covered in lectures, workshops and debates.

Attendance is counted as bonus points for the final exam (week 1 does not count): zero or one absence = 5 points, 2 absences = 3 points).

Final grades will be assigned using the following scale:

90% and greater	A
80-89%	B
70-79%	C
60-69%	D
Less than 60%	F

Class Attendance: Please, see the link to the Georgia Tech Attendance Policy, http://www.catalog.gatech.edu/rules/4/

Missed Quizzes or Exams: In exceptional circumstances that a student will have not completed the required number of Quizzes there will be an extra Quiz at the end of the semester. All missed quizzes will be scored as zero. If a student misses any of the Exams, the student will receive a score of zero, or, to the discretion of the instructor, on a case-by-case basis, the exam might be re-scheduled.

Learning Objectives: Upon completion of this course, students will be able to:

1. Describe the processes involved in RNA metabolism and function, and the basic concepts of major RNA technologies.
2. Become familiar with theoretical foundations of the major technical approaches involved in RNA detection and quantification.
3. Understand molecular and cellular foundations of RNA biology and major approaches utilized in RNA biotechnology.
4. Get exposure to the several interdisciplinary approaches utilized to address major biological problems.
5. Read, interpret, explain and discuss primary literature that concerns RNA biology and biotechnology.
6. Develop skills that are necessary for scientific discussion and for the analysis of current scientific literature.

Learning Accommodations: If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or http://disabilityservices.gatech.edu/, as soon as possible, to make an appointment

to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible to set up a time to discuss your learning needs so that we will make necessary classroom accommodations.

Student-Faculty Expectations Agreement: At Georgia Tech we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. See http://www.catalog.gatech.edu/rules/22/ for an articulation of some basic expectation that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Course format: Classes will be comprised of introductory lectures, workshop presentations of recent papers chosen by students with help of instructor on assigned topics, and debates on assigned topics. This course places also a strong emphasis on developing the student's ability to understand and critically evaluate scientific literature and discuss about recent exciting findings and challenging problems in RNA biology and biotechnology. The lecture part of the course is intercalated with six or seven workshops, where (~4-5) students will make short presentations on the assigned topic on research papers (published in the last year) chosen by the students, and four debates, where (~6-10) students will make short presentations (3-5 pro and 3-5 contra) on the assigned topic for debate using material chosen by the students.

Academic Integrity: Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit http://www.catalog.gatech.edu/policies/honor-code/ or http://www.catalog.gatech.edu/rules/18/.

All students are required to adhere to the Georgia Tech Academic Honor Code (www.honor.gatech.edu). This includes, but is not limited to, the following issues that pertain to the exams, oral and slide presentations, and homework for this class:

1. Plagiarism is not allowed. Plagiarizing is defined by Webster's as "to steal and pass off (the ideas or words of another) as one's own; use (another's production) without crediting the source."

In simpler terms: When you use any phrases, sentences, etc. verbatim from another source, they must be identified by quotation marks and citation of the source. In scientific writing, it is generally preferable to rephrase information from other sources and cite the source rather than use the

same text, even when you offset the text with quotation marks. When you show diagrams, models and other materials that are not your own, the sources must also be identified.

These rules apply both to published information and information that you might receive from another student, website, previous class report, etc.

Plagiarizing will be dealt with according to the GT Academic Honor Code.

2. Unless specifically identified as group work; quiz tests, exam test, slide preparation and homework, etc. are to be completed alone.

3. For quiz and exam tests: Cheating off of another person's test or is unethical and unacceptable. Cheating off anyone else's work is a direct violation of the GT Academic Honor Code, and will be dealt with accordingly.

4. At all exams, students are allowed to use notes in the form of 1 paper page per person, could be double-sided, handwritten or printed (you can use only your own notes and cannot ask another person for his/her notes).

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

For any questions involving these or any other Academic Honor Code issues, please consult the professor, or www.honor.gatech.edu.

Support Services and Resources: In your time at Georgia Tech, you may find yourself in need of support. Below you will find some resources to support you both as a student and as a person.

Academic support

- Center for Academic Success http://success.gatech.edu
  - 1-to-1 tutoring http://success.gatech.edu/1-1-tutoring
  - Peer-Led Undergraduate Study (PLUS) http://success.gatech.edu/tutoring/plus
  - Academic coaching http://success.gatech.edu/coaching
- Residence Life's Learning Assistance Program https://housing.gatech.edu/learning-assistance-program
  - Drop-in tutoring for many 1000 level courses
- OMED: Educational Services (http://omed.gatech.edu/programs/academic-support)
  - Group study sessions and tutoring programs
- Communication Center (http://www.communicationcenter.gatech.edu)
  - Individualized help with writing and multimedia projects

Personal Support

Georgia Tech Resources

- The Office of the Dean of Students: http://studentlife.gatech.edu/content/services; **404-894-6367**; Smithgall Student Services Building 2nd floor
    - You also may request assistance at https://gatech-advocate.symplicity.com/care_report/index.php/pid383662?
- Counseling Center: http://counseling.gatech.edu; **404-894-2575**; Smithgall Student Services Building 2nd floor
    - Services include short-term individual counseling, group counseling, couples counseling, testing and assessment, referral services, and crisis intervention. Their website also includes links to state and national resources.
    - *Students in crisis may walk in during business hours (8am-5pm, Monday through Friday) or contact the counselor on call after hours at **404-894-2204**.*
- Students' Temporary Assistance and Resources (STAR): http://studentlife.gatech.edu/content/need-help
    - Can assist with interview clothing, food, and housing needs.
- Stamps Health Services: https://health.gatech.edu; **404-894-1420**
    - Primary care, pharmacy, women's health, psychiatry, immunization and allergy, health promotion, and nutrition
- OMED: Educational Services: http://www.omed.gatech.edu
- **Women's Resource Center: http://www.womenscenter.gatech.edu; 404-385-0230**
- **LGBTQIA Resource Center: http://lgbtqia.gatech.edu/; 404-385-2679**
- **Veteran's Resource Center: http://veterans.gatech.edu/; 404-385-2067**
- **Georgia Tech Police: 404-894-250**

Students experiencing a crisis that requires immediate attention may speak with a counselor at any time 24 hours a day, 7 days a week:

- During regular business hours (Mon-Fri 8AM - 5PM), established GT Counseling Center clients (w/in 6 months of contact) may call 404-894-2575.
- Students who are not actively in GT counseling may call CARE at 404-894-3498.
- After business hours, please call either 404-894-2575 or 404-894-3498 and select the option to speak to the after-hours counselor.

Other free crisis resources available to anyone 24/7:

- Crisis Text Line: **Text HOME to 741741 https://www.crisistextline.org/**
- Georgia Crisis & Access Line: **Call 1-800-715-4225**
- National Hopeline Network, Suicide & Crisis Hotline: **Call 1-800-442-4673**
- National Suicide Prevention Lifeline: **Call 1-800-273-8255,** or access text chat here **https://suicidepreventionlifeline.org/chat/**