



## BIOE 360: Transport and Flow in Bioengineering

### Meeting times and locations:

Lecture: Mondays, Wednesdays, and Fridays  
9:00 – 9:50 AM, 1302 Everitt Lab

**Credit hours:** 3

**Prerequisites:** BIOE 201 and MATH 285

### Course Staff

*Instructor:* Caroline Cvetkovic, Ph.D. ([ccvetko@illinois.edu](mailto:ccvetko@illinois.edu)), 3138 Everitt Lab

*Teaching Assistant (TA):* Neha Hebbar ([nhebbar@illinois.edu](mailto:nhebbar@illinois.edu))

### *Undergraduate Graders:*

- Ainsley Hanner ([ahanner2@illinois.edu](mailto:ahanner2@illinois.edu))
- Eric Wang ([ericw6@illinois.edu](mailto:ericw6@illinois.edu))

### Course Information

*Description:* BIOE 360 covers the fundamentals of fluid dynamics and mass transport applied to analysis of biological systems. In this course, the specific topics include:

- Heat Transfer (Heat Transfer Modes; Governing Equation for Heat Transfer; Boundary Conditions; Steady-State; Non-Steady-State; Convection; Phase Change)
- Mass Transfer (Chemical Kinetics; Mass Transfer Modes; Diffusion; Governing Equation for Mass Transfer; Boundary Conditions; Steady-State Mass Diffusion; Non-Steady-State; Convection)
- Biofluids

*Objectives:* At the end of the course, you should be able to:

- Describe the importance of transport phenomena across a variety of biomedical applications
- Describe modes of heat transfer: conduction, convection, radiation
- Describe modes of mass transfer: diffusion, dispersion, and convection
- Select and implement appropriate governing equations and boundary conditions to solve simpler transport problems (heat, mass, and fluids)
- Understand the importance and utility of simulation software for modeling transport phenomena (heat, mass, and fluids)

### Course Resources

*Website:* The Canvas site (<https://canvas.illinois.edu/courses/42656>) will be used for course materials and announcements, accessing lecture slides, submitting assignments, and grading.

Please note that the instructor reserves the right to make changes to the schedule at any time if necessary. Every effort will be made to convey the changes to the students in a timely manner. The updated schedule will always be posted on Canvas.

### Office Hours:

- Tuesdays 2:00 – 3:00 pm, 3100 Everitt Lab
- Thursdays 3:00 – 4:00 pm, 3100 Everitt Lab
- If necessary, by appointment with course instructor or TA

**Textbook:** *Heat and Mass Transfer: A Biological Context* by Ashim Datta, 2<sup>nd</sup> edition (2017) – available through Grainger library; first edition is available online through Grainger Library

## Grading Policies and Assignments

### Components of Grade:

	% of Grade
Homework	<b>30</b>
Participation	<b>10</b>
Exams	<b>60</b>
• Exam 1	20
• Exam 2	20
• Exam 3	20

**Homework (30% total):** Homework assignments will be assigned periodically throughout the course. These problem sets are meant to help students practice the key concepts of the material. Students may work together but must submit individual work on Gradescope via Canvas.

**Participation (10% total):** As engagement with the material is critical to success in this course, participation in lectures and online activities outside of class (such as engagement with the discussion board) is highly encouraged. Participation points (up to a maximum of 10% of your grade) will be awarded for attendance and various activities announced at a later date.

**Exams (60% total):** There will be three non-cumulative midterm exams throughout the semester. Exams are timed and will be completed individually. As exams will be given during scheduled class times, no conflict exams will be held.

- Exam 1: Chapters 1-4 (20%)
- Exam 2: Chapters 5-7, 9-10 (20%)
- Exam 3: Chapters 11-14 (20%)

### Grading Scale:

≥97.0	A+	≥87.0	B+	≥77.0	C+	≥67.0	D+
≥93.0	A	≥83.0	B	≥73.0	C	≥63.0	D
≥90.0	A-	≥80.0	B-	≥70.0	C-	≥60.0	D-

Final grades may be rounded at the instructor's discretion. Requests for grade inflation or extra points will not be accepted.

### Assignment Submission Policies:

- The submitted work should be neat, easy to follow, legible, and submitted as one PDF file. If submitting handwritten work, a scanning app (not phone camera) should be used.
- Students should verify after uploading the assignment that all pages are included, and all figures are displaying properly.

- Following any issues with file upload, students should email the assignment directly to the TA before the assignment deadline, making sure to also document the upload error.

*Late Policy:* The course late policy is as follows:

- A homework assignment submitted within 24 hours after the deadline will lose 10% of the total points. An assignment submitted 24-48 hours after the deadline will lose 20% of the total points. No credit will be received after 48 hours past the assignment deadline.
- Each student will receive two 3-day extensions on homework assignments, with no penalty or loss of total points, and no excuse needed. However, because solutions will be posted after 3 days, no partial credit option will be given after that point. An online form will be provided for a student to use their “passes”.

*Regrade Requests:*

- Regrade requests are possible for mistakes in grading, and not a negotiation of how many points something is worth, or the number of points deducted.
- The course staff will reconsider a student’s work provided that the request is clear, concise, and professional. Unprofessional requests will not be considered for regrades. The student should clearly and concisely state why they believe their answer is correct.
- Students may ask for clarification if a grader’s comments are not clear, but that must be done outside of a regrade request. After clarification, a regrade request may be submitted if the student believes there was a mistake in the grading of their work.
- Regrade requests are due 2 days after grades are posted.

## Course Policies

*Course-Related Communication:* Email communication is preferred between students and the instructor/TA. The Canvas discussion board may also be used and will be monitored by the instructor or TA. There is no guarantee that communication sent after 5:00 pm will be answered that same day. Please include "[BIOE 360 SP24]" in the subject line.

*Attendance and Illness:* This is a lecture-based course in which attendance is imperative for success, and your grade depends on your active involvement with the material. Students are responsible for all materials and announcements given during class time. For planned schedule changes for university excused absences, religious observances, interviews, or university-sponsored athletic events, please contact the instructor as soon as possible. Students who feel ill must not come to class. In this case, students may view the recorded lecture. Makeup exams will only be scheduled for a medical or personal emergency, with documentation from the Dean of Students or medical facility and instructor notification as soon as possible.

*Laptops and Mobile Devices:* Mobile devices should be silenced and out of sight during lectures. Laptops and mobile phones may be used for course-related tasks only (e.g., to take notes or answer polling questions) and not for other coursework or email.

*Use of Generative AI Technology:* Generative AI, such as ChatGPT, Bard, and Microsoft Copilot/Bing Chat, can answer questions and generate text, images, and other media. The appropriate use of generative AI varies from course to course. In BIOE 360, there are times when generative AI may be useful in the course. If you choose to use generative AI as permitted below, you must document and attribute all AI contributions to your coursework and take full responsibility for the contributions including the accuracy of the information and reliability of sources. When

using generative AI, keep a journal documenting prompts, AI responses, and your usage. Your instructor may ask you to provide this documentation.

You may use generative AI in BIOE 360 for the following:

- Revision of your own text in assignments for spelling and grammar
- Creating study aids (e.g., flashcards) for exams
- Testing and practicing your knowledge of course topics

You MAY NOT use generative AI in BIOE 360 for the following:

- Calculations for homework questions
- Assistance during exams
- Writing entire sentences, paragraphs, or papers to complete class assignments

If you have a question about the use of Generative AI, please reach out to your instructors. Failure to abide by these guidelines is a violation of academic integrity. We will investigate suspected uses of generative AI that do not follow these guidelines and apply sanctions as outlined in the Illinois Student Code.

**Academic Integrity:** Students will sign their name to an academic honesty agreement during the first week of the semester in order to be allowed to participate in the course. Academic dishonesty may result in a failing grade. All students are expected to:

- Read and abide by the [University of Illinois at Urbana-Champaign Student Code](#), including [Article 1, Part 4: Academic Integrity](#).
- Complete homework assignments individually, without the use of materials from other students (either those currently taking the course or those who completed the course in past semesters).
- Complete exams without the aid of class materials, peer input, or the internet.
- Uphold the highest ethical standards, be honest, and practice academic integrity. This includes doing original work and citing sources used. TurnItIn will be used to check for plagiarism in assignments uploaded to Canvas.
- Ask the instructor(s) if in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity. Ignorance is not an excuse for any academic dishonesty.

## University Policies and Resources

**DRES Accommodations:** To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor as soon as possible and provide the instructor with a Letter of Academic Accommodations from Disability Resources and Educational Services (DRES). To ensure that disability-related concerns are properly addressed from the beginning, students with disabilities who require assistance to participate in this class should apply for services with DRES and see the instructor as soon as possible. If you need accommodations for any sort of disability, please speak to the instructor. DRES provides students with academic accommodations, access, and support services. To contact DRES, you may visit 1207 S. Oak St., Champaign, call 217-333-1970, e-mail [disability@illinois.edu](mailto:disability@illinois.edu), or visit the [DRES website](#). Apply for services at <https://www.disability.illinois.edu/applying-services>.

**Diversity and Inclusion:** I value all students regardless of background and am committed to fostering a climate of inclusion in the classroom. The diversity of participants in this course is a valuable source of ideas, problem solving strategies, and engineering creativity. If you feel that

your or any other student's contribution is not being valued for any reason, please speak with me directly or submit anonymous feedback.

***Grainger College of Engineering Statement on Anti-Racism and Inclusivity:*** The Grainger College of Engineering is committed to the creation of an anti-racist, inclusive community that welcomes diversity along a number of dimensions, including, but not limited to, race, ethnicity and national origins, gender and gender identity, sexuality, disability status, class, age, or religious beliefs. The College recognizes that we are learning together in the midst of the Black Lives Matter movement, that Black, Hispanic, and Indigenous voices and contributions have largely either been excluded from, or not recognized in, science and engineering, and that both overt racism and micro-aggressions threaten the well-being of our students and our university community.

The effectiveness of this course is dependent upon each of us to create a safe and encouraging learning environment that allows for the open exchange of ideas while also ensuring equitable opportunities and respect for all of us. Everyone is expected to help establish and maintain an environment where students, staff, and faculty can contribute without fear of personal ridicule, or intolerant or offensive language. If you witness or experience racism, discrimination, micro-aggressions, or other offensive behavior, you are encouraged to bring this to the attention of the course director if you feel comfortable. You can also report these behaviors to the [Bias Assessment and Response Team \(BART\)](#). Based on your report, BART members will follow up and reach out to students to make sure they have the support they need to be healthy and safe. If the reported behavior also violates university policy, staff in the Office for Student Conflict Resolution may respond as well and will take appropriate action.

***Emergency Response:*** Emergency response recommendations can be found at the following websites:

- Emergency preparedness: <http://police.illinois.edu/emergency-preparedness/>
- Campus building floor plans: <http://police.illinois.edu/emergency-preparedness/building-emergency-action-plans/>
- "Run, Hide, Fight": <https://police.illinois.edu/emergency-preparedness/run-hide-fight/>

***Sexual Misconduct Reporting Obligation:*** The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX Office. In turn, an individual with the Title IX Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options.

A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: <https://wecare.illinois.edu/resources/students/#confidential>. Other information about resources and reporting is available here: <https://wecare.illinois.edu/>

***Religious Observances:*** Illinois law requires the University to reasonably accommodate its students' religious beliefs, observances, and practices regarding admissions, class attendance, and the scheduling of examinations and work requirements. Students should complete the [Request for Accommodation for Religious Observances](#) form should any instructors require an absence letter in order to manage the absence. In order to best facilitate planning and communication between students and faculty, students should make requests for absence letters as early as possible in the semester in which the request applies. Within the first 2 weeks of classes, if possible, notify your instructor of potential conflicts and [request appropriate accommodations](#).

*Family Educational Rights and Privacy Act (FERPA):* Any student who has suppressed their directory information pursuant to Family Educational Rights and Privacy Act (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See <https://registrar.illinois.edu/academic-records/ferpa/> for more information on FERPA.

*Mental Health:* Diminished mental health, including significant stress, mood changes, excessive worry, substance/alcohol abuse, or problems with eating and/or sleeping can interfere with optimal academic performance, social development, and emotional wellbeing. The University of Illinois offers a variety of confidential services including individual and group counseling, crisis intervention, psychiatric services, and specialized screenings which are covered through the Student Health Fee. If you or someone you know experiences any of the above mental health concerns, it is strongly encouraged to contact or visit any of the University's resources provided below. Getting help is a smart and courageous thing to do for yourself and for those who care about you.

- Counseling Center: 217-333-3704, 610 East John Street, Champaign, IL 61820
- McKinley Health Center: 217-333-2700, 1109 South Lincoln Avenue, Urbana, IL 61801
- University of Illinois Wellness website: <https://wellness.illinois.edu/>
- National Suicide Prevention Lifeline (800) 273-8255
- Rosecrance Crisis Line (217) 359-4141 (available 24/7, 365 days a year)
- If you are in immediate danger, call 911.

*Community of Care:* As members of the Illinois community, we each have a responsibility to express care and concern for one another. If you come across a classmate whose behavior concerns you, whether in regards to their well-being or yours, we encourage you to refer this behavior to the [Student Assistance Center](#) (SAC; 217-333-0050). Based on your report, the staff in the Student Assistance Center reaches out to students to make sure they have the support they need to be healthy and safe.

Further, as a Community of Care, we want to support you in your overall wellness. We know that students sometimes face challenges that can impact academic performance (examples include mental health concerns, food insecurity, homelessness, personal emergencies). Should you find that you are managing such a challenge and that it is interfering with your coursework, you are encouraged to contact the SAC in the Office of the Dean of Students for support and referrals to campus and/or community resources.

*Disruptive Behavior:* Behavior that persistently or grossly interferes with classroom activities is considered disruptive behavior and may be subject to disciplinary action. Such behavior inhibits other students' ability to learn and an instructor's ability to teach. A student responsible for disruptive behavior may be required to leave class pending discussion and resolution of the problem and may be reported to the [Office for Student Conflict Resolution](#) ([conflictresolution@illinois.edu](mailto:conflictresolution@illinois.edu)) for disciplinary action.