

TEACHING ASSISTANT HANDBOOK

Teaching Committee
Department of Chemical and Biological Engineering
Northwestern University

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TEACHING ASSISTANT RESPONSIBILITIES

The PhD Student Handbook states the following:

All students in the PhD program must complete four (4) quarters of duties as a teaching assistant (TA) for a CHEM_ENG or MBIOTECH course or a department-assigned substitute. Department-assigned substitutes may include organizing graduate student recruiting or mentoring the department's iGEM team. The program considers teaching experience to be an essential part of a student's graduate education. Therefore, there are generally no exceptions to the teaching requirement, even if an internal fellowship (e.g., ISEN) requires service as a TA for a non-departmental course or activity or a student possesses an external fellowship.

A typical time commitment of a TA is 8 hours per week, depending on the course and instructor, and is not intended to significantly supplant research activities for the quarter. Some students may be assigned as a 'paid' TA, which requires additional time commitment, and is intended to be in lieu of some research activities for that quarter. Students on external fellowship (e.g. NSF Graduate Research Fellowship) should not generally act as a 'paid' TA. There is an excellent student-generated document that can help students manage expectations for the various courses to which they may be assigned. Student input is sought when TA positions are assigned, but a student cannot be guaranteed a particular position.

Every year, a faculty committee uses CTEC scores and nomination forms to select several graduate students who perform their TA duties outstandingly. The winner(s) receive a plaque and a cash award.

In quarters that a student is acting as a TA, they must sign up for GEN ENG 545, a zero-unit course, for tracking purposes. Students acting as a 'paid' TA should sign up for GEN ENG 546. Failure to sign up for these courses could jeopardize the student's ability to graduate.

Each year, the department will solicit student preferences for courses they would like to TA. Additionally, faculty can request specific students to TA a course if they either have students in mind, want their own students to TA for them, or if a student reached out to them with specific interest in TAing for them. If you are interested in TAing a specific course with a specific professor, we *highly recommend* discussing this with them ahead of time and notifying them of your interest and that you will be ranking them as your top choice TA preference.

Note, first-year graduate students do not get to put preferences down, but rather are assigned courses to TA based on their undergraduate research and transcript. First-year graduate students never TA in the fall of their first quarter.

Undergraduates can ask to serve as a TA for the department and can be granted such with approval of the professor and department.

TAs are reviewed by the students in the class via CTECs (Course and Teacher Evaluation Council surveys) at the end of the quarter. We recommend that you save all your CTECs by downloading the document upon receiving the email that they are ready to view, as these scores can be helpful later on when applying for jobs, particularly those interested in faculty positions. Additionally, the

scores are useful when applying for the Teaching Apprenticeship Program (TAP) within the department. At the very least, they are useful for your records so you can receive and respond to feedback and track progress or strengths over the years you TA here.

Graduate students in the PhD program must TA 4 quarters. Serving on the recruitment committee, serving as the iGEM team advisor, and participating in the Teaching Apprenticeship Program (see section below) each count as a TA requirement for the year served.

PAID TA

The department selects a few students each year to serve as paid TAs.

It is important to note that students who are paid TAs are not personally paid more than regular TAs. Instead, the paid TA position indicates that the department is paying for your graduate student salary that quarter rather than your PI or other grants. It is not always up to the student whether or not they are a paid TA, but it might be useful to offer to be one if you know you need funding for given quarter.

Paid TAs are typically expected to work twice as many hours as regular TAs, and as a result are often (but not always) the only TA for a class, rather than splitting the course responsibility across two or three students.

TA TIMELINES IN THE CHBE DEPARTMENT

The table below shows the typical timeline of TAs in our department.

Table 1. TA Timelines in the Department

1 st YEAR	2 nd YEAR	3 rd YEAR	4 th YEAR	5 th YEAR+
Graduate Student Teaching Conference				
TA (Winter or Spring only)	TA	TA	TA	
				Teaching Apprentice Program (either 4 th or 5 th year)

TEACHING APPRENTICESHIP PROGRAM (TAP)

Each year the department selects 2-3 students to participate in the Teaching Apprenticeship Program (TAP). We highly recommend you participate in this program if you are interested in a career in teaching, but it is not exclusively available or useful to only those students.

The PhD Student Handbook states the following with regards to TAP:

A special opportunity for students interested in academic careers is the program's Teaching Apprenticeship Program (TAP). Graduate students admitted to the TAP work closely with faculty mentors to teach two to four weeks of a course, typically a core undergraduate chemical engineering class. The apprentice teaches the course as a faculty member would, preparing lectures, assigning homework, and writing and grading quizzes and exams. The faculty mentor attends the apprentice's lectures and provides feedback. The apprentice's performance is also evaluated formally by the students in the class.

Interested students typically apply to the Teaching Apprenticeship Program (TAP) in the spring prior to their fourth or fifth year. The Graduate Committee evaluates applicants to the program and selects 2-3 qualified students. In the event that a Graduate Committee faculty member is the advisor of a TAP applicant, an alternative faculty member is appointed by the Department Chair. TAP participants are excused from the usual teaching assistant assignment during the year in which they serve as an apprentice. TAP participants are often, but not exclusively, interested in academic careers.

HOW TO APPLY

Each year, approximately spring or early summer, the department will solicit applications for the TAP. For the application, you must provide the following for the selection committee:

- A CV
- A cover letter that details your reason for wanting to participate in the program, the classes you are interested in teaching and why, and a summary of any discussions that you have already had with faculty members about their class
- Other information such as CTEC scores and TA evaluation comments

We *highly recommend* you discuss ahead of time with the professor of interest you would like to teach with during TAP. You may even want to talk to multiple professors and have a list of possible options. You will outline this information in the requested cover letter.

Once selected for TAP, you and the department chair will decide with which professor and class you will do TAP. It generally works out that there is only one TAP student per undergraduate level.

DIVERSITY, INCLUSION, ANTI-RACISM, AND EQUITY

TAs encounter and interact with a variety of faculty and students, and it is important to be understanding and respectful in these interactions. This section covers two types of differences you may encounter amongst faculty and particularly students: different types of learners and different types of backgrounds. We provide basic information on each subject as well as advice for the TA on how to interact with students of all types.

DIFFERENT TYPES OF STUDENT LEARNING

As a TA you will encounter different types of learners, and you can cater to different student's learning goals and needs. A student's learning style may even change between classes, depending on their level of interest or skill level associated with a given class. Table 2 below lists the three types of student learners—surface, strategic, and deep—and how these learners work through a class as well as what they need from a TA for support through that process.

Table 2. Different types of student learners and strategies for TAs for aiding each type.

	SURFACE	STRATEGIC	DEEP
INTENTION	Cope with course requirements	Achieve high grades	Understand for oneself
PROCESS	Memorize facts and procedures Study with little reflection Treat course as unrelated bits of knowledge	Put consistent effort into studying Manage time well Focus on assessment requirements and criteria	Relate ideas to previous knowledge Look for patterns and underlying principles Check evidence for conclusions
TA APPROACH	Transmit knowledge	Help connect concepts	Encourage conceptual understanding

Biggs, 1999; Entwistle, 1997; Entwistle, 1991 (in Bradford); Franson, 1977; Heikkilä & Lonka, 2006; Prosser & Trigwell, 1999; Trigwell, Prosser, & Waterhouse, 1999; Vermetten, Lodewijks, & Vermunt, 2001; Campbell et al., 2001; Trigwell, 1999

DIFFERENT TYPES OF STUDENT BACKGROUNDS

As a TA, you will find your classroom also filled with students of different backgrounds. Differences in background mean many things: culture and diversity; socioeconomic status; learning, physical, or mental disabilities/limitations/difficulties; and different technical backgrounds. It is important to understand and respect all students and strive to practice teaching in a way that fosters an equitable environment to ensure all students feel accepted and are able to succeed. Table 3 below offers basic examples of these differences and how you as a TA can ensure that you are respecting all your students and serving as the best resource possible.

Table 3. Different types of student backgrounds and how TAs should approach each type.

	CULTURE & DIVERSITY	SOCIOECONOMIC STATUS	LEARNING, PHYSICAL, OR MENTAL DISABILITIES/ LIMITATIONS/ DIFFICULTIES	TECHNICAL BACKGROUNDS
EXAMPLES	<p>Different personal boundaries or methods of social engagement</p> <p>Different political affiliations, ethnic identities, sexual identities</p> <p>Different ways of relating to other students or the professor</p> <p>Language barriers</p>	<p>Different family backgrounds related to education, income, and occupation</p> <p>Varying access to resources</p>	<p>Difficulty with certain physical tasks, such as moving, writing, seeing, hearing, etc.</p> <p>Difficulty with reading, learning, or focusing</p> <p>Difficulty with emotional and mental states or taking care of oneself, such as anxiety or depression</p> <p>Chronic medical conditions, such as chronic pain, skin conditions affecting appearance, etc.</p> <p>NOTE: not all of these are visible, and these can be identities much like sexuality and race</p>	<p>Different levels of knowledge of each subject (based on quality and type of school attended previously, or even based on who taught a previous course required for the one you're TAing, or if elective vs core course)</p> <p>Masters and PhD students especially, as many come in with different undergraduate degrees</p>
TA APPROACH	<p>Don't make assumptions about what students are like, have experienced, have access to, or need/don't need</p> <p>Ask yourself why are you making that assumption about a student? Is it a personal bias?</p> <p>Adapt your way of communicating and relating to each student to respect boundaries</p>	<p>Don't make assumptions about ability to access resources (e.g. stable internet, computers, textbooks, food, secure places to live)</p> <p>Share university resources (Student Enrichment Services) to promote student success and meet needs</p>	<p>Don't make assumptions about what students can do</p> <p>Don't single out a student with a disability Be patient, provide help when asked or offer when appropriate</p> <p>Be conscious of ableism— Can all my students do this problem/activity I'm proposing? Can you offer something in multiple forms to ensure everybody can access it equally?</p> <p>Be careful with how you talk about disabilities—Use these words as prepositions (ex: "a person with anxiety", "a person with a learning disability") to put the person first. They are not their disability.</p> <p>Encourage use of Northwestern resources (again, if appropriate to bring up)</p>	<p>Don't make assumptions about what students know</p> <p>Explain relevant missing background to those that need it</p> <p>Adapt level of detail and scope of explanations to student needs</p> <p>Guide students through problems using guided questions</p>

TEACHING ASSISTANT RESOURCES

SEARLE CENTER

The Searle Center for Advancing Learning and Teaching has a wealth of resources for faculty, graduate students, and undergraduates to enhance learning and teaching. Specifically, for graduate students and post-docs, The Searle Center offers various programs and services:

- [Graduate Student Teaching Conference](#)
 - (mandatory for all first-year ChBE graduate students)
- [Teaching Certificate Program](#)
- [Graduate Teaching Mentors](#)
- [Graduate Teaching Fellows](#)
- [Feedback on Teaching](#)
- [Center for Integration of Research, Teaching and Learning \(CIRTL\) at Northwestern](#)
- [Workshops on teaching and learning](#)

You can find general information on the Searle Center at the following link:

<https://www.northwestern.edu/searle/index.html>

TEACHING STRATEGIES AND MATERIALS

Searle provides a list of teaching resources here on a variety of topics such as teaching strategies and materials and assessments of student learning:

<https://www.northwestern.edu/searle/resources/index.html>

Searle also provide materials on teaching strategies including:

- Diversity in the classroom
- Course design
- Teaching methods
- Teaching and learning with technology
- Grading and assessment
- Evaluating courses and instruction

You can find these resources and more at the following Searle Center link:

<https://www.northwestern.edu/searle/resources/teaching-strategies-materials.html>

INCLUSIVE TEACHING PRACTICES AND RESOURCES

Searle also provide resources on fostering inclusive learning environments here:

<https://www.northwestern.edu/searle/initiatives/diversity-equity-inclusion/inclusive-learning-environments.html>

They also provide a list of campus resources here, including AccessibleNU, Counseling and Psychological Services (CAPS), LGBTQIA+ Resources, and Office of Institutional Diversity and Inclusion:

<https://www.northwestern.edu/searle/initiatives/diversity-equity-inclusion/campus-resources.html>

CENTER FOR INTEGRATION OF RESEARCH, TEACHING, AND LEARNING (CIRTL)

The Center for Integration of Research, Teaching, and Learning is a national network of universities focused on developing future faculty. There are on-campus events at Northwestern, including Mentored Discussions of Teaching, Searle Teaching-as-Research Program, and CIRTL Workshop Series. You can also connect online through journal clubs, workshops, and courses hosted by CIRTL. You can find their resources here:

<https://www.northwestern.edu/searle/initiatives/grad/cirtl/index.html>

ACCESSIBLENU

AccessibleNU is Northwestern's office dedicated to equal access to education and university life. Through this office, you or your students can receive academic and exam accommodations. You can find out more about their resources here:

<https://www.northwestern.edu/accessiblenu/>

STUDENT ENRICHMENT SERVICES

Northwestern's Student Enrichment Services partners with first-generation, lower-income, and/or DACA/undocumented students to foster identity development, navigate campus resources, and build community. You can find their resources here:

<https://www.northwestern.edu/enrichment/index.html>

<https://www.northwestern.edu/enrichment/resources/top-ten-list-of-resources-for-fgli-students.html>

TITLE IX RESPONSIBLE EMPLOYEE

As a TA, you are a "responsible employee," meaning that you are required to report all allegations of discrimination and sexual misconduct (including sexual assault, sexual exploitation, dating violence, domestic violence, stalking, and sexual harassment) to the Title IX coordinator in Northwestern's Office of Equity. This includes incidents that happened off-campus involving a member of the Northwestern community.

The Title IX FAQs offers suggestions of how to talk about your reporting obligation as a responsible employee before an incident is disclosed to you and resources of how to report. You can find resources about Title IX and reporting sexual misconduct here:

<https://www.northwestern.edu/sexual-misconduct/title-IX/faqs.html>

https://www.northwestern.edu/sexual-misconduct/docs/ReportingResponsibilities_092418.pdf

HOW TO BOOK A ROOM

As a TA, one of your responsibilities may be to book a room for office hours. This can be done through 25Live for any room at Northwestern or through Mudd Library specifically.

25LIVE

You can book rooms in any building on campus through 25Live. You can specify the date, number of people, whether or not the event recurs, and other useful specifications. This can be useful if you are in charge of booking rooms for office hours. You can use the following link to book rooms:

<https://25live.collegenet.com/pro/northwestern#!/home/dash>

MUDD

You can also book rooms in Mudd Library. These are more useful for smaller groups, but there are a few larger rooms. You can use the following link to book rooms:

https://northwestern.libcal.com/booking/mudd_group

LIGHTBOARD

The Lightboard is located in the Lightboard Studio in Mudd Library. The Lightboard is a piece of technology where you can record yourself writing, as if on a white board, but the board is clear and when the video is processed, it will show you behind the board and flip the writing automatically to be readable to the audience. Alternately, you can project PowerPoints and animate in things as you wish.

This can be a great way to provide extra resources for students outside of the classroom, such as examples of working through problems or explanations to concepts.

You can sign up for the Lightboard Studio as you would other rooms in Mudd using the link below.

<https://digitallearning.northwestern.edu/article/2016/04/12/lightboard-studio>

TEACHING COMMITTEE

The ChBE Department Teaching Committee, led by a group of graduate students and one faculty sponsor, provides resources for all department teaching assistants (TAs). We provide the following resources:

- Answer questions for any and all TAs
- Provide tips and guidance on office hours, maneuvering through any tricky TA-student dynamics, and constructing positive TA-professor relationships
- Write and update the TA Handbook to serve as a resource for finding information, requirements, and resources
- Provide a one-on-one TA Mentor upon request to serve as a personal guide, mentor, and point of contact

We also host a variety of seminars and workshops to serve as a resource to students.

COFFEE CHATS

We schedule open, informal Q&A style discussions with faculty members on selected topics relating to teaching. Topics include, but are not limited to, lesson planning, course design, running lab classes, and teaching styles/methods. These chats generally last an hour and Panera coffee and cookies are provided!

Some previous Coffee Chats have been as follows:

- Teaching Different Student Cohorts (Dr. Danielle Tullman-Ercek, WQ 2018)
- Technology as a Teaching Tool in the ChBE Classroom (Dr. Wes Burghardt, SPQ 2018)
- Developing and Teaching a Class for the First Time (Dr. Linsey Seitz and Dr. Jeff Richards, WQ 2019)
- Adapting Your Teaching: Implementing and Evaluating Changes to your Class (Dr. Jennifer Cole, FQ 2019)
- Teaching Across the Years: From Freshman to Seniors to Graduate Students (Dr. Mike Jewett, WQ 2020)

These chats are a great opportunity to learn more about a specific topic related to teaching and the professor hosting the topic.

TA WORKSHOPS

We provide workshops to graduate students with opportunities to improve various teaching skills. Several topics can be covered in a single workshop.

Topics include but are not limited to:

- Navigating office hours
- Creating positive TA/Professor relationships
- Designing exam review sessions
- Balancing commitments to research during your TA quarter
- Organizing your teaching portfolio for faculty applications

We welcome any of your suggestions for additional workshop topics!

Materials from TA Workshops will be added to the appendix of this handbook over time so the resources will be available for future students.

TEACHING ASSISTANT HANDBOOK

The teaching committee is responsible for developing and maintaining this Teaching Assistant Handbook.

PROFESSIONAL DEVELOPMENT SEMINAR

The Teaching Committee typically leads one session during First-Year Professional Development Seminar in the fall quarter detailing all the above information about their role in the department, Diversity and Inclusion in the classroom, and questions first-years have about TAing in general.

CONTACT

You can contact the ChBE Department Teaching Committee with any questions regarding the committee, TAing in general, or come to us for advice or with concerns via email:

chbe.teaching@gmail.com

CHBE COURSES AND DESCRIPTIONS

Table 4. Chemical and Biological Engineering Department (CHEM ENG) courses with descriptions (including material and typical structure), quarter typically offered, student populations in the class, and the type of class (core vs elective).

#	TITLE	DESCRIPTION	QUARTER	STUDENTS	CORE VS ELECTIVE
190	Engineering of Chemical and Biological Processes	Survey of engineering principles related to chemical and biological transformations, economics, ethics, and nontechnical constraints		Freshmen	
210	Analysis of Chemical Process Systems	Intro to chemical engineering; energy and mass balances	Fall Spring	Freshmen Sophomores	Core
211	Thermodynamics	Fundamental laws, enthalpy/entropy, process engineering thermo	Fall Winter	Sophomores	Core
212	Phase Equilibrium and Staged Separations	Multi-phase mixtures, distillation, McCabe-Thiele	Winter Spring	Sophomores	Core
275	Molecular and Cell Biology for Engineers	Intro to cell and molecular biology; foundation for modern biotech and bioengineering	Winter		Core
307	Kinetics and Reactor Engineering	Reactor design equations; reaction rates and mechanisms described through ordinary differential equations; analysis of rate data;	Spring	Juniors	Core

		typically weekly homework assignments, a few exams and a final (varies by instructor)			
312	Probability and Statistics for Chemical Engineers	Intro to probability theory and statistical methods; analyzing behaviors of processes and experiments	Winter		Core
321	Fluid Mechanics	Shear stress, shell balance, Bernoulli equation, Navier-Stokes. Typically homeworks most weeks and about 3 exams. Deem textbook, homework problem from the book. 2-3 Experimental labs (varies by instructor)	Fall	Juniors	Core
322	Heat Transfer	Differential equations; energy transport in different geometries; heat exchangers	Winter	Juniors	Core
323	Mass Transfer	Diffusion and convective mass transfer; chemical and biological process applications	Spring	Juniors	Core
330	Molecular Engineering and Statistical Mechanics	Introduction to stat mech, application of stat mech in liquid/mixture, transport/kinetic, transition state theory, a little bit molecular simulation. Typically 2 exams and homeworks (few coding) (varies by instructor)	Winter Spring		Elective
341	Dynamics and Control of Chemical and Biological Processes	Modeling and controlling dynamic (time-dependent) processes; Laplace transforms; PID control; Homework sets with math and MATLAB/Simulink problems, generally multiple exams and a final	Winter	Seniors	Core
342	Chemical Engineering Laboratory	Unit operations laboratory; typically operates one day a week for several hours; students write lab reports and give presentations; help students troubleshoot labs and oversee work	Fall Winter Spring	Seniors	Core
345	Process Optimization for Energy Sustainability	Optimization theory, linear, non-linear, mixed-integer, stochastic optimization. GAMS software	Winter	Juniors Seniors	Elective
351	Process Economics, Design, and Evaluation	ASPEN HYSYS plant simulation, HYSYS tutorials, process lectures (includes economics, controls, etc.); students typically have weekly homework sets; Typically two midterms and a final (varies by instructor).	Fall Winter	Seniors	Core
352	Chemical Engineering Design Projects	HYSYS project; weekly progress report presentations; midterm and final presentations	Winter Spring	Seniors	Core
355	Chemical Product Design	Case studies; properties and selection of chemicals; product design methods.	Spring	Juniors Seniors Grads	Elective
361	Introduction to Polymers	Polymer chemistry (1 st half) and polymer physics (2 nd half). Chemistry side will focus on synthesis of common polymers;	Fall (if offered)	Undergrads Grads	Elective

		physics will be on things like glass transition temperature. Typically homework every 2 weeks with 3 exams (varies by instructor). Lab will require lab reports, and projects and project paper			
364	Chemical Processing and the Environment	Chemistry and mechanisms, reactions and rate, transport phenomena in environmental problems; risk assessment and analysis; case studies			Elective
365	Sustainability, Technology, and Society	Technical discussion on sustainability topics; bio-fuel, water purification, policy, risk assessment	Varies	Juniors Seniors	Elective
367	Quantitative Methods in Life Cycle Analysis	Modeling mass and energy flows, environmental impact analysis, engineering decision methods	Spring (mostly)		Elective
372	Bionanotechnology	Examine nanoscale phenomena in biological systems; self-directed exploration of bionanotechnology landscape	Winter		Elective
373	Biotechnology and Global Health	Survey of the application of biotechnology for global health topics such as diagnostics and medicine; involves semester long group project	Fall	Undergrads Grads	Elective
375	Biochemical Engineering	Bioreactor design; nutrient analysis in bioreactors	Winter (if offered)	Undergrads Grads	Elective
376	Synthetic Biology	Literature focused course introducing and exploring synthetic biology research; periodic homework assignments, exams, and a final	Fall (if offered)	Undergrads Grads	Elective
377/ 477	Bioseparations	Unit operations applied to separations of biological samples, including column chromatography, centrifugation, and filtration; students have homework and exams	Winter	MBP Undergrads	MBP Core ChBE Elective
379	Computational Biology: Principles and Applications	Introduction to a variety of computational methods, spanning machine learning, ordinary differential equations, and agent-based models, in the context of synthetic biology examples and literature; periodic homework assignments and research-based project	Spring (if offered)	Undergrads Grads	Elective
381	Practical Biological Imaging				Elective
382	Biotechnology Regulatory Science	A guest-lecture based course about process of applying for drug approval from FDA with a group project and periodic assignments for that project	Winter	MBP Grads	MBP Core ChBE Elective
390	Personal and Organizational Effectiveness	Intro to non-technical skills required in business environment; improve marketability of future graduates		Seniors Grads	Elective

395	Special Topics in Chemical Engineering*	See Table 5 below	Varies	Undergrads BS/MS Grads	Elective
404	Advanced Thermodynamics	Maxwell Relations, Partition Functions, Ensembles; Typically 4 homework sets and 2 midterms (varies by instructor)	Winter	BS/MS Grads	Grad Core
406	Selected Topics in Thermodynamics	Varies; No TA	Spring	BS/MS Grads	Elective
408	Chemical Engineering Kinetics and Reactor Design	Transition State Theory, Pseudo-Steady-State, Reactors; Typically weekly homework sets, and several midterms and 1 final (varies by instructor)	Fall	BS/MS Grads	Grad Core
409	Advanced Reactor Design	Reactor design, scale-up and optimization; Extension of 408.		Grads	Elective
410	Principles of Heterogenous Catalysis	Transition state theory, kinetics and mechanisms of reactions on surfaces, catalyst characterization, structure of solids, acidity of zeolites, shape selectivity, surfaces of metals and alloys, chemical bonding, trends in surface reactivity, active sites, mass transfer limitations in surface-catalyzed reactions and catalysis over metals, metal oxides, metal sulfides and zeolites; grade homework and provide feedback on final project presentations; recommended you take before TAing	Winter (even years)	Grads	Elective
421	Fluid Mechanics	Mathematical methods, PDE/ODE, Boundary Layer Theory, Typically weekly homework sets, a midterm and final (varies by instructor)	Fall	BS/MS Grads	Grad Core
422	Heat and Mass Transfer	Self-Diffusion, Transport Limitation, Heat exchanger	Winter	BS/MS Grads	Grad Core
451	Applied Molecular Modeling	Molecular Dynamics, Monte Carlo Simulation, Quantum Chemistry; Typically weekly homework sets and a project with final paper and presentation (varies by instructor)			Elective
462	Viscoelasticity and Flow in Polymer Systems	Fundamentals of polymer rheology; polymer processing behavior, kinetic-molecular theories, measurements.			Elective
463	Polymerization Reaction Engineering	Molecular weight distributions, batch, CSTR, PFR design for optimal polymerization; emulsion and catalyzed polym.; photoresist technology.	Varies (if offered)		Elective
478	Advances in Biotechnology	Seminar based course covering a variety of biotechnology related topics		Grads BTP	Elective BTP Core
489	Selected Topics in Chemical Engineering	Varies			

Table 5. CHEM ENG 395 Special Topics Courses descriptions, quarter typically offered, student populations in the class, and the type of class (core vs elective).*

#	TITLE	DESCRIPTION	QUARTER	STUDENTS	CORE VS ELECTIVE
395	Protein Engineering	Design of proteins for synthetic biology and bioprocess applications	Winter (if offered)	Undergrads Grads	Elective
395	Quantum Mechanics and Path Integrals			Undergrads Grads	Elective
395	Advanced Principles of Biomolecular Engineering				
395	Advanced Probability and Statistics	Distributions, sampling, hypothesis testing. Typically involves homework sets and a project			
395	Graduate Probability and Statistics				
395	Electrochemistry				
395	Structure and Dynamics of Soft Materials				
395	Introduction to Differential Geometry				
395	Introduction to Statistical Thermodynamics				

*NOTE: A 395 course is a “pilot” course. Often, they become officially numbered classes. This list will be a moving target.

Table 6. Masters in Biotechnology Program (MBIOTECH) course descriptions, quarter typically offered, student populations in the class, and the type of class (core vs elective).

#	TITLE	DESCRIPTION	QUARTER	STUDENTS	CORE VS ELECTIVE
MBP 301	Balances and Kinetics for Bioprocessing	Pseudo Energy and Mass Balances for MBP biology B.S. students	Fall	MBP	
MBP 476-2	Properties and Separation of Biologically Produced Molecules	Separations course with focus on pharmaceutically related molecules	Fall	MBP	Core
MBP 302	Fluids and Mass Transfer for Bioprocessing	Elementary transport course for MBP biology B.S. students	Winter	MBP	
MBP 476-1	Kinetics, Energetics, and Bioreactor Design	Bio-focused Kinetics and reactor design fusion, greater qualitative focus; Typically weekly homeworks and periodic exams	Spring	MBP	Core

For more information, please visit the department’s website of classes:

<https://www.mccormick.northwestern.edu/chemical-biological/academics/courses/>

APPENDIX

This appendix includes supplementary documents such as:

- Searle Handout: “Questions to ask as a Teaching Assistant at Northwestern”
- Materials from TA Workshops
- Information about specific teaching methods/resources such as remote teaching

SEARLE HANDOUT: QUESTIONS TO ASK AS A TEACHING ASSISTANT

Searle provides the following handout for Teaching Assistants at Northwestern University. This document outlines most of the possible questions you could ask a professor during the first meeting with them to outline course structure, your responsibilities, and what you'd like to get out of the quarter. The handout format has been adapted to match the style of this handbook. Additionally, text in blue is was added by a member of the Teaching Committee to include questions that they felt were missing.

QUESTIONS TO ASK AS A TEACHING ASSISTANT AT NORTHWESTERN

Given the wide range of teaching assistant roles at Northwestern University, it is important to understand your responsibilities. We recommend you meet the faculty member in charge of the course *before* the beginning of the quarter. The following list of questions is intended to guide your discussion. Not all may be relevant to your context, and you may need more than one meeting to address them.

TA RESPONSIBILITIES

It is important to be aware of any potential scheduling conflicts you may have with key events in the course. Be prepared at your first meeting with the course instructor to highlight any potential schedule conflicts you may have. The quicker you address possible conflicts, the easier it will be to resolve them.

Some questions about teaching responsibilities to consider asking at your meeting:

- Will we meet regularly to discuss students and/or the course? If so, how often?
- What is the expected time commitment?
- How many office hours should I hold each week?
- Do I need to attend class?
- Will I be expected to lead review sessions for midterms/final exams?
- Do I need to help write exams or quizzes? Will I be expected to proctor exams?
- Do I need to manage (or have access to) the course Canvas site?
- Will I be asked to present lectures? If not, can I request this opportunity?
- Will I need to lecture in your absence if you miss class? Will I be given any guidance?
- Will I be evaluated? By whom? How will I be informed of the results of any evaluation?
- What would you like me to get out of my TA experience? Do you have any particular goals for me?

CLASS FORMAT

Note: Even if the course has a syllabus, it can be helpful for the TA to provide their own brief section syllabus or handout to articulate expectations and section policies. For example, if you are responsible for participation, how will you assign points? Make sure to receive clarification from the instructor as to the following:

- Do I need to develop my own syllabus or will one be provided? Will the faculty be designing and planning the content of sections or will I be expected to do so?
- If there are multiple TAs, do you want all the sections/labs to be similar in format/content? If so, who will be providing guidelines?
- If students work in groups, should they self-organize or should we assign them?
- What role would you like me to play during class (lecture/main class meeting)?
 - Would you like me to observe or gauge the interest/reaction of the class?
 - Would you like me to participate in discussions during class?
 - May I offer my ideas during lecture?
 - Should I be a liaison between the students and you?
- Will I be teaching labs?
 - Will the lab lectures be provided to me?
 - If I cannot vary the content, may I vary the format of the labs? For instance, could I bring in real-life example or ask some higher-level questions during the lab?
- Will I be leading problem-solving sections?
 - What role does the section serve in this course?
 - Will I have an opportunity to apply theory to problems? To address student questions? To review material for exams?
- Will I be leading discussion sections?
 - What role does the discussion section serve in this course?
 - Will I be expected to recap lectures? Adding supplemental material? Address student questions?

LEARNING GOALS

- What are the learning goals for the course?
- Will I be involved in reviewing/modifying the course goals? The course syllabus?
- Are there any goals for which I will be primarily responsible as the TA?

GRADING STRATEGIES

- What is the grading breakdown for the course? What is the grading/scoring system?
- Is there a particular portion of the course grade that I am responsible for as a TA?
 - Will participation in the lecture and/or sections be assessed? How?
 - Will I be responsible for grading homework? Essays? Journals? Lab reports?
 - Will I be responsible for grading quizzes? Midterms? Exams? Final Projects?
 - Are there any particular formats/special instructions for the material that I am grading?
- If there are multiple TAs, do you expect grading to be consistent across sections? If so, how?
- Will I be given answer keys/rubrics or will I have to prepare them?

- When grading homework, should I be concerned with the student's approach to the problem or simply the final answer?
- Should we grade anonymously (using Student ID number rather than names)?
- How will grading be delegated or divided between TAs? Between TAs and faculty?
 - Should the same instructor always grade the same students to track progress or should instructors swap students after each assignment?
- Can we discuss grading after I receive the first assignment?
- What is the expected turnaround time for grades?
- Who records the grades?
 - Where are grades recorded?
 - How do we communicate student grades with one another without violating FERPA laws?
- How should I handle students' grading concerns?
- Will solutions be posted for the students to see?
 - When will solutions be posted?
 - Who is responsible for posting solutions?

ASSIGNMENTS/FEEDBACK

- How involved should/can/will I be in creating projects and assignments?
- Are there any group projects? If so, how will we assess group work?
- Should I give students written or in-person feedback?
 - When should I give students feedback on assignments?
 - Do you have a preference for the type or amount of feedback I give?
 - How many hours do you expect me to spend on written feedback?
 - How much attention should I pay to spelling, grammar, style, and presentation?
- How do we handle student deadlines?
 - Under what circumstances can extensions be granted?

ADDRESSING STUDENT INTEGRITY AND ISSUES

- Can students collaborate on homework/lab reports?
- How does the honor code pertain to your course?
- What steps would you like me to take to detect instances of plagiarism?
 - What do I do if I suspect someone of cheating?
- What do I do if I have behavior problems in my section?
- What do I do to address absences or missed work?
- What do I do if I suspect mental health issues with one of my students?
- What do I do if I suspect substance abuse with one of my students?
- If students have questions or issues they want to resolve, should they come to me first or you? Are there exceptions for any particular questions or issues?

COURSE MATERIALS

- Will you provide me with a textbook and/or other reference materials for the course?
- Where do I get supplies that I may need (e.g., copies)?

- Do I need to put materials on reserve/electronic reserve?
- Do I need to put together the course pack for the course?
- Do I need to make photocopies for the course?
- Has my name & NetID been added to the CTEC evaluation site by the department assistant so I can get access to my TA-specific comments?
- What software will be used in the course (e.g, Canvas, Zoom, ASPEN/HYSYS, MATLAB, Simulink, etc)?
 - How will I get free access to these programs?

COMMUNICATION WITH STUDENTS

- What is the preferred method of communication with students (e.g., Canvas, personal email, etc.)?
- Can I set boundaries on expected communication turnaround time (e.g., guarantee a response within 24 or 48 hours)?

PERSONAL AND PROFESSIONAL DEVELOPMENT

- Discuss what you would personally like get out of your TAship.
 - Consider if you would like any experience lecturing or helping to develop homework and exams. Let your instructor know and ask if you can have the chance to do so.
- Evaluations can be useful for developing teaching skills, and later for showcasing your ability as a TA/teacher when applying for jobs and programs.
 - Typically, you will only be evaluated at the end of the quarter. If you want the chance to get feedback more often, consider a mid-quarter assessment by students and/or the instructor, or an assessment right after you teach a lesson if you do so.

Adapted from Vanderbilt University's 'Possible TA Questions for Course Heads' handout, NU Linguistics Department's 'Outline of TA Responsibilities' worksheet, and NU Learning Sciences' Department 2007 New TA Training workshop. Blue texted added by Alex Prybutok in 2020.

TEACHING ASSISTANT WORKSHOP WINTER 2020

This section covers the material covered during the Winter 2020 Teaching Assistant Workshop held by the Teaching Committee. The parts of the document that were redundant with the TA Handbook have been removed.

RESOURCES FOR TAS FROM OTHER SCHOOLS

We have placed a few resources/guides about TAing in the folder provided with this workshop.

This resource, provided by the Office for Faculty Development at the University of Massachusetts Boston, contains a lot of guidelines on a variety of topics such as TA training, creating a teaching portfolio, a guide for future faculty, and good practices for undergraduate education.

https://www.umb.edu/ofd/resources_for_graduate_student_instructors_tas

This resource, provided by the Center for Teaching and Learning at the University of Georgia, contains information on creating a teaching portfolio, writing teaching statements, and a grad student published magazine that publishes information on teaching strategies.

<https://ctl.uga.edu/grad-student/resources-and-ta-handbook/>

This resource, provided by the University of Pittsburgh, provides a list of information and resources on library resources, the University Center for Teaching and Learning, and the Center for the Integration of Research, Teaching and Learning (CIRTL) of which we are also a part of as a university.

<https://www.gradstudents.pitt.edu/teaching-support>

This resource, provided by the College of the Environment at the University of Washington, provides information about Title IX and disability resources.

<https://environment.uw.edu/students/student-resources/graduate-student-resources/>

DISCUSSED DURING WORKSHOP

WHAT TO COVER IN YOUR FIRST MEETING WITH YOUR INSTRUCTOR

The first time you meet with the professor, you set how the next quarter's TA assignment will be structured and what will be expected of you. We recommend you cover the following topics during that meeting:

- Time commitment
 - Set expectations about how many hours a week you will give to the course
 - Reminder: the handbook states that for a non-paid TA the expectation is 8 hours week. Any additional time you give should be your choice.
- Software
 - Cover what software will be used in the course (ex: Canvas, MATLAB, Simulink, etc) and what you are expected to know/be able to help with
 - Establish who is allowed to add grades to Canvas if using Canvas
- Office hours
 - Establish who will hold office hours, when, and how frequently
 - Establish who will book rooms for office hours
- Student communication
 - Establish whether or not you are allowed to send emails/Canvas announcements to all students and when that would be your responsibility
- Homework creation, grading, and turnaround time
 - Establish who is responsible for writing or finding homework problems
 - Establish who is responsible for writing homework solutions
 - Establish the expectation for how long you will have/need/be given to grade a homework set and when it should be returned to the students
- Posting homework solutions
 - Establish who is in charge of posting solutions to homework assignments and when after the homework is turned in this should occur
- How to share grade information
 - Certain methods of sharing grades (such as keeping spreadsheets on google sheets or anything internet scrapable) is illegal.
 - Make sure you establish with your professor what method you will use (put grades directly on canvas, put in only excel worksheets and email them to each other, etc)
- Grading complaints
 - Establish who should deal with grading complaints for exams and homeworks. Likely you will be in charge of homework, but exams may be delegated to the professor. This is something you should establish early on.
- Personal goal setting and professional development
 - Discuss what you personally would like to gain from your TAing experience
 - Don't be afraid to ask for opportunities to do more than the average TA if you are interested in doing so. This can range from making Lightboard videos in Mudd to teaching a lecture or two to running review sessions.

RUBRICS

It is always best to be consistent with grading as much as possible. It's best to create a grading rubric upfront for yourself, establishing how many points you will give for each part of the problem, the answer itself, and the work. We advise giving more points for work rather than for the exact answer. Creating a rubric will both help you be consistent and will help you if students come to you asking for more points. You can point to the rubric as a reference to show them why they lost points. When grading, it is also best to leave a comment indicating why they lost the point, as this is most helpful for them and will also minimize grading complaints.

WHAT TO DO AND NOT TO DO IN OFFICE HOURS

In office hours, you should aim to help guide students through learning, rather than simply giving them the answers to problems. Some students may ask you to confirm answers, and that might be okay, but if the answer is wrong, help them work through the problem rather than telling them exactly how to do it. This robs them of the opportunity to learn how to do the work, which will then only hurt them in the long run such as on exams and in future classes.

WHAT TO DO IF SOMEBODY CHEATS

If you catch students cheating, either by copying each other or copying directly from the solution manual, there are certain actions you should take. We recommend you first email the professor directly, describe the problem, and ask for a meeting to solicit their opinion and the course of action. You can then meet with them to discuss the severity of the cheating and whether or not action should be taken and who by. Generally, it will be the professor's responsibility to handle the situation that you identified, unless action only involves a grade change. Action can span anything from simply giving no points for the work copied, the whole problem, the whole homework set, to full reporting to the university for higher-level action.

As a reminder of university policy, below is the link to Northwestern's official policy on cheating.

<https://www.northwestern.edu/provost/policies/academic-integrity/principles.html>

BIAS

Avoiding bias is important in both teaching and grading fairly. There are specific measures you can take to minimize your bias when interacting with students. One measure you can take is to ask yourself questions during office hours as checkpoints. Examples are as follows:

- Who is participating and asking questions? Is it evenly distributed?
- Who from the class shows up to office hours or asks direct questions?
- Are there ways to help ensure all students get and ask for help equitably?

You can ask and answer these questions for yourself and take action if you notice there is bias that you can mitigate. For example, if you notice some students are getting more attention than others, and maybe are just asking more questions than others, feel free to approach quieter students and ask them if they need help directly. Alternately, rotate who you answer questions from and ensure you ask every student before returning to any student for a second question.

FOSTERING A GOOD RELATIONSHIP WITH THE PROFESSOR

Maintaining a good relationship with the professor you are TAing for is important both for making your life easier and potentially making a new contact that you can rely on in the future. To foster and maintain a good relationship with your professor, we recommend you meet all the expectations you set for yourself together at the beginning of the quarter, be friendly, and show that you care about the class.

If you ever feel like a bad relationship with your teaching professor is developing and don't know what to do, such as they are expecting more from you than what was established, demanding more of your time than you have to give, or generally treating you poorly, there are some actions you could take to mitigate the situation:

- Refer to expectations
 - Remind the professor what the expectations were that you set together
- You can say no to things or ask for extensions
 - If you're being asked to go above and beyond normal TA expectations or those set at the beginning of the quarter and don't have the time to manage both TAing and research, you can say no to things that are extracurricular.
 - If you can't meet a certain deadline, be sure to notify the professor in advance
- Talk to Professor, your own PI, or the Director of Graduate Studies
 - If you feel like you can't handle the situation on your own, you might consider addressing the professor in a polite conversation directly, or talking to your own advisor or the Director of Graduate Studies to mediate the situation or get advice on what to do.

WHAT MAKES A REALLY GOOD TA

The characteristics that make a good TA are as follows:

- Effort, intentionality, compassion
- Investment of time
- Being nice
- Being conscientious about power disparity
- Commenting homework with constructive feedback/specifying where they got wrong
 - This will also minimize the number of people that come to ask you about lost points later on
- Turning homework around quickly
 - Especially before an exam
 - And if that isn't possible, provide the solutions
- Helping to keep the instructor informed of student experiences in the class
 - You as a TA have more power to help students than you might think, and students might be more likely to tell you or trust you with information such as complaints about the course or other aspect of the classroom experience. At times it may be appropriate to inform the instructor if there is a fixable problem that can improve student experiences.

REMOTE TEACHING AND ONLINE LEARNING

You may find yourself as a TA in a remote or online course. There are several formats, but most common are synchronous (normal lecture done at a regular time via Zoom or other live-streaming platform) and asynchronous (recorded lectures or videos for students to follow on a schedule). Hybrid courses combine an in-person lab or discussion section with online preparation.

REMOTE TEACHING BEST PRACTICES

The Teaching Committee compiled advice from undergraduate and graduate student responses on what worked well, what was difficult, and other advice following the Spring 2020 quarter that went fully online.

ADVICE FROM SPRING QUARTER 2020 TAS

- Record office hours and lectures
- Hold discussions through Slack or Canvas to improve engagement with students
- Use a tablet or low-tech dry-erase board/paper with markers to write out equations and share on-screen
- Post notes or guides on Canvas as a resource
- Have a moderator during synchronous lectures to monitor the chat for questions and keep class running smoothly
- Encourage students to come to office hours and stay engaged with practice problems and review sessions
- Create student connections early on
 - Introduce yourself as the TA early on in class, making it less intimidating to go to online office hours
 - Encourage (but not require) video on during synchronous lessons
 - Use other interactive technologies and apps
 - [Flipgrid](#)
 - Can have students record videos and responses to those videos to have more personal but asynchronous discussion; can be integrated into Canvas
 - [Kahoot](#)
 - An website where you can set up fun multiple choice quizzes and have students compete (essentially a fun game); can be used to check student understanding; can be accessed via website on phone or computer; has fun music that students are obsessed with for some reason
 - [Perusall](#)
 - Allows students to collaboratively read and comment on a reading assignment (PDF, website, etc.); can be integrated into Canvas
 - [Padlet](#)
 - Can create interactive discussion boards in a variety of possible structures; only creator of the Padlet needs an account

Below is a sample of some of the advice students who TAed in Spring 2020 left in the survey:

"Work as a team with the professor and do what you can to have clear, regular communication with the students. Reliability and routines help!"

"Don't be too frustrated if the participation is not as same as an in-person classroom! It's not you. It's COVID."

"Go to class if you can and remind students about office hours, especially if it's for extra practice. It can be intimidating to go to office hours alone via zoom, especially when you haven't ever seen/met the TA. Introducing yourself in class and allowing students to get to know you beforehand will potentially make them more likely to come to office hours. Also, be willing to help your professor and/or offer suggestions for improvement during the course! This is new to all of us, and we're all looking for ways to make it better."

ADVICE FROM SPRING QUARTER 2020 STUDENTS

Overall, students echoed the following pieces of advice for future students of remote learning:

- Go to office hours
- Attend class if you can
- Try to stay focused, don't let yourself get on other websites, take notes
- Keep your camera on to encourage you to pay attention

Below is a list of selected student responses left as advice from the survey:

"Ask questions. It's so awkward over Zoom, but getting clarification is so so important!"

"Make regularly scheduled group study/homework review Zoom calls."

"Being virtual doesn't preclude you from engagement...don't let yourself become so disengaged where it impacts your ability to focus during class."

"It's hard. Don't beat yourself up over the fact that it IS an adjustment and it IS hard."

"Be open to new ways of learning! Everyone is doing the best they can, and it IS possible to succeed if you're willing to adapt."

"Make sure to take breaks so you're not staring at a screen all day."

"Go to class even though it's easy not to. You'll never actually watch the recording later like you say you will."

"Pretend you are going to class and find a place in your apartment/home that is different from your normal work station (if possible) and "commute" to class. Don't check email, don't check your phone, get in the classroom headspace."

"GO. TO. OFFICE. HOURS."

"Try your best to create a schedule even though you may be at home most of the day. Make sure to take breaks so you're not staring at a screen all day."

“It’s easy to get distracted during lessons. Try your best to stay focused eg keep your phone away. Don’t forget you can still work with people”

THINGS STUDENTS WANT

Below is a list of things students said they desired in a remote setting:

- At least one office hour time they can attend
- Review sessions before final
- Recorded lectures
- Posted notes or outlines
- Give students grace still as pandemic is still going
- Be considerate of students in other time zones (particularly outside the US)
- More invitation to speak up in class and more check-ins with students
- To still get to know their professors

If you find yourself TAing for a remote class, consider incorporating those suggestions into the course.

REMOTE TEACHING RESOURCES

The following is a compile list of resources or trainings for remote teaching.

Northwestern IT (NUIT) trainings on remote teaching and tools can be found here:

<https://www.it.northwestern.edu/remote/index.html#tools>

NUIT workshops on remote teaching can be found here:

<https://www.eventbrite.com/o/teaching-amp-learning-technologies-workshops-6742953567>

AICHE hosts a webinar on remote teaching that can be found here:

<https://youtu.be/iaJtNWGGx78>

AICHE Computing & Systems Technology Division resources provides webinars on online teaching in chemical engineering that can be found here:

<https://www.aiche.org/community/sites/divisions-forums/computing-systems-technology-division-cast/blog/webinars-online-teaching-chemical-engineering>

The following article, “Equity Literacy During the COVID19 Crisis”, discusses resources to foster inclusion and equity in the remote classroom and can be found here:

<https://www.equityliteracy.org/equity-covid-19>