University of Utah Mathematics Department Engineering Math Teaching Assistant and Instructor Policies and Procedures—Pandemic Update Spring 2021

EM coordinator: Dr. William Nesse, nesse@math.utah.edu

The Engineering Math (EM) program delivers an enhanced and slightly accelerated, applications-focused curriculum combined with weekly lab sections. The weekly lab sections are led by a Teaching Assistant (TA) to facilitate group-based active learning activities. The material covered in lab combines basic skills practice with longer, more involved problems than typical homework problems–i.e., “story problems."

To serve this goal, EM classes entail an instructor-TA team. The following details the work responsibilities of each team member and how they coordinate. Subsequent pages detail the specific workflows and teaching pedagogy.

TA Responsibilities

1. Conduct the scheduled weekly lab meetings and facilitate student learning through active student participation.
2. Devise and administer lab expectation-setting, attendance policy, and grading policy. Also, track attendance in lab for course credit.
3. Coordinate with instructor to plan weekly lab activities.
4. Conduct lab sessions in Zoom using Breakout Rooms feature.
5. Develop and grade lab worksheets and other materials (e.g., matlab or python code).
6. The lab materials must be clear, free of mistakes and typos. **The TA is responsible for any materials that go before their students, irrespective of who originally created the materials.**
7. Facilitate a productive and inclusive and learning environment.
8. Hold two “office hours" in ~~the College of Engineering tutoring lab (WEB 1705), or similar location~~ in Zoom. Be available to help students in your own lab sections, but also other engineering math courses when possible.
9. TAs are responsible for 40% of exam grading workload (instructors take on 60%). Typically, number of problems will be split equally or slightly more for the instructor, with the more time-consuming problems taken on by the instructor.
10. Be available occasionally for help in the lecture section, either help in administering in-lecture learning activities, lecturing in the instructor’s absence (e.g., for conference travel), or exam/quiz proctoring, if possible.
11. On rare occasions help with quiz grading.

Instructor Responsibilities (aside from standard instructor responsibilities)

1. The lab curriculum covers a large fraction the story-type problems that you would normally assign in homework in a standard lecture-only course. Consequently, scale back homework sets by leaving off most story problems.
2. Coordinate with TA to plan weekly lab activities, and incorporate relevant activities in lecture that support the lab activities.
3. Be available occasionally for help in the lab sections during a TA absence (e.g., for conference travel), if possible.
4. Administer a coherent grading policy that incorporates combines lab and lecture components. It is recommended that the lab component (including attendance credit) comprise 15-20% of the course grade, commensurate with the lab being 20% of class time.

Weekly EM Lab Workflow

In non-pandemic semesters we would usually host 45-minute lab group meetings for the large course groupings (i.e., 1310 Fall and 1320 in Spring, and 2250) to develop and refine each week's lab offerings; however in order to minimize zoom fatigue, these meetings will be suspended in lieu of each instructor-TA pairing holding their own meetings. Experienced instructor-TA groups can use lab banks they are familiar with in prior semesters; and for others, the Coordinator will furnish some pre-made labs, placed in our shared box folders which TAs can use/adapt/modify if they like in order to minimize workload. Of course, TAs can also search out other problems and develop their own in they like.

Digital document sharing

All the EM courses utilize box.utah.edu file sharing system in order to store and share files among the Department. All TAs and instructors are required to use this platform (it's free, provided to you by U of U!). Each semester's files are stored for the benefit of future semesters, ensuring we have a large back catalogue of material. The coordinator will get you invited to the relevant folders when you supply him with your unid— nesse@math.utah.edu

Each TA should store their final lab document in the relevant week's folder (e.g., "Week 8"), and distinguish it from similar files with initials or section number in the file name (e.g., "Math1320Week8LabSection2-3.tex").

What to do: go to box.utah.edu to get your account set up (should be automatic upon your unid login). Then, use a search engine to locate and install the "Box Sync" application on your machine (see https://community.box.com/t5/Using-Box-Sync/Installing-Box-Sync/ta-p/85), which will automatically synchronize all your files, and store a copy natively on your machine. One common grad student TA mistake is forgetting to manually upload their work (including all supporting files and graphics), which causes problems for all those depending on that work. So, get the Box Sync app and simply do all your work in the Box folders, so no manual upload is needed.

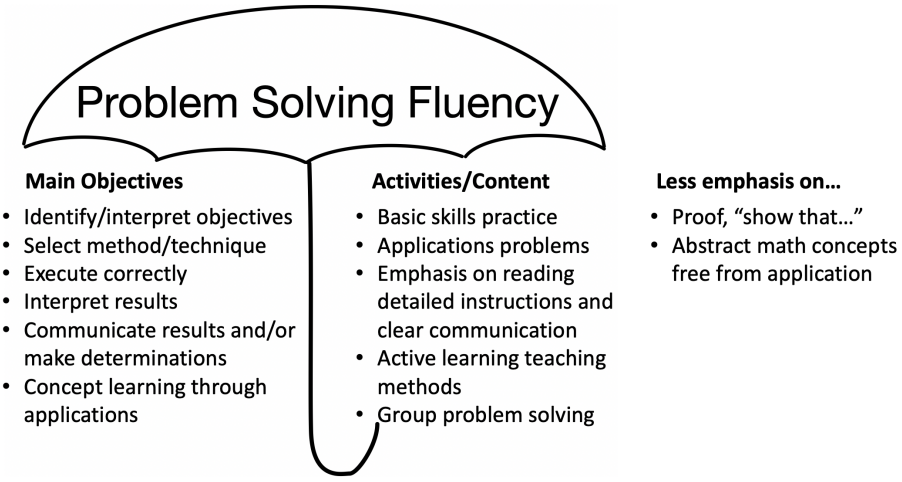

Figure 1: The umbrella concept of the EM program: problem solving fluency.

Lab Learning Objectives and Practices: Problem Solving Fluency (Fig. 1)

The lab is designed to help students become for fluent in applied mathematics problem solving. Irrespective of specific topics, mathematical problem solving comprises some basic quasi-sequential steps.

1. Reading and understanding problem objectives.
2. Selecting and executing correct methods.
3. Interpreting results and communicating to others how/if a solution/result satisfies problem objectives.

Any problem presented to a student that comprises all of the above we define as a *complete* problem. Such problem solving skills are valuable for every student, but particularly so for engineers. Notably, No. 1 and 3 is the ones often missing from typical homework problems. Because story problems require multiple steps, students often find it frustrating to execute on their own, and often give up before completion. The EM lab sections provide a positive environment to promote problem completion.

To meet the objectives, the following prescriptions are offered:

- The Lab should be a welcoming environment for student participation.
  - The TA should create a professionalizing environment mirroring organizations practicing engineering: solvers with varying degrees of expertise working together with project leaders toward a solution.
- The Lab is structured work, with a clear direction set by the TA with the use of worksheets that give complete problems.
  - The Lab is not primarily a "Q-and-A" or review session where bits and pieces of content are covered—that's more appropriate for office hours. However, on weeks when an exam will be held, the Lab may take on a more review or Q-and-A style.
- Problem solving should be student-group-driven.
  - It's not a lecture: The TA ~~"gets between desks" to~~ guides students who are actively problem solving themselves. TAs DO NOT stand at the front of the class awaiting questions, but are continually moving between Zoom Breakout groups and actively inquiring how students are doing.
  - TAs visit student groups repeatedly throughout lab session, *often without being asked for assistance*, and engage based on work students have done or plans they are formulating.

Continued on next page ...

- The Lab provides space for *positive feedback* on problem solving.
  - TA contact provides opportunities to check acceptableness of solutions and direction *toward* correct answers.
  - Positive feedback is a strong stimulus for learning that should be readily supplied within the lab environment.
  - Positive feedback works best when reviewing the metacognitive aspects of problem solving. That is, TAs should review not only methods execution, but analysis and decision-making components of student problem solving—the latter aspects can produce the most learning.
- Students should work mostly in groups to make efficient use of TA time.
  - Large labs are only efficient if groups of students call on TA help, not individuals.
  - Lone students must be encouraged to partner up or receive much less attention.
  - The most common critique given in TA observations is that TAs spend too long with single students. Effective TAs find ways of engaging lone students and quickly linking them to neighboring students and stimulating multi-student collaborative momentum. Effective TAs also know the soonest time to move on to the next group once this momentum has been achieved.
  - If multiple groups all have a common problem, it may be most efficient for the TA to give a lecture-style exposition at the ~~chalk~~ Zoom whiteboard to move the class along.
- The Lab must be coherent with the lecture.
  - TAs and instructors should communicate about the content goals and complete problem selection on a continual basis each week.
  - The TA is ultimately responsible for making sure lab works effectively with the lecture course.
- The TA should communicate with instructor often on the status of student progress.
  - The TA is the “eyes and ears" of the course, tracking how students are doing and may have clearer view of student progress than in lecture.