

Computational Biomechanics Lab Expectations and Policies

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I. Introduction

Imagine a world where orthopedic surgeries and rehabilitation procedures are custom tailored to the patient, similar to how suits can be custom tailored to the business executive. Rather than basing treatment decisions on population studies or crude anatomic measurements, clinicians use patient-specific computer models to develop personalized treatment approaches. These models are created from movement data collected from the patient prior to treatment and utilize state-of-the-art imaging, computational, and simulation technologies. By performing virtual treatments on the personalized computer model, clinicians can customize the surgical parameters or rehabilitation procedures under consideration to optimize treatment outcome. The end result is millions of patients whose quality of life is greatly improved through these technologies.

As a research assistant in the Computational Biomechanics Lab (CB Lab) at the University of Florida, you will play an important role in turning this futuristic scenario into reality. The initial research focus of the lab is on clinical problems related to the knee, with current projects involving 1) virtual prototyping of artificial knee designs to improve longevity and functionality, 2) simulation-based gait retraining and surgical planning to slow the progression of knee osteoarthritis, and 3) surrogate modeling of joint contact mechanics to permit large-scale dynamic human movement simulations with multiple deformable joints. The primary engineering technologies involved in these projects are multibody dynamics, optimization, and elastic contact theory.

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II. Expectations

A. Academic performance

1. Grades

Students in the lab are expected to perform well in all of their courses. We want other faculty in the department to view the students in our lab as some of the best students in the department. One of the best ways to achieve this goal is for every student in the lab to perform well in every course. While it may not be possible to obtain an "A" in every course, I expect every student to give his or her best effort in each course taken.

2. Attitude

All students in the lab are expected to relate to their professors with the utmost respect and with a positive attitude.

3. Honesty

Every student in the lab is expected to behave with the utmost integrity and honesty in all academic endeavors. Cheating of any kind will not be tolerated in the lab. Any student caught cheating on an exam or course assignment will be dismissed from the lab, including loss of funding.

4. Courses

All research assistants in the lab are expected to take the following courses to prepare them for research:

EML 5215 Analytical Dynamics (fall semester, offered each year) – take from Dr. Fregly.

EML 5595 Mechanics of the Human Locomotor System (fall semester, offered every other year) – only taught by Dr. Fregly.

EML 5598 Orthopaedic Biomechanics (fall semester, offered every other year) – only taught by Dr. Banks.

EGM 6341 Numerical Methods of Engineering Analysis I (fall semester, offered every year) – ideally take from Dr. Fregly, but other professors okay as well.

Research assistants who are not already proficient in C++ programming are also expected to take a C++ programming course (check with other students in the lab for good courses, as not all C++ programming courses are taught well).

In addition, MAE PhD students need to take the following two courses to prepare for the MAE PhD written qualifying exam:

EML 5311 Control System Theory (spring semester, offered every year) – take from any professor.

EML 6281 Robot Geometry I (fall semester, offered every year) – take from any professor.

Note that MAE PhD students must take EML 5215, EML 5311, and EML 6281 during the first year to prepare for the PhD qualifying exam at the start of fall semester the second year.

As is evident from this list, one of the problems with course selection is that almost every important course for the lab is offered during fall semester. Below is a recommended course sequence, depending on whether you are an MAE or BME PhD student:

MAE PhD Students

Year 1

Fall – EML 5215, either EML 5595 or EML 5598, and EGM 6281

Spring – EML 5311 plus two other courses

Year 2

Fall – EGM 6341, either EML 5595 or EML 5598, and one other course

Spring – additional courses as needed to complete course requirements

BME PhD Students

Year 1

Fall - EML 5215, either EML 5595 or EML 5598, and one other course

Spring – Three courses

Year 2

Fall - EGM 6341, either EML 5595 or EML 5598, and one other course

Spring – additional courses as needed to complete course requirements

B. Research performance

1. Progress

The most important yardstick of your research performance is research progress. Each research assistant in the lab is expected to make significant research progress each semester. Expected progress will be discussed and agreed upon between me and you at the start of each semester, and expectations will be based on the amount of time available that semester for research (i.e., coursework or teaching assistant responsibilities will reduce expectations). When research goals are not met, we will discuss the situation in light of the additional performance expectations listed below. Our goal will be to determine whether poor progress was due to unavoidable circumstances, poor communication or advising on my part, or poor performance by the research assistant. My goal is to provide each student with whatever resources and support he or she needs to be successful in research. *The renewal of the research assistantship each semester will be contingent on demonstration of satisfactory research progress at the semester review meeting.*

2. Motivation

Every research assistant in the lab is expected to be self motivated. The best PhD students push their projects forward on their own and do not require me to push them. If I have to motivate you to make research progress, then the PhD program is not for you. I do not have the time or energy to push forward underperformers in the lab.

3. Independence

One of the biggest limitations you will encounter in your research is my availability. Unfortunately, faculty members have a wide variety of time pressures (teaching, research, administrative service, graduate student supervision). Most of these activities are valuable, and graduate student supervision is one of the activities that I enjoy the most. However, if you wait until you can meet with me to discuss a problem you are encountering with your research, it will take you a long time to resolve each problem. Instead, my goal is for each research assistant to learn to work independently without my supervision to the fullest extent possible. This goal means that you will need to learn to take initiative to resolve problems on your own. Some suggestions for how to resolve research problems without my assistance are provided in the next section below.

My hope is that each of you will learn how to work independently and think creatively to solve whatever problems you encounter in the course of your research. I am here to help as well, but my goal is that you will be able to use your own problem solving skills to resolve the majority of issues that you encounter in your research.

4. Resourcefulness

Research is full of obstacles that will prevent you from making progress. When you hit an obstacle, I expect you to think through all of the different ways that you could resolve the problem on your own. Then I expect you to try each possibility, and repeat the process until the problem is resolved. A specific suggestion for how to do this is as follow:

1. Make a list of three possible approaches that you can take to resolve the problem or understand it better (e.g., search the web, read a book or journal article, talk with other students in the lab, attack the problem using two different approaches).
2. Try each possibility, and make detailed notes on what you learn.
3. Based on what you learn, make a new list of three possible solution approaches, and repeat the process.

When you meet with me to discuss problems you are having in your research, the first thing I will do is ask to see your lists of possible solutions and what you learned by trying them. In many instances, you will be surprised to learn that you will be able to resolve your problems on your own without my assistance. That said, I am glad to provide assistance when necessary, and I realize that you will not be able to resolve every research problem by yourself.

5. Responsibility

Your research progress is ultimately your responsibility. If there is something that you need to move forward with your research (e.g., software, a journal article), figure out on your own how to get it. Most journal articles can be downloaded for free from www.uflib.ufl.edu. Software or other items can be purchased using my work credit card (I will provide the number as needed). If there is a problem that is blocking you from moving forward, figure out how to resolve it. Again, do not wait for me to figure things out for you. Make your best effort to keep your research moving forward on your own, and I will be glad to help you when you are truly stuck.

6. Cooperation

There is a great deal of knowledge available from other students in the lab. Older PhD students are expected to help the newer students with questions and other “ramp up” tasks. At the same time, newer students are expected to be sensitive to the time constraints of older students, especially as they approach graduation. Overall, I want the lab environment to be a mutually supportive one.

Cooperation also means contributing to the general upkeep of the lab. Upkeep includes basic issues such as vacuuming the floor (vacuum cleaner available in the closet at the far end of the hall), cleaning up the lab area, working with MAE Technical Support to have software on the computers updated, or maintaining the automatic backup system in the lab.

7. Integrity

As with course work, each research assistant is expected to maintain the highest standards of integrity in your research work. The falsification of data, improper data selection, use of another person’s work without permission, plagiarism, and any conduct that intentionally misleads constitutes scientific misconduct. Any student who knowingly engages in scientific misconduct is subject to dismissal and may also be subject to university regulations and penalties.

III. Policies

A. Time

1. Work hours

Graduate students in the lab receiving a paid salary, either from a grant obtained by me or a scholarship/fellowship provided by the University or some external source, are considered employees of the University of Florida under my supervision. As such, you are expected to work *a minimum of 40 hours* per week, just like any other University of Florida employee. In reality, you will normally work much more than 40 hours per week as I do. During the semester, the 40 hour minimum is split between a minimum of 20 hours for research (or 10 hours for research and 10 hours for teaching assistant duties if you are a TA) and 20 hours for class work. Your research time is why you will typically take 9 instead of 12 or more credits per semester. Between semesters, over breaks (e.g., Christmas break and spring break), and during the summer, the entire 40+ hours per week is to be used for research. Note that while Christmas and other breaks are a break from classes, they are not a break from work. In fact, breaks are one of the primary times during the academic year to make significant research progress due to the lack of course assignments and other distractions.

I provide these minimums not because I am going to check up on anyone but rather as basic guidelines so that you can determine if you are putting in the time on your project that you should be putting in. I have found in the past that research assistants sometimes do not view their projects as a priority and so do not put in even this minimum number of hours. However, the reality is that your research project is the primary reason for your funding.

I realize that some weeks will be more difficult than others due to exams and class assignments, so the expectation is that you *average* the above hours *as a minimum*.

2. Work schedule

Given that I expect all students in the lab to be self-motivated and self-directed, I do not require you to work any specific hours but instead allow you to set your own work schedule based on when you find you are most effective. For example, I get my best writing done either early in the morning or late at night. Consequently, I sometimes take time off in the afternoon to do other things, since afternoons are lower productivity times for me. I also do not expect you to work in the lab all of the time. If you are more productive working at home, or at the library, or anywhere else, that is fine with me. *Remember, however, that it is results, not effort, that counts.* If you work at home consistently but are unable to make acceptable research progress, then I will require you to work in the lab, where you can get input from other researchers and will have fewer distractions.

3. Vacation

The University of Florida has no official vacation policy for graduate student employees. Some advisors do not give their students any vacation time, which I believe is unreasonable. I have decided to give every student in the lab two weeks of paid vacation time, to be used whenever you would like subject to prior approval by me (for planning purposes). Two weeks is the standard vacation time in the United

States. However, we work hard in academia, so I am happy to consider requests for a third week if I feel you have been making exceptional progress in your research.

Keeping track of your vacation time is done by each research assistant individually on the honor system. I will not micro-manage anyone but will trust the honesty of each of you. I consider the vacation cycle to run on the academic year calendar starting in mid to late August.

Official University of Florida holidays (e.g., Thanksgiving Day, Christmas Day, New Year's Day) can be taken off and will not count against your vacation time.

4. Deadlines

When I ask someone to do something for me by a particular time, I mean it. It is not a suggestion or a request. Basically, I am the employer (hopefully a benevolent one) and the research assistants are the employees being paid to work for my company (CB Lab). Since you are being paid to provide service to the lab, if I ask you to do something for me related to work in the lab, I expect you to do it. If some extenuating circumstance prevents you from doing this, I am reasonable as long as you communicate the situation to me.

B. Publications

1. Authorship

In academia, the question always arises as to who will be the first author on any journal or conference papers generated by the student. My philosophy on this issue is as follows:

- If you do the work and you write the paper (with my input on both the work and writing of course), then you are first author.
- If you do the work but do not write the paper, and I have to write the paper, then I am first author, and you become second author.
- If you contribute significantly to the work, then you are included as a co-author (the determination of "significantly" is made by me).
- If you do the work and write the paper, but the paper is rejected, and I have to do significant additional work and writing on my own to get the paper published (e.g., because you graduated and are no longer available to work on the paper), then I am first author and you are second author. However, if you perform all of the additional work and writing needed to get the paper published, then you remain first author.

In general, every paper that comes out of the lab will have multiple authors. Author order will be in order of significance of contribution, with the most significant contributors being listed first. My name will typically go at the end of the author list as the corresponding author.

2. Manuscript preparation

All students in the lab will be required to use the following standards when preparing journal or conference papers for submission:

- Microsoft Word will be used for all text, including the title page, abstract, body of the manuscript, references, and figure and table captions. All of these items will be included in a single Word document.

- All figures will be provided as Adobe Illustrator files. If you generate your figures in a program other than Illustrator, you will need to figure out how to transfer them to Illustrator in a way that the line types and text can be edited in Illustrator. Matlab 7.0 and higher is capable of exporting figures as Illustrator files. No figures should be mixed in with the text in the main Word document. If you don't know how to use Adobe Illustrator, now would be a good time to start learning it. Illustrator is available on at least two of the computers in the lab.
- All tables will be provided in a separate Microsoft Word document. No tables should be mixed in with the text in the main Word document.
- A signed copyright transfer agreement form found on the publisher's web site will be filled out by the student who is the lead author. All signatures required on the form will be obtained at least one week before the planned submission date of the manuscript. This standard will prevent last-minute crunches trying to obtain signatures from faculty members who cannot be found or are out of town.
- The student who is the lead author will check the journal web site for all formatting standards (e.g., page size and margins, word count limitations, reference formatting), all items that must be submitted with the manuscript (e.g., copyright transfer agreement, list of suggested reviewers), and any other requirements imposed by the journal.

It will be the responsibility of the student who is the lead author to ensure that all of these guidelines are followed. Please take these requirements seriously. I will return any journal manuscripts or conference papers that do not meet these guidelines, and if we are under a deadline, I will expect you to do whatever it takes (e.g., drop travel plans, miss sleep and/or meals, as I have been forced to do more times than I would like to admit) until the problems are corrected.

3. Conference travel

Research assistants will be selected for conference travel based on the following criteria: (1) acceptance of paper for presentation, (2) research relevance, (3) research productivity, and (4) availability of travel funds. The student will serve as a representative of CB Lab and is expected to maintain the utmost professionalism. The proper forms for travel authorization forms may be obtained from the research advisor and must be submitted prior to travel. The travel allowance is the standard university allowance.

C. Operations

1. Data safety

The main products produced by our lab are software, computer models, and computational results. Consequently, it is critical that everyone in the lab backs up his or her data on a regular basis. A co-worker of mine in industry used to have the following phrase displayed in bold letters on his computer: **HARD DISKS DIE!!!** The purpose of this display was to remind him to back up his data regularly.

Each student in the lab is responsible for ensuring the safety of his or her research data (software, models, data, results). Back up your data at least every two weeks. We will have a lab "pot" to encourage students to follow this policy. I will periodically ask everyone in the lab to show me the date of your latest backup. If the date is beyond two weeks, you will owe the lab "pot" \$20. Once the pot gets big enough, we will use the funds for some sort of lab activity (though hopefully the "pot" will remain empty).

2. Software distribution

If you receive a request from someone outside the lab for software we have developed in the lab (e.g., Matlab or C/C++ code), models we have developed in the lab (e.g., Autolev, Mechanica, or SIMM models), or data we are using in the lab (e.g., gait, CT, or MRI data), please do not respond until you have talked with me.

I will assess all requests for software, models, and data and determine which ones we can and should respond to. UNDER NO CIRCUMSTANCES IS ANYONE IN THE LAB TO DISTRIBUTE SOFTWARE, MODELS, OR DATA TO ANYONE OUTSIDE THE LAB WITHOUT MY PRIOR CONSENT.

3. Lab security

If you are the last person in the lab, ALWAYS lock the lab door behind you when you leave the lab, only if you are only going down the hall to get a drink or go to the bathroom. We have not had any important items stolen from the lab yet, and I want to keep it that way.

4. Phone calls

A phone log should be kept next to the phone in the lab. All long distance phone calls made on the CB Lab phone must be related to research. Relevant information (date, time, name, person called, and phone number) must be recorded at the time of the phone call. Personal long distance phone calls, if necessary, may be made using personal phone cards.

IV. Conclusion

I believe that the expectations and policies listed above are very reasonable. If you have any questions about any expectation of policy, please let me know. I have developed these guidelines gradually over several years, but they are continually evolving as the lab moves forward. I would welcome any comments on how we can make things work better. I want each of you to have a rewarding experience working in the lab, and my goal is to do whatever I need to do on my end to empower each of you to be successful in your projects.