

Department: Bioengineering

Course Number: BIOE 325

Title: Biotransport (Online TR 12:30 PM–1:45 PM)

Instructor: Zhangli Peng <zhpeng@uic.edu>

Office hour: 4:30 pm – 5:30 pm Thursdays (via Blackboard Collaborate)

Lectures: Lectures will be delivered online through the Blackboard Collaborate and they will be recorded and made available online.

Teaching Assistant: Iram Hameeduddin <ihamee2@uic.edu>

Office hour: 1:30 pm – 2:30 pm Wednesdays (via Blackboard Collaborate)

Contact information:

Clinical Science North (CSN) 164F

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Course Description: Basic principles of biotransport, fluid mechanics, and their applications to characterize transport processes in biological system. It includes momentum transport, mass transport, and energy transport.

Prerequisites:

MATH 220 and BIOS 100 and BIOE 205

Required Textbook:

Elger, DF., LeBret, BA., Crowe, CT, Roberson, JA. Engineering Fluid Mechanics, Wiley. 10th edition or newer editions.

Suggested readings

1. A more advanced book on fluid mechanics: C. Pozrikidis, Fluid Dynamics: Theory, Computation, and Numerical Simulation, Springer, 3rd ed. 2017 (available online via the library and it has been put in the Bookshelf tool in Blackboard).
2. A more advanced book on biotransport: Truskey, GA. Yuan, F. Katz, DF. Transport phenomena in biological systems Prentice Hall. 1st or 2nd editions (hardcopies available at UIC Richar J. Daley Library).

Course objectives

- Understand the basic principles and equations of fluid mechanics
- Apply basic principles of fluid mechanics to understand several transport phenomena in biological systems
- Introduction of mass transport in biological systems

Topics covered

- Basic properties and parameters of fluid
- Fluid statics

- Fluid kinematics
- Conservation relations and boundary conditions
- Constitutive relations
- Laminar and turbulent flow
- Application of momentum balances
- Differential form of the equation of conservation of mass (Continuity)
- Differential form of the conservation of linear momentum and Navier-Stokes equation in three dimensions
- Fluid motion with more than one dependent variable
- Dimensional analysis and dimensionless groups
- Low Reynolds-number flow
- Simple shear flow and tube flow
- Bernoulli's equation
- Biomedical Applications: Viscosity of body fluids, whole blood rheology, blood flow profiles, mechanosensing of flow, red blood cell mechanics, mechanics of blood vessels, microfluidics/nanofluidics (inertial, acoustic, electrokinetic).
- Introduction to mass transport and molecule diffusion

Grading System

Pre-class assignments (9)	10%	* Late homework or assignment is not accepted.
Homework (15)	30%	
Midterms (3)	55%	
In-class assignments	5%	(whether they will be graded will be announced in advance)

All homework and exams will be submitted through Gradescope tool in Blackboard.

If there are any potential grading errors, you must discuss with your TA for potential correction within a week after you receive your graded exams or classwork.

A: 90-100; B: 80-89.9; C: 70-79.9; D: 60-69.9; F: <60.

Disability Accommodation

The University of Illinois at Chicago is committed to maintaining a barrier-free environment so that students with disabilities can fully access programs, courses, services, and activities at UIC. Students with disabilities who require accommodations for access to and/or participation in this course are welcome, but must be registered with the Disability Resource Center (DRC). You may contact DRC at 312-413-2183 (v) or 312-413-0123 (TTY) and consult the following:

http://www.uic.edu/depts/oaa/disability_resources/faq/accommodations.html

Academic Integrity

As an academic community, UIC is committed to providing an environment in which research, learning, and scholarship can flourish and in which all endeavors are guided by academic and professional integrity. All members of the campus community—students, staff, faculty, and administrators—share the responsibility of insuring that these standards

are upheld so that such an environment exists. Instances of academic misconduct by students will be handled pursuant to the Student Disciplinary Policy: <http://www.uic.edu/depts/dos/studentconduct.html>

If you have experienced sexual assault, domestic/dating violence, stalking, or harassment, there is help available on campus. The Campus Advocacy Network provides free and confidential services to UIC students, faculty, and staff who have experienced or are experiencing interpersonal violence. If you would like to speak with an advocate, please contact CAN at can-appointment@uic.edu, call (312) 413-8206, or stop by the CAN office at 1101 W. Taylor St. To learn more, visit CAN's website at <https://can.uic.edu/>.

COVID-19 SAFETY PROTOCOLS AND POLICIES AT UIC

Face Masks: Masks must be worn at all times by all students, faculty, and staff while on campus, whether in or out of class, in all offices, on all pathways, and inside and outside of all buildings. If you do not wear a mask, you will be asked to leave the classroom and will not be allowed back in class unless or until you wear a mask. Students who refuse to wear a mask in class will be dropped from the class. Eating and drinking is not allowed in classrooms.

Social Distancing: We all must maintain appropriate social distancing at all times, whether in or out of class, in all offices, on all pathways, and inside and outside of all buildings. On-campus classes are being held in classrooms that are large enough to maintain a minimum physical distance of 6 feet (or two arm's length) between people; we will implement assigned seating to ensure social distancing is observed and also to make contact tracing easier if there is an incident of COVID-19 infection in our class.

Hand Washing/ Sanitizing: Everyone is expected to wash or sanitize their hands before class, either by using personal sanitizer or by using one of the sanitizer dispensers located on campus. Please remember to wash your hands with soap for 20 seconds or more. If using hand sanitizer, please remember it should be at least 60% alcohol and you should rub your hands together until dry.

COVID-19 Infection Procedures, Testing and Tracing:

UIC has built an infrastructure for COVID-19 testing and tracing of UIC community members. Please refer to the UIC website, [Coronavirus Disease 2019 \(COVID-19\) | UIC Today](#), and the Circle Back to Campus Plan [website](#) and [newsletter](#) for up-to-date campus policies and procedures. For information about what to do: [UIC FAQs](#)

Students who test positive should inform their instructors as soon as possible, so that faculty can take action in accordance with [University policies](#). Please do not hesitate to share a positive diagnosis; your identity will NOT be revealed to your classmates. UIC's utmost concern is for the students' welfare and trying to ensure that everyone can take the needed precautions to reduce the likelihood of additional infection. Arrangements will be made with students on an individual basis to accommodate missed classes or assignments due to illness.

Faculty who find themselves infected will also inform students as soon as possible.

ONLINE COURSE COMMUNICATION GUIDELINES (NETIQUETTE)

- Be sensitive to different cultural and linguistic backgrounds, as well as different political and religious beliefs.
- Use good taste when composing your written responses. Swearing and profanity should be avoided. Also consider that slang terms can be misunderstood or misinterpreted.
- Avoid using all capital letters when composing your written responses. This can be considered “shouting” on the Internet and is regarded as impolite or aggressive. It can also be stressful on the eye when trying to read your message.
- Be respectful of others’ views and opinions. Avoid “flaming” (publicly attacking or insulting) others.
- Be careful when using acronyms. If you use an acronym it is best to spell out its meaning first, then put the acronym in parentheses afterward, for example: Frequently Asked Questions (FAQs). After that you can use the acronym freely throughout your message.
- Use good grammar and spelling in written communications, and avoid using text messaging shortcuts.
- In emails, always identify yourself and what class and section you are in. It is a good practice to put your course and section in the subject line. This helps your instructor identify course related emails.

PRIVACY NOTIFICATION AND POLICY FOR VIDEO RECORDING OF SYNCHRONOUS CLASS SESSIONS

We will be recording the class sessions, or portions of the class, for students who are unable to attend synchronously. The recording feature for others is disabled so that no one else will be able to record this session through Zoom, Blackboard Collaborate, or Echo360. Recording by other means is not permitted.

The recorded class sessions will be posted on our Blackboard class website unless otherwise notified. Pursuant to the terms of the agreement between the vendor and UIC, the data is used solely for this purpose and the vendor is prohibited from re-disclosing this information. UIC also does not use the data for any other purpose. Recordings will be deleted when no longer necessary. However, the recording may become part of an administrative disciplinary record if academic misconduct occurs during a videoconference session.

If you have privacy concerns and do not wish to appear in the recording, turn OFF your video and notify me in writing (via email) prior to the next class session. If you prefer to use a pseudonym instead of your name, please let me know what name you will be using so that I can identify you during the class session. If you would like to ask a question, you may do so privately through the chat feature by addressing your question to me or your TA only (and not to “everyone”), or you may contact me or your TA by another private method, which we will agree upon in advance of class. If you have questions or concerns

about this video recording policy, please contact me before the end of the first week of class.