

Science and Science Fiction Syllabus

Contents

Essential Course Components, pages 1-2

- Course number and name
- Contact Details: Faculty Contact, Communication, Continuity, Meeting Times/Locations/Student Hours
- Accommodations
- Course description: Prerequisites, Learning Goals, Credit Hours
- Course requirements: Attendance, Assignments, Exam/Quizzes, Participation
- Evaluation/Grading
- Course Plan

Important Policies and Resources to be Included in Brandeis Syllabi, pages 3-4

- Academic Integrity
- Accommodations (We suggest putting the required language about Accommodations on the first page of the syllabus, due to its importance.)
- Classroom Health and Safety
- Course Materials/Books/Apps/Equipment
- LATTE
- Library
- Privacy
- Student Support

Science vs. Science Fiction

Contact Details

Gess Iraj
Email: gessiraji@brandeis.edu

Office location: TBD – Abelson 335
Zoom ID: [566 283 1271](#)

Communication

I use the course LATTE page for important news and announcements. I will also be available by email during the weekdays, 9am-5pm, and will respond within 6 hours. We may set up a *Slack* page for the class given the consent of everyone enrolled. This syllabus contains important information for you to succeed in the course. You are expected to read it entirely before or during the first week of classes and be fully familiar with its content.

Continuity

In case of a session cancellation, I use the course LATTE page for directions and announcements. In case of a speaker no-show or cancellation, the links to the relevant resources, documentaries or interviews, will be available on the LATTE page through the Brandeis library.

Meeting Times/Locations

Classes

Tuesday and Friday, 12:30 –1:50 PM

Goldfarb 230

Labs or sections

Not Applicable

Student Hours

Tuesday 2-3PM and Friday 2-3PM, and/or by appointment [gather.town office](#)

Stuck on a problem or writing assignment? Questions, suggestions, comments? Bring them all to the student hours. Even if you feel confident about the course materials, this is a chance for you to adventure further and explore deeper and discuss the topics that excite you the most. You can also show up for a chat, see fellow classmates, or play games.

Accommodations

Brandeis seeks to create a learning environment that is welcoming and inclusive of all students, and I want to support you in your learning. If you think you may require disability accommodations, you will need to work with Student Accessibility Support (SAS) (781-736-3470, access@brandeis.edu). You can find helpful student FAQs and other resources on the [SAS website](#), including guidance on how to know whether you might be eligible for support from SAS. If you already have an accommodation letter from SAS, please provide me with a copy as soon as you can so that I can ensure effective implementation of accommodations for this class. In order to coordinate exam accommodations, ideally you should provide the accommodation letter at least 48 hours before an exam.

Course Description

Course Prerequisite(s):

No prerequisites, just your curiosity and openness. This course is open to students with all backgrounds especially non-STEM majors, or those with little mathematical, computational, or research experience.

Writing constitutes an essential part of the course. I encourage you to reach out to The Brandeis Writing Center regularly.

- **Textbooks:** You are not required to buy any of the course materials but are welcome to if you prefer so. The links to the readings will be available on LATTE, except for **Clay's Ark** by **Octavia Butler** which will be on reserve at the library for this course. Many of the readings will also be available in audio form. The topics that we discuss will be motivated by and closely follow the book **Mathematical Models in Biology** by **Leah Keshet-Edelestein**.
- **Technology:** We will use **MATLAB** which will be available to you as a student using your Brandeis credential. Depending on the class consensus, we will use **Slack** for communication.
- **Important note:** Success in this course requires access to a working computer where MATLAB can be installed. If this is an obstacle for you for any reason, please contact me or Student Financial Services as soon as possible.

What to Expect During each Class Session

Before each session, you are required to check the LATTE page, the course calendar, or this syllabus for the required readings and activities before the session. Note that you may need to download the latest version of the syllabus or calendar from LATTE. Once the session starts, we closely follow this routine except for when we have an invited speaker or during finals week:

1. The session begins with a short warm-up activity including but not limited to polls, games, or improv debates related to the weekly topic.
2. A volunteer reiterates the important class announcements from the LATTE news and announcements forum.
3. We read, watch, or interact with a piece of media that reminds us of the pre-class readings or activities and motivate the weekly topic.
4. In groups, you will answer a guided question or work on a guided modeling problem related to the weekly topic.
5. We reconvene and each group presents their summary to the class. We discuss the problem as a class.
6. Depending on the length of the problems, each class consists of repeating steps 3 and 4.
7. We conclude the session with a session summary and possibly a quick session survey or group evaluation.

Learning Goals:

During this course, you will

- read scientific articles, watch experts talk, and listen to audio clips regarding equity and mathematics, sciences, and coding, and engage in constructive discussions and debates on those topics,
- form interdisciplinary collaborations and conversations to solve a modeling problem in groups,
- become familiar with a diverse group of science fiction writers and respond to their science fiction work,
- recognize the steps required in developing a mathematical model,
- use research to answer the scientific, social, and economic questions that you may encounter in your daily life and evaluate the credibility of your resources,
- use the library tool, OneSearch to find reliable resources,
- read and extract information from scientific papers and properly cite references when needed,
- compare the models used in a range of biological topics, including population growth, spread of infectious diseases, and interacting systems,

- analyze mathematical problems, assess your solutions, and think critically about the limitations of your models,
- modify a MATLAB program to compute the desired output when solving a problem and visualize and interpret the results,
- use storytelling as a tool to explore ideas in scientific research and further explore your own intersecting identities,
- set your course goals and self-motivate your learning journey,
- and communicate effectively with a course instructor and your classmates when you need help.

Credit Hours:

Success in this four-credit course is based on the expectation that students will spend a minimum of nine hours of study time per week in preparation for class (readings, papers, discussion sections, student hours, assignments, etc.)

Course Requirements

Attendance

Attendance and participation are a **main component** in learning and excelling in this course. If you are unable to attend a session, you must let me know in advance (exceptions apply). To pass the course, you will need **fewer than 6 unexcused absences**.

Assignments

All assignments must be submitted on LATTE. Late assignments will not be accepted unless you use a *token* (read below for more on tokens). In addition to the final paper or project, we will see three types of assignments in this course: essays, modeling assignments, and VoiceThread assignments. We will go over and discuss the rubrics and guidelines for the essays and projects during the first day of class and they will be available on LATTE after.

VoiceThread assignments free you from being limited to only one form of communication. You can record an audio response, respond with a video or image, or type up your thoughts and comments. As a bonus, they make it easier to respond to other submissions by your classmates. We will use these assignments as discussion threads for reflections, opinion pieces, reactions, and questions that do not require extensive preparation. For each assignment, you may choose to

- respond to at least one post by your classmates,
- or make an original submission.

During the first class session, we will discuss some expectations and rules for responding to others' submissions. Responses to each VoiceThread assignment can earn up to 2 points as *engagement credit*, with each response accounting for 1 point if it follows the rules and expectations set by the class. See section *Participation* below for more on engagement credits.

Modeling Assignments

The modeling assignments will be in form of short digital notebooks that guide you through the steps of an assignment. They will be related to the weekly modeling topic and similar to the problems that we work on in groups during class sessions. Each notebook will specify what the assignment expectations are.

Essays

After each science fiction reading, you will write a short essay. You can choose **one** of the following:

- Discuss three main ideas that the reading explores, with at least one relevant to science or math. The essay should cover what these ideas are, why you found them significant, and how they relate to your personal life.

- Discuss three points in the reading that surprised you, appeared confusing, or conflicted from your perspective. Justify why you chose these points.
- Write about one scientific question that the reading inspires. Briefly reflect on how you would develop a model to answer this question, or what tools, knowledge, and resources you may need.
- Write about the author. You must cite the sources that you use.

If you have another idea that you want to explore in your essay that is different from the choices above, you can let me know beforehand, and we can discuss expectations for its assessment.

The essays are meant to be short (maximum of 2 pages) focusing on quality over quantity. You should be spending **fewer** than 3 hours total on an essay.

Tokens

Tokens are virtual points that buy you an extra day (**24 hours**) on any deadline **except for the final project** or give you the opportunity to **resubmit an assignment** with grade N or R (more on grading at *Grading and Evaluations*). Each student starts the semester with **5 tokens** and will have opportunities during the semester to earn more tokens:

- You earn 1 token each week when you visit the student hours.
- You earn 1 token each time you make an appointment at the Writing Center and attend the appointment, limited to 1 token per essay or assignment.

Your LATTE gradebook keeps track of the number of tokens that you have left. You will submit a request for additional tokens on LATTE when you have completed one of the token activities (e.g. visiting the student hours).

Exams/Quizzes

The final course assessment will be in form of final projects or papers due at 6PM on the last day of finals week. The only quiz you will take during this course is on the content of this syllabus. You may retake this quiz as many times as you need, but you have to pass the quiz in order to pass the course.

Final Project and Short Presentation

You will have two choices for the final project: you can write a short science fiction story where you use some of the concepts discussed throughout the course, or you work on a mathematical modeling project where you formulate a new problem or use one of your favorite questions that you came up with during the course and attempt to solve the problem. You will not be evaluated on the correctness of your final answers but on your scientific approach, authenticity, and efforts in reaching and evaluating your solution. You will give a short presentation, 5 to 20 minutes, the length of which is flexible in accordance with the feedback from everyone in the class, explaining to your peers what you did for your project.

Expectations for the Final Project

- Final projects are due at 6PM on the first day of finals week (May 6) on LATTE.
- You will discuss your topic and your methods for accomplishing the project with me by **3/18**. Depending on how the conversation goes, you can start working on your project immediately after, or revise your topic and inform me by **3/25**.
- You will submit the outline of your project by **3/28**. The outline should state the topic, show the steps required to complete the project, and provide an approximate timeline of when you expect to complete each step.
- You have the option of writing a **short science fiction story** or completing a **mathematical modeling project**.
- I understand that these options may be limiting. Let me know if there is another type of project, for instance an art project, other than these two options that you want to explore.

Expectations for the Short Science Fiction Story

- The LATTE submission must include two documents: the short story in pdf format and the accompanying journal.
- The journal must outline the research that you did to write the story and cite the appropriate sources.
- The short story can be centered around a scientific problem of your interest or a mathematical model discussed in the course.
- You must proofread the story before submitting it and schedule a writing center appointment to get advice on its overall writing after proofreading.
- The short story must be **under** 6,000 words. **No required minimum** number of words.
- The writing must follow the writing guidelines as posted on LATTE by 3/18.

Expectations for the Mathematical Modeling Project

- The LATTE submission must include two documents:
 - a pdf file containing a description of the problem and the attempted solution,
 - and the MATLAB code used in attempting to solve the problem.
- The pdf document must outline the research that you did to solve the problem and cite the appropriate sources.
- You must proofread the document before submitting it and schedule a writing center appointment to get advice on its overall writing after proofreading.
- The pdf file must be at least 2 pages, double-spaced, including images, graphs, or diagrams. Exceptions apply.
- The problem must be original and your own work, not taken exactly as is from the course or done as a group assignment.

Expectations for the Final Presentation

- The presentation should cover these three basic points: the main idea behind your project, what motivated you to pursue it, and how it relates to the topics discussed in class.
- The length of the presentation does not affect your grade as long as it covers the points above.
- The presentation should be organized, easy to follow, and well-rehearsed.
- You are expected to be present during your classmates' presentations. You will earn up to 5 engagement credits, 1 credit/question, by writing down a question about a classmate's project and asking it later in the discussion thread related to presentations. The discussion rules apply here.

For each assignment, there will be clear assignment-specific instructions and rubrics posted prior to the deadline so that there are no surprises along the way on how the assignments are assessed.

Participation

Participation forms an essential ingredient for learning and succeeding in this course. The more you engage with the material, your peers, and the instructor, the easier it is for you to evaluate your understanding and seek help when you need it. To encourage participation, you will earn **engagement credits** which will partially determine your final grade. More specifically, they will determine the plus or minus modification to the base grade. Read more about this in the *Grading and Evaluations* section. You will keep an online journal to document how you are staying engaged throughout the course. The gradebook on LATTE will keep track of the engagement credits that you have earned. A portion of the engagement credits will come from your groupmates' evaluations. The comprehensive list of opportunities for earning engagement credits will be posted on LATTE by the second week of classes.

Some examples of engagement and participation include:

- preparing discussion questions on the required readings and the speaker talks each week (taking notes can help a lot here),
- completing the class preparation work, including the readings,
- commenting, listening, and interacting during the in-class synchronous discussions,
- responding to the discussion forums and VoiceThread discussions beyond the assignment requirements,
- responding thoughtfully and constructively to the contributions made by other class members,
- keeping the screen view on during Zoom meetings when signal strength allows, and letting me know ahead of time if you cannot have your video on during Zoom meetings for other reasons,
- communicating with me or your classmates, asking questions during class, and coming to the student hours when you need help with or have questions about the course materials,
- reading and responding, if needed, to course-related Emails and posts,
- and actively contributing to group work when working in teams.

Course Plan

Date	Modeling Topic	Learning Goals	Guiding Prep Questions	Class Prep Work: Reading, Practice, Problems ...	Work to Submit
1/18-1/21	Introduction and Orientation	-Setting class rules, expectations, and outcomes -discussing the grading process and rubrics -Installing MATLAB and using OneSearch -forming groups	How can we build a thriving and healthy ecosystem in our class? What do we expect to gain from this course?	Install MATLAB (optional but encouraged) Visit student hours Read the syllabus, and take the syllabus quiz on LATTE	VoiceThread Assignment 1
1/24-1/28	Why Modeling?	-seeing examples of biological models and their relevance to human life - Installing MATLAB and getting familiar with its interface	What questions do you think mathematical modeling can answer?	TED talk by Charlie Jane Anders As Good as New by Charlie Jane Anders Prepare questions to ask the class in response to the TED talk Visit student hours Take the syllabus quiz if you have not passed it yet	VoiceThread Assignment 2 Modeling Assignment 0
1/31-2/4	Population Modeling	-learning about the writer	-How are science	As Good as New by Charlie Jane Anders	Essa

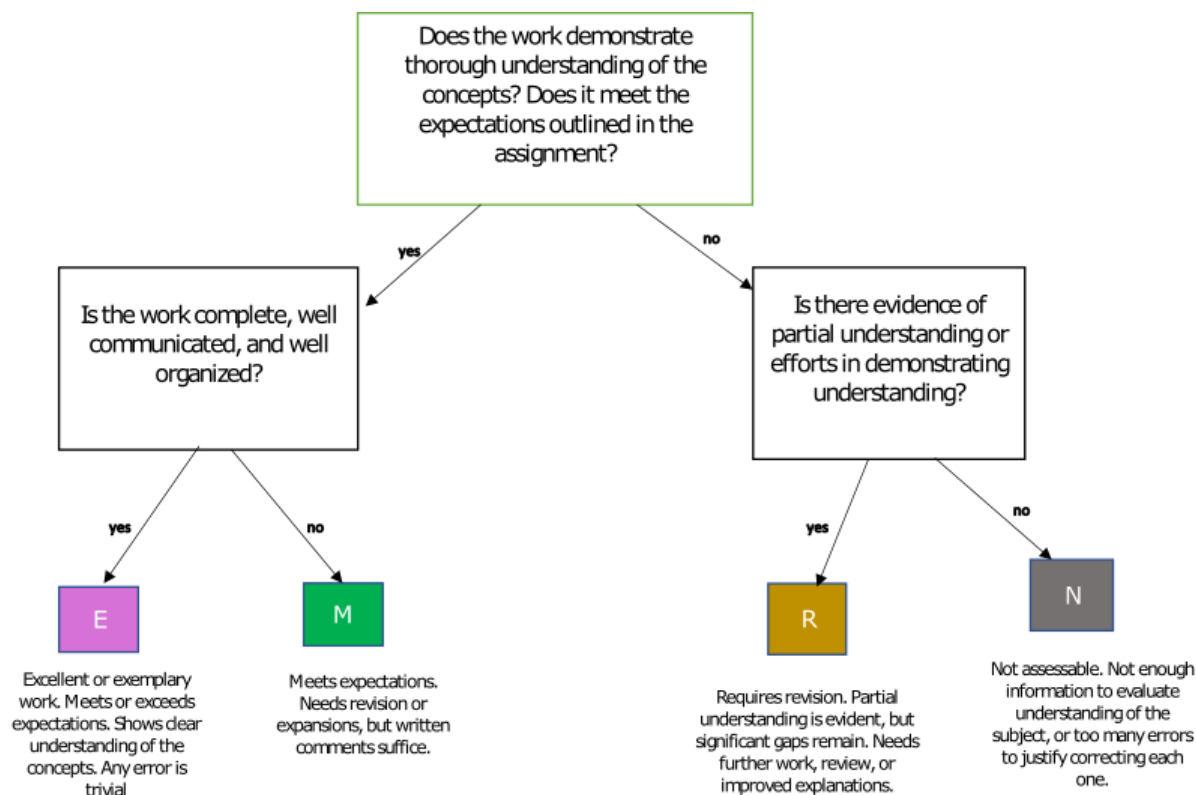
		Charlie Jane Anders, thinking about how real world shapes the world of imagination in science fiction -Motivating the next modeling topic: population modeling	fiction and the future connected? How does one influence the other? -What is an example of population growth in the Charlie Jane Anders' story?	Prepare questions to ask this week's speaker	
2/7-2/11	Population Modeling	-understanding the basics of single species population modeling, the exponential growth vs. the logistic model, discrete models to continuous models	What population growth questions does the reading <i>As Good as New</i> motivate?	Play around with the Bi-weekly MATLAB code example on single species population growth for a discussion on sustainable fishing and fungal growth	Modeling Assignment 1
2/14-2/18	Prey-Predator I	-learning more about the visionary writer Octavia Butler -exploring intersectionality and the science fiction community	How does Octavia Butler's fictional 2020 world compare to the world we live in today? How is the worldwide response to the COVID-19 pandemic similar to or different from the characters' responses in <i>Clay's Ark</i> ?	<i>Clay's Ark</i> by Octavia Butler (beginning – part II) NPR episode on Octavia Butler Prepare questions to ask the class in response to the NPR episode	Essa
2/28-3/4	Prey-Predator II	-becoming familiar with the prey-predator, host-parasite and	What are some ways that different species interact that	Educational Video on Ecological Relationships	Modeling Assignment

		host-pathogen models and using them to answer questions about the populations	affect their populations?		
3/7-3/11	SIR	-becoming familiar with the SIR model and using it to answer questions about the spread of diseases -comparing the SIR and host-parasite models	How long would it take for the world population to be infected by a pathogen similar to the Clay's Ark parasite?	Make an appointment or visit the student hours to discuss the topic for your final project	Modeling Assignment
3/14-3/18	Smarter Futures (or review)	-research a topic related to the field of soft robotics -Intro to machine learning, reinforcement learning, and their connection to robotics*	How does biology inspire robotics? How does a robot learn?*	Short story by Rebbecca Roanhoarse Video on Reinforcement Learning (MATLAB account log-in required) Article related to soft robotics and biologically inspired robots This week we choose between learning a new topic or reviewing the models that we have studied so far dependent on the overall consensus	Modeling Assignment Final project to
3/21-3/25	TBA	TBA	TBA	Yiwu by Lavie Tidhar You Perfect, Broken Thing by C.L. Clark	Essa
3/28-4/1	Home in Space	-discussing the biological and ethical considerations related to searching for life on other planets	Can space be our second home? What are the biological and ethical arguments for and against colonizing other planets?	Mono No Aware by Ken Liu Read Colonizing other planets is a bad idea by L. Billings Read Biodiversity requirements for self-sustaining space colonies by A. J. Johnson	VoiceThread Assignment

4/4-4/8	Modeling: Limitations and Impact	-discussing the limitations of mathematical and scientific modeling -researching bias in research	What do we do when our scientific model fails?	The Best We Can by Carrie Vaughn	Essa
4/11-4/14	Modeling and science: the greater Impact	-researching the consequences of using scientific models to form public policies	What are some of the similarities between the story by Nnedi Okorafor and the story behind the life of Henrietta Lacks?	Biweekly reading: The Book of Phoenix by Nnedi Okorafor Watch TED talk by Nnedi Okorafor Read an excerpt from the book The Immortal Life of Henrietta Lacks Prepare questions to ask the class in response to the TED talk Prepare questions to ask this week's speaker	Essa
4/25-4/29	Final Reflections and Presentations	-Review the models covered in the course -discussing further directions	Reflecting back on our journey: where did we begin, what have we gained, and where do we go from here?		Final Presentat
5/6-5/17	Finals Week				Final Paper or Proj

Evaluation and Grading

All graded submissions are graded on four levels: E, Excellent or M, Meets Expectations (considered satisfactory) and R, Requires Review or N, Not Assessable (considered unsatisfactory). A visual diagram is shown here and will be available on LATTE; the table below the diagram reiterates the same information for accessibility purposes.



Adapted from the EMRF rubric by Rodney Stutzman and Kimberly Race

E	Exceeds expectations	The response to the assignment is complete and clear. All error is trivial. The submission provides the necessary reasoning. The steps outlined in the solution are easy to follow.
M	Meets expectations	The response to the assignment displays relative mastery of the relevant topics. There may be minor errors that need no additional review or instruction. The response may be correct but not fully justified with clear evidence, or the constituent components are not easy to connect.
R	Requires review and reassessment	The response shows partial mastery of topics or attempt at mastery, however significant gaps remain. The submission does not fully communicate the reasoning and justification behind the arguments presented, or there remain significant errors related to the topic or solving the problem.
N	Not assessable	The submission shows no response or insubstantial attempt. Or there are too many errors to correct each one individually. The tools or methods used do not fit the problem type.

In this course, to obtain the following base letter grades, you need to meet the requirements as listed in the table below:

<u>Letter Grade</u>	<u>Requirements</u>
A	<ul style="list-style-type: none"> • E or M grade on the final project and presentation, • 2 or fewer <u>unexcused</u> absences and otherwise prepared for the class and engaging, • Satisfactory marks (M or E) on 4 modeling assignments including 1 E mark, <ul style="list-style-type: none"> • an M mark on 3 essays including an E mark on 2 essays <ul style="list-style-type: none"> • Pass the syllabus quiz
B	<ul style="list-style-type: none"> • E or M grade on the final project, • 4 or fewer <u>unexcused</u> absences and otherwise prepared for the class and engaging, • Satisfactory marks (M or E) on 3 modeling assignments, <ul style="list-style-type: none"> • an M mark on 3 essays, an E mark on 1 essay <ul style="list-style-type: none"> • Pass the syllabus quiz
C	<ul style="list-style-type: none"> • 6 or fewer <u>unexcused</u> absences and otherwise prepared for the class and engaging, • Satisfactory marks (M or E) on 3 modeling assignments, <ul style="list-style-type: none"> • an M mark on 4 essays <ul style="list-style-type: none"> • Pass the syllabus quiz
D	<ul style="list-style-type: none"> • 6 or fewer <u>unexcused</u> absences and otherwise prepared for the class and engaging, • Satisfactory marks (M or E) on 2 modeling assignments, an M mark on 3 essays <ul style="list-style-type: none"> • Pass the syllabus quiz

After calculating the base grade, to determine the modification to the grade, use the following guidelines:

- Move up one letter grade (for instance from C to B) if you have **50** or more engagement credits.
- Add a plus (for instance B changes to B+) if you have **42** or more engagement credits.
- Keep the same letter grade (for instance B remains B) if you have between **12-42** engagement credits.
- Add a minus (for instance B changes to B-) if you have fewer than **12** engagement credits.

Important Policies and Resources

Academic Integrity

Every member of the University community is expected to maintain the highest standards of academic integrity. A student shall not submit work that is falsified or is not the result of the student's own effort. Infringement of academic integrity by a student subjects that student to serious penalties, which may include failure on the assignment, failure in the course, suspension from the University or other sanctions. Please consult [Brandeis University Rights and Responsibilities](#) for all policies and procedures related to academic integrity. Students may be required to submit work via TurnItIn.com or similar software to verify originality. A student who is in doubt regarding standards of academic integrity as they apply to a specific course or assignment should consult the faculty member responsible for that course or assignment before submitting the work. Allegations of alleged academic dishonesty will be forwarded to

the Department of Student Rights and Community Standards. Citation and research assistance can be found at [Brandeis Library Guides - Citing Sources](#).

Breaks

Class meetings of 90 minutes include a 10-minute break, while class meetings of 180 minutes include two breaks, at the instructor's discretion.

Classroom Health and Safety

- Register for the [Brandeis Emergency Notification System](#). Students who receive an emergency notification while attending class should notify their instructor immediately. In the case of a life-threatening emergency, call 911. As a precaution, review [this active shooter information sheet](#).
- Brandeis provides [this shuttle service](#) for traveling across campus or to downtown Waltham, Cambridge and Boston.
- On the Brandeis campus, all students, faculty, staff and guests are required to observe the university's policies on physical distancing and mask-wearing to support the health and safety of all classroom participants. Face coverings must be worn by all students and instructors in classes with in-person meetings. Students and faculty must also maintain the appropriate 6 feet of physical distance from one another when entering, exiting, or being in the classroom and continue to sit in seats assigned by the professor to assist the university in its contact-tracing efforts. All faculty and students must also clean their work areas before and after each class session, using the sanitizing wipes provided by the University. (Classrooms will also be professionally cleaned by Brandeis custodial staff multiple times per day.) Review up to date [COVID-related health and safety policies](#) regularly.

Course Materials/Books/Apps/Equipment

If you are having difficulty purchasing course materials, please make an appointment with your Student Financial Services or Academic Services advisor to discuss possible funding options, including vouchers for purchases made at the Brandeis Bookstore.

LATTE

[LATTE](#) is the Brandeis learning management system. Login using your UNET ID and password. For LATTE help, contact Library@brandeis.edu.

Library

[The Brandeis Library](#) collections and staff offer resources and services to support Brandeis students, faculty and staff. Librarians and Specialists from Research & Instructional Services, Public Services, Archives & Special Collections, Sound & Image Media Studios, MakerLab, AutomationLab, and Digital Scholarship Lab are available to help you through consultations and workshops.

Privacy

To protect your privacy in any case where this course involves online student work outside of Brandeis password-protected spaces, you may choose to use a pseudonym/alias. You must share the pseudonym/alias with me and any teaching assistants as needed. Alternatively, with prior consultation, you may submit such work directly to me.

Student Support

Brandeis University is committed to supporting all our students so they can thrive. If a student, faculty, or staff member wants to learn more about support resources, the [Support at Brandeis](#) webpage offers a comprehensive list that includes these staff colleagues you can consult, along with other support resources:

- The [Care Team](#)
- [Academic Services](#) (undergraduate)



- [Graduate Student Affairs](#)
- Directors of Graduate Studies in each department, School of Arts & Sciences
- Program Administrators for the Heller School and International Business School
- [University Ombuds](#)
- [Office of Equal Opportunity](#).