Biosensor Systems and Materials (BioSyM) Laboratory

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Part of the

Department of Biomedical Engineering

Texas A&M University

Lab Manual

2014

MY EXPECTATIONS OF STUDENTS

Students will be held to the highest academic and research standards in terms of effort, productivity, and quality, as well as courtesy and professionalism. Students are expected to attend scheduled meetings on time and interact with me more frequently as new ideas or problems arise. They are also expected to communicate with one another and assist one another in completing their work.

Students are expected to be hard-working, conscientious, courteous, and helpful to everyone. They are also expected to be **totally honest**, even if that sometimes means embarrassment or disappointment. Dishonesty in any form will not be tolerated, because the environment in which we work requires that we are able to trust and depend on each other. This is particularly true between students and myself, but also between all students, and students and department/university staff.

Students must understand that they will be representatives of the group, the Department of Biomedical Engineering, and TAMU in many ways. Actions and words must be carefully selected, as they may reflect positively or poorly on me, other students, the department, and the University.

When given assignments, students are expected to do the absolute best job they can, and complete the work by the given deadline. High quality is expected to be the trademark in everything that is done, and this usually requires extra effort and time to achieve. *Perfection* is not expected, but is desired and must be pursued.

Intellectual property is an important aspect of research in today's world. TAMU has the right and desire to protect discoveries made using university resources. Therefore, students should not discuss their research with anyone without prior permission from me. Have them contact me instead. We will discuss disclosure issues prior to attending conferences, etc.

All students must abide by University and departmental policies as well as those peculiar to the lab as defined in this document.

STUDENT EXPECTATIONS OF DIRECTOR

Students can expect me to provide the guidance and resources for pursuing an advanced research-based degree in Biomedical Engineering. Other disciplines may also fit into the main research areas, which mainly focus on development of novel technology or methods for chemical analysis using micro- and nano-engineering. I also collaborate with other faculty within TAMU as well as other institutions, and students may interact with researchers from many different fields.

Students can expect to see dedication on my part, sincere efforts to continue advancing knowledge and applications related to the current projects, as well as care and concern for students. Students can expect I will try to be a role model and mentor, to the extent of my ability, and will do the same things I ask from you. You can expect consideration, understanding, and compassion, but also high demands, strictness, and discipline as necessary. I will also attempt to identify employment opportunities and other helpful experiences for students.

I will provide opportunities for students to learn and experiment with science and engineering, and will also help further develop important skills such as professional technical speaking, report-writing, and proposal preparation. However, these opportunities will necessarily depend on the students and their various levels as explained below.

Students can also expect there are some things that are even more important to me than work, including God and my family. There may be times when this may affect my availability to students and others, and this may impact activities within the lab in small ways. Examples include commitments to meetings, taking care of children, etc.

GENERAL RULES AND PROCEDURES

Work Times

All graduate students are expected to be in the lab most of the day unless in class. Undergraduates and high school students are expected to work during the times agreed upon when employment begins. If you are not able to be in the building, including cases where you are working somewhere else on campus, please notify me by e-mail or otherwise. Students are expected to be independent and productive, using the time they have wisely. Generally speaking, I am most concerned about progress and productivity, but everyone must realize that these come from working hard and often long hours.

Access to the Building

Regular hours for the departmental staff are 0800 to 1700. During those hours, you will have access to secretarial, administrative, and facility support personnel. This includes photocopying, postage, etc., for business purposes. The building is always open, and you are free to work any time at day or night. However, please be aware of your environment at all times, especially when working at night, to avoid being caught off guard by others that may wish to do you harm. TAMU is a very safe campus, but it is not immune to criminal activity, so just be smart and careful.

Interacting with Departmental Staff and Faculty

Be kind and courteous to the staff and other faculty. It is expected that you treat everyone with respect, regardless of how they treat you. Do not say or do things that get you into trouble with others, as that reflects upon me and everyone else in the group. Please follow proper protocol in borrowing/using equipment belonging to other faculty. When requesting assistance from staff for things related to research, please consult me in advance.

Faxes

Make sure you put my name on any fax requests coming into the department's machine. Otherwise, the secretaries don't know what to do with the faxes, because they don't know all of the students and who they work for. I will put fax messages in the lab for you, in a designated location. Please check there for requested materials. I will write your name on the top if it is not on the document, and I know who it belongs to. Also, make sure that you don't take anyone else's material!

Contacting the PI

I am typically available in my office when not in class. If the door is closed, and I have not asked you to come see me, then I probably do not want to be disturbed. Try e-mail. You may call my cell phone or text me. If my cell phone is off, or I do not answer, call back in 5 minutes, and leave a message if there is still no answer. *Please do not use my home phone number unless there is a true emergency*. (Examples: you are personally severely injured, ETB is burning down, something in the lab has exploded, the ceiling is leaking, etc.).

RESPONSIBLE CONDUCT OF RESEARCH

An important component of training is becoming familiar with the key aspects of responsible conduct in the research community. This includes the principles of honesty and integrity in reporting research results and in writing proposals, giving credit where it is due, and reporting fraud or misconduct. It also includes ethical treatment of animals. As part of regular group meetings, we will discuss these issues to ensure everyone is aware of expected behaviors and to allow discussion and debate on controversial subjects.

RESEARCH ACTIVITIES

All graduate students are assigned research problems for which they will have primary responsibility, and they are expected to pursue those problems with enthusiasm and dedication. The problems should become the students' "own," and significant effort is expected in completing the tasks necessary to solve the problems. Furthermore, students are expected to go beyond what is specifically required: be creative, look for new applications, or discover things that are not known.

Literature Searching

The work begins and constantly relies upon an understanding of the specific problem in its context, and finding all of the relevant literature related to it. Students are expected to know all related work, who has done it, and what are the differences between your work and that of others. Know what journals are most important to your work, and the quality of papers they publish (e.g. impact factor).

You should also be taking a broad view and reading many different types of work that may be useful to you eventually. Keep up with the latest science and technology news.

One of the most important things for you to do quickly is to become familiar with the different methods of obtaining scientific documents, including papers and patents. Find out what databases are available on-line through Evans Library, the Medical Sciences Library, as well as through professional societies. Become familiar with the process of requesting books and papers through interlibrary loan/ document e-delivery.

Experimental Work

When you are ready to do experiments, you should have a firm grasp on all of the instrumentation, chemicals, etc. that you will be using. Your experiments must be designed to answer questions, and you should have an expectation of what you will see. All experiments should be repeated several times to ensure that single data points are not anomalous, and to allow statistical treatment of the data. Think through the design of the experiments carefully before beginning, so time and money are not wasted collecting useless data. This is one example of a case where you should bring your ideas to me before starting.

Record-Keeping

When performing experiments or any other research-related activities, be extremely careful to record all factors and maintain all conditions as consistently as possible. Be sure to update notebook regularly, and have someone read and sign the entries as a witness. Treat the notebook as the main record of your work, so that your efforts are clear upon inspection. Keep in mind that all notebooks are TEES property, as are all disks, CDs, etc. that store data. Guard them carefully, and remember that they also must stay here when you leave.

Independence

Students are supposed to work independently, meaning that they do not need constant supervision or prompting from anyone else. Furthermore, you should be able to generate ideas for new experiments as well as solutions to problems. Do not come and ask for help without first carefully thinking through the situation and identifying what you think should be done.

Work Ethic and Attitude

The lab is a workplace, so treat it that way. Do not play games, horse around, yell, throw things, or anything else disruptive or potentially dangerous. Be respectful of the others in the lab. With so many students, it is important that those that are diligently working not be interrupted for purely conversational or non-urgent matters. I encourage conversation related to work in the lab and other scientific or professional topics. Other subjects should be kept for other places, in order to maintain the proper work environment. Do not use bad language. Speak in English unless another language is required to define English terms!

The following guidelines should be followed for research work in the lab.

Graduate students, no classes	60 hours per week
Graduate students, 1 class	40 hours per week
Graduate students, 2-3 classes	20-30 hours per week
Undergraduates	10-20 hours per week, or as agreed

WORKING IN THE LAB

Eating and Drinking

You may use the student office area for storing and consuming refreshments. Food and drinks should not be taken into the lab under any circumstances.

Cell Phones/iPods, etc.

Refrain from using phones, texting, listening to music with headphones, etc. when working on experiments. If only doing computer work (writing, processing data, etc.), you may go to the office and use your devices there. The obvious exception is infrequent use of phones for communication on emergencies/urgent matters.

Equipment Use

When working with any equipment, you MUST have proper training and certification BEFORE you may use it on your own. It is YOUR responsibility to find out who is in charge of each instrument, set up training, and receive official qualification notice from the person in charge of the equipment. For our lab, that is usually me. However, I may direct you to learn from other qualified personnel and responsible individuals. Use of large spectrometers and all optics equipment requires my approval in advance!

Make sure that you turn off all equipment when you are done using it. This goes for our lab as well as any other lab in which you may work. It also goes for the computers in the lab if you are the last one to leave. (You may leave the computers running if necessary, but turn off monitors). Please consult the checklist on the door if you are the last person to leave the lab.

Also, please make sure that all optics components such as mirrors, lenses, beamsplitter, and detectors are covered when not in use. The best covers are plastic ziploc bags or other suitable material. This will help to avoid dust buildup that can degrade performance, and will reduce the frequency with which we need to clean the optics. Optical fibers should be capped, if possible, to avoid scratching and breaking of fibers.

NOTE THAT IT IS ALSO YOUR RESPONSIBILITY TO REPORT THOSE WHO MISUSE/ABUSE EQUIPMENT OR VIOLATE THESE RULES! Proper care must be taken with our expensive equipment. If you see people using my equipment and are unsure of what they are doing, question them and ensure that they have my approval. This goes for all instrumentation, optics, chemicals, etc. If you are unsure as to how to use things, or what they are to be used for, then let me know.

Nobody should modify equipment in any way without first gaining my approval. Penalty for violation of these simple rules is suspension of assistantships or expulsion from the lab.

Do not let anyone from another lab borrow anything from our lab without permission from me. Ask me first before giving or loaning anything, including supplies, to anyone. In addition, while you should be as helpful to others as is reasonably possible, do not spend extensive periods of time working for other people. You are responsible for getting work done for me, first and foremost.

Sample Labeling

Sample containers should be labeled *before* insertion of materials. Minimum requirements:

1) Use a unique identifier for each new sample: your initials, dash, a number
2) For the number, start with 1 and increment with each new sample (to infinity, of course)
3) If there is room on the label, note the date and composition of contents
4) Record the exact information about the sample in your notebook: contents, concentrations, date
5) Refer to appropriate sample ID when performing experiments and analysis, and making other entries into notebooks

NEVER use a sample prepared by someone else without their permission, and without knowing exactly what you are doing!

Computer Use

Back up your data on the server drive, in the appropriate place. This may be a project folder, or a folder assigned to you. Do not keep all of your files on a hard drive, as they periodically fail. Loss of data would mean starting over on your research, which should be enough incentive to be careful about this.

The computers have been installed and networked as a convenience for you to complete your research most efficiently. It is my belief that your access to other computers, the internet, etc. allows us to effectively transfer files and locate information. It also allows us to print information to hardcopy on paper. It is incumbent upon you to use these for their intended RESEARCH purposes. That means that you shall not use lab computers for CHAT or answering personal e-mail...even though I encourage you to check mail often, you should not be writing personal messages from lab computers. In reality, this should extend to using laptops on lab ports. Do your personal correspondence and other work elsewhere, or use specific, limited break times to do them.

This also prohibits use of lab computers for watching movies, playing games, and reading non research-related websites, etc. If you are in the lab, you should be working on something related to research. Use wait time to read papers and catch up on relevant science/engineering/technology news rather than entertainment.

As for classwork, I also discourage use of lab computers for non-research work. You have other computer resources available for class-related work elsewhere on campus. Non-research items should not stored on the lab drive nor be printed on the lab printer—use the common computer labs for this purpose. I will reconsider special cases as appropriate—just ask!

Telephone

The phone in the lab is not for personal calls, and the number should NOT be given to anyone in any capacity other than professional. The exceptions include wives, husbands, close friends, etc. but these persons should not be calling constantly, and the phone should not constantly be in use. Make use of cell phones for personal communications, and limit cell phone use while you are supposed to be working. Also, be conscientious of others…if you must have an extended conversation that is not research-related, and you may disturb others in the process, be polite and take your call outside.

When answering the phone, be pleasant and say "McShane Lab, this is ___" (fill in the blank with your name) when picking up. If the caller asks for someone in the lab, ask for a name and affiliation before seeking the person. Unwanted personal calls should be terminated in a friendly manner, with a clear statement that the phone number is for professional use only. You are not expected to take messages for anyone, nor should you expect anyone to take messages for you. Use the whiteboard as needed to record important calls. If a call is received for someone not currently in the lab, direct the caller to try again later.

Incoming Packages

Whenever items are received, there are two major steps that must be taken:

1) Place the packing slip and any included documents in the credit card/purchasing binder.
2) Make sure that they are labeled with my name using permanent marker so there is no question about ownership. That goes for chemicals, equipment, everything that can be written upon without compromising function. Chemicals are to be labeled with the “received” date and properly stored.

Relocating Equipment and Supplies

Nothing should be removed from the building, or even the lab, without prior permission from me. If you have need to remove equipment, supplies, or anything else from the building, make absolutely sure you have authorization to do so.

ASSISTANTSHIPS

Some students may receive assistantships—financial aid in return for work performed. This work is to be defined by the advisor, and is NOT NECESSARILY the same as the thesis research. Student salaries are determined by the advisor or the college, and should be kept in confidence between the advisor and the student. This is especially true when a research grant is involved. Students are expected to keep discussions regarding salary between them and their advisor.

Sometimes this general rule is broken, and information about student pay does get out. Feelings get hurt, or conversely sometimes students begin to feel more important than they should. Here are some things to keep in mind about student salaries:

1) Graduate school is not a money-making business. It is for education and career preparation, which should be the motivation for the work. Many people, myself included, end up going into debt to complete their advanced degrees, then end up having to continue to pay for that years after finishing their degrees. Assistantships are helpful, but cannot be a necessary or expected component. Having an assistantship is a privilege, not a right. Students with assistantships should consider themselves fortunate, especially if their stipend is enough to cover living expenses. Finding a project/advisor that can provide the necessary environment for progress toward career goals is much more important.

2) Assistantships are awarded at varying levels based on a number of factors. These include but are not limited to grant needs, college needs, project needs, degree plan of student, background, value and effort of student. The advisor and/or college determines what a student can or will be paid based on a combination of these things. They are not all equal. It is this way at every university, and it is this way in the "real world".

VACATION

Students are expected to work during semester breaks and on holidays. Extended absence from the lab will be without pay, and only with advance agreement. Furthermore, vacations of more than two weeks will not be allowed under any circumstances, unless pre-approved at least two months in advance. The university will not pay students when they are not on campus, so a modification to any assistantship will be required for such absences. Even then, this must be coordinated with me to ensure minimal impact on ongoing projects.

PUBLISHING WORK

Conferences

All graduate students are expected to present their work at professional conferences. A minimum of one poster or presentation is expected for all MS students. PhD students are expected to give at least two platform presentations and one poster. These requirements must be met (submissions must be accepted) prior to the defense. Undergraduates will also be encouraged to submit papers. I will provide some funding for these trips, but will also ask that students cover some of their own expenses. This will be on a case-by-case basis. Of course, all of this must be done with my knowledge and approval. Seminar opportunities will also arise, and students may be asked to present.

Presentations should be prepared using a standard lab template, available on the lab computers. This is important because I may need to use some of your slides later, and the format must easily fit with mine.

Manuscripts and Papers

All graduate students are expected to publish their work in high-quality journals. One first-author manuscript must be accepted for all MS students prior to graduation; PhD students are expected to have two first-author papers that have been published and one at least more accepted before scheduling the defense. Discussions about publication should begin once results are being generated from projects.

Invention Reports

I encourage everyone to consider the value of their research, and look into filing reports of invention (ROI) through the University. I will guide and assist in this process, as anything coming from our research must first be cleared through me. Forms for RoIs are available from me upon request.

Research Proposals

PhD students will be asked to contribute significantly to research proposals that include aspects of their work. This is an important part of education at this level. These students, as they near graduation, may also consider submitting research proposals of their own to fund postdoctoral research positions, research as new faculty at other institutions, or research efforts at small companies. I will assist with this to an extent consistent with the available time, my abilities, and legal issues, and will also allow some of lab resources for preliminary data, etc. upon request.

GROUP MEETINGS

The entire group will meet regularly (almost weekly) to keep one another informed on important news, discuss important topics related to lab operations, review recent research, and share progress reports. Attendance is expected for all students doing work in the lab. Meetings will be schedule to avoid conflicts with classes. A schedule for each semester will be posted to inform students of rotating agenda items. This is available on the lab Google Drive.

The general agenda will be as follows

1) News and Announcements: 5-10 mins
    a. Dr. McShane's schedule, activities, etc
    b. Any important news related to TAMU, BME, projects, grants, papers, conferences, etc.
    c. Open announcements – anything important to share
2) Facilities and Safety 5-10 mins
    a. Discussion of lab equipment, supply needs, etc
    b. Review of any important safety-related notices (led by designated Safety Liaison)
3) Weekly topic – ~30-45 mins
    a. Flash Journal Club – 5
    b. Full Journal Club (one or a few students) – as assigned; reserved for broadly important papers; will shared in advance to facilitate discussion
    c. Progress Reports – as assigned; conference-style (12-15 mins), followed by questions and critique
    d. Conference Rehearsals – as needed
    e. Tutorials
    f. Professional Development Topics
        i. Responsible Conduct in Research
        ii. Networking
        iii. Time Management