EXAMPLE 1 of 2

Expectations of M.S. and Ph.D. Students in my Research Group

Introduction

This document provides current and prospective graduate students a description of general expectations during your studies at the University of Delaware. This document helps eliminate any misunderstandings as you work with me and in my research group.

You will spend the next few years immersed in research and study. During this time you will learn how to formulate research questions, you will develop the technical and analytical skills to address those questions, and you will learn how to communicate your results to a wide range of audiences. A substantial portion of your graduate studies will be spent performing advanced research where you will operate with considerably greater independence than you did as an undergraduate student. This can be a significant paradigm shift for students who just earned their undergraduate degree and are unfamiliar with performing independent research.

You will need to do in-depth literature reviews on your research topic, enhancing your understanding of both the broad field of study and the specific technical and analytical aspects of your research project. You will develop experimental procedures and protocols to investigate your topic in the field and/or laboratory, and you may work with mathematical models to understand the system you are investigating and/or to interpret your experimental results. This independence requires that you have the ability to learn and adapt; show initiative, be dependable and be self-motivated; and conduct your research to the highest standards.

It is important to realize that it takes a lot of work to earn a graduate degree. **Many students spend about 50-60 hours a week on classwork and research, and perhaps 40-50 hours per week when classes are not in session.** However, I do not require a set number of hours for work each week, nor do I want to micro-manage your time, nor do I want you to become a "slave" to your work. It is important to take time off; your work is not your life, but an important part of your life. I lead by example. I also work 50-60 hours per week in the office and additional hours at home.

Table 1 provides characteristics that are important to succeed in graduate school by comparing mediocre students to outstanding students. I only invite students to join my research group if I think they have the ability to be outstanding students. If you fall under the mediocre student category, you need to spend some time thinking why you want to perform graduate-level research.

Finally, graduate school should not be all hard work. It should be one of the best experiences of your life. You will have opportunities available to you that are not available in any other setting. You will make new friends/colleagues from different countries and likely with different research interests, you will learn that you can succeed at discovering new things through your research, you will travel for field work and conferences, you will develop skills in sensor wiring and deployment, sensor trouble shooting, and Matlab and other data analysis, and you will develop a network of researchers from other institutions.

Table 1. Characteristics of Mediocre and Outstanding Students[1]

Characteristic	Mediocre Student	Outstanding Student
Work habits	Has a rigid view of research as a "9 to 5" job. Is not willing to come in on evenings or weekends when required to complete laboratory experiments or prepare for field work. Arrives in the late morning, spends an hour surfing the web, takes a long lunch, goes to the gym, leaves at 4:30 and tells him/herself that was a full workday. Takes shortcuts on experiments because the experiment is "taking too much time." Takes short cuts in preparing for field work because "we can figure it out when we get there". Only performs analysis at advisor's prodding.	Uses time efficiently and is willing to work non-standard hours to complete work requirements. Ensures work is performed to the highest standards. Proactively initiates research.
Journal reading	Reads only journal articles provided by advisor or other students.	Actively and continuously performs literature searches to independently locate journal articles.
Research hypothesis	Content to work on research hypotheses developed by research advisor or others.	Independently and continuously assesses research data, both from the student's project and that from other researchers, and formulates hypotheses describing observed phenomena.
Lab notebooks	Takes general notes, where the notebook acts more as a research diary.	Provides detailed descriptions of work done in the laboratory or field. Step-by-step descriptions and observations are recorded so that anyone using the notebook can completely understand what was done.
Writing	Only writes when forced by their advisor.	Continually writes, including maintaining updated literature review of pertinent topics, writing journal publications and reports, and developing research protocols and sensor "cheat sheets".
Publication	Looks at publication as an afterthought to the research. Minor effort put forth in developing manuscripts and assumes advisor will rework mediocre manuscripts or thesis/dissertation.	Realizes that publication of research results is paramount for PhD work, and focuses considerable effort in developing and writing manuscripts. Continuously develops new publication ideas and proactively approaches advisor with potential manuscript topics.
Problem solving	Comes to advisor seeking solutions to research problems. Tries a singular solution and then returns to advisor for future direction. Views research in small incremental steps where each is guided by advisor.	Looks at research problems as an opportunity to grow and learn. Develops potential solutions to problems and **discusses** them with advisor.
Teamwork	Focuses solely on own research. Does not understand the benefit of teamwork and learning a new concept, procedure, sensor capability, and/or approach to solving a problem.	Understands that the collective output of the research team is a key component of the student's own success. Willingly assists others in the lab or field with projects and lab/field chores (even mundane ones).

[1]Adapted from a memo by Dr. R. Hughes, UMI, to his graduate students, dated 16 December 2003.

Philosophy of Advising Graduate Students

I want to prepare you to be an independent thinker, who is capable of formulating research questions; to be technically capable, so you can identify research questions and develop and implement research plans to address those questions; and to be an effective communicator in disseminating your research ideas and results to the scientific community and general public. As your research advisor, I will help you learn how to do research, including how to design and conduct appropriate experiments; analyze and interpret your data; document your results; present your results and publish your results where appropriate. I will act as your mentor, collaborator, counselor and advocate looking out for your best interests. I will provide professional development where possible and seek opportunities for you outside the immediate research group. In return, I expect you to work hard and be self-motivated, be diligent, conscientious, strive for excellence, and proactively initiate and conduct your research.

The M.S./M.C.E and Ph.D. degrees differ in the amount of work required to achieve the degree, the guidance provided by me in laying out the research problem, and the level of supervision.

> **M.S./M.C.E Thesis:** based on advanced research focusing on solving an engineering or scientific problem, with the problem and solution approach typically defined by close consultation with me. I strive to have M.S./M.C.E students submit a journal article based on their work but this is not always possible.

> **Ph.D. Thesis:** represents a student's original and independent research that advances the field being studied. A Ph.D. typically involves the publication of one to three peer-reviewed research articles depending on the project and scope of work. The research topic is often dictated by an existing research grant and the generic hypotheses have already been identified in the proposal. The student should not rest on these hypotheses alone and instead seek alternate hypotheses and/or tangential directions in the research focus. Potential shifts in project focus are critical in the early stages as they may lead to alterations in experiment design and/or deployment strategy. The student will be largely responsible for experiment design, deployment, understanding how sensors work and how to collect data from them, data quality control, data archiving, data analysis and hypothesis testing, and results dissemination under my supervision.

I intend to provide numerous opportunities for you to build skills that will enhance your marketability following completion of your degree. For M.S./M.C.E students these may include oral and written communication, data analysis, fundamental coastal engineering principles, networking and site visits. For Ph.D. students these may include oral and written communication, data analysis, fundamental coastal engineering principles, networking and site visits, help developing research ideas, proposal writing, budget preparation, paper writing, and feedback on teaching to name a few.

Expectations of Graduate Students

I expect hard work, creativity, ingenuity self-motivation and honesty from my students. I expect a willingness to pursue new ideas without fear of failure. A key requirement to join my research group is that my students must be fluent in English (both orally and written), as a significant portion of research involves presenting and publishing the research and results. For international students, my expectations are diminished only slightly, but you must still be sufficiently fluent in English such that your research and thesis/dissertation preparation are not hampered.

You are responsible for managing and conducting your research to the highest standards. This requires a responsible, independent and professional outlook on your part. I also expect that you be ethical in your approach to your research, your studies, and your interactions with fellow students and faculty. Examples of unethical behavior include plagiarism, cheating on coursework, fabricating experimental data, and behaving dishonestly or rudely with other students or university staff. Unethical behavior will result in dismissal from my research group.

I also have an expectation of continual progress and excellence in your research. Research should be carried through to completion including analyzing and writing up the results. Half-hearted efforts lead to poor results dissemination and lackluster theses/dissertations. Publication is important for M.S./M.C.E. students and critical for Ph.D. students. Progress in your research means trending towards publication of research findings especially for Ph.D. students.

You will be expected to present your research at national and international conferences. Learning to speak in public settings is critical for your future career. In addition, conference attendance allows you to build your network of peers. I will schedule weekly one-on-one meetings with each student to discuss their research and progress. This meeting provides an opportunity to address any issues you may be facing but is also an opportunity to showcase your communication skills.

All students are required to take shop safety training classes and must wear eye protection when working in the lab. Other safety gear must be worn when appropriate for the work being completed. Safety is taken seriously and should be the first, second and third consideration when working in the laboratory or field. Cutting corners on safety is never an option. You will be called out when acting in an unsafe manner and repeated warnings may be cause for removal from the research group.

You must document all your work. Maintain a notebook that is detailed and has a date on every page. Field and experimental notes are absolutely critical. When in doubt write it down. It is nearly impossible to remember details months after an experiment. If the details are not in a log book they will be lost. Students are responsible for backing up their own data. I maintain a data server and I provide each student with a backup drive for data. You can also use cloud services or drop box. More than one backup is a good idea.

EXAMPLE 2 of 2

Research Group Guidelines

This document is intended for current and prospective graduate students. It provides a description of general expectations for your studies at the University of Delaware. It should help minimize misunderstandings as you work with me and in my research group.

1.   My philosophy of advising graduate students

I want to prepare you to be an independent thinker who is capable of formulating research questions; to be technically capable, so you can identify research questions and develop and implement research plans to address those questions; to have a broad, interdisciplinary perspective on disaster research and practice; and to be an effective communicator in disseminating your research ideas and results to the scientific community and general public. As your advisor, I will help you learn how to do research. I will provide professional development opportunities for you to build skills that will enhance your marketability following completion of your degree. I will act as your mentor, collaborator, counselor, and advocate looking out for your best interests. In return, I expect you to work hard; be self-motivated, diligent, and conscientious; strive for excellence, maintain high ethical standards; and proactively initiate and conduct your research.

My hope is that graduate school can be a wonderful experience for you. You will have opportunities available to you that are not available in any other setting. You will make new friends/colleagues from different countries and likely with different research interests, you will learn that you can succeed at discovering new things through your research, you may travel for field work and conferences, you will develop skills in math modeling, programming, data analysis, and other areas; and you will develop a network of researchers from other institutions.

2.   Mode of operation

Weekly one-on-one meetings. At the beginning of each semester, I will set a time for a one-on-one meeting (typically 45 min.) with you once a week. While we can certainly talk in between meetings and we can skip a meeting if there is nothing to discuss, this ensures that time is set aside for regular discussions. Before each meeting, you will complete the brief weekly update form that documents what you did since the last meeting, what you plan to do until the next meeting, and anything else you want to discuss. The form is available in the Research Group folder on the shared drive. The update is not meant to be onerous or time-consuming. Just brief lists of tasks done and planned. You will upload it to our shared drive the night before the in-person meeting so we can refer to it at the meeting. At the end of the meeting, we will write a brief list of action items for each of us on the same form. Over time, this collection of documents will facilitate our communication and provide a record of our progress and plans.

Monthly research group meetings. Once a month we will meet as a research group. Each month, one student will lead the meeting. That student will (1) schedule and reserve a room for the meeting, (2) give each person a hardcopy handout of the slides, and (3) present to the group. The presentation will describe what they have done so far and what they plan to do next. Results do not have to be final, and I can help develop an outline of what to present. The leader will rotate through the group. Other members are expected to actively participate in the meeting, offer support, and provide constructive criticism. These meetings serve multiple purposes. They help students practice presenting their research; practice critiquing other work; and learn about what others in the group are doing, broadening their exposure, facilitating opportunities for students to help each other, and building a sense of community.

Biannual one-on-one Individualized Development Plan meetings. Twice a year (beginning of Fall and Spring semesters) I will meet one-on-one with you for longer term planning. We will use two tools to facilitate these meetings—Student-advisor expectation scales and Individualized Development Plans

(IDP). These two tools are available in the Research Group folder on the shared drive as well as on the COE website (https://www.engr.udel.edu/tools-for-advising-graduate-students/). Before the meeting, you and I will independently complete each form. Then we will discuss at the meeting.

3. Typical tasks and products

Every research project is different, but the following are tasks that are typically required among graduate students in my research group. Skills that you do not have at the start will be developed through coursework and research experiences.

- Write in-depth literature reviews on your research topic, enhancing your understanding of both the broad field of study and the specific technical and analytical aspects of your research project.
- Work with and develop mathematical models
- Write computer code
- Use Geographic Information Systems (GIS) software to analyze and present spatial data
- Analyze data
- Troubleshoot, debug, figure out when something is not working
- Interpret results of analyses
- Present data in clear, professional, compelling way
- Document research, results, and their implications in journal papers, conference papers, and thesis

The typical approach in my research group is to focus on writing journal paper(s) describing the research, then after they are written, combine them into a thesis. In my experience this works a lot better than first writing the thesis and then trying to translate into papers.

4. Degrees

The M.S./M.C.E and Ph.D. degrees differ in the amount of work required to achieve the degree, the guidance provided by me in laying out the research problem, and the level of supervision.

M.S./M.C.E Thesis. Based on advanced research focusing on solving an engineering or scientific problem, with the problem and solution approach typically defined by close consultation with me. I strive to have M.S./M.C.E students submit a journal article based on their work.

Ph.D. Thesis. Represents a student's original and independent research that advances the field being studied. A Ph.D. typically involves the publication of one to three peer-reviewed research articles depending on the project and scope of work. The research topic is often dictated by an existing research grant, but through the course of the project, the student should take ownership of the research gradually moving from following specific task assignments to leading it.

5. Statement of inclusion

It is my intent that students from all diverse backgrounds and perspectives feel valued and welcome in my research group, and that the diversity that students bring to the group be viewed as a resource, strength, and benefit. It is my intent to present materials and activities that are respectful of diversity, including gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of my advising for you personally or for other students or student groups. In addition, if any of our meetings conflict with your religious events, please let me know so that we can make arrangements for you.

6.   Expectations and information for success as a graduate student

I encourage you to review the College of Engineering expectations for graduate advising as well: https://www.engr.udel.edu/wp-content/uploads/2019/05/COE-expectations-for-graduate-advising.pdf.

Certifications. All students must complete the *Responsible Conduct of Research* and *Human Subjects* online training. They take several hours each. DRC staff can provide instruction on how to do so.

Communication. The number one most important ingredient for a successful and enjoyable graduate school experience is regular, on-going, clear, honest, respectful communication between you and me. Challenges are normal and things come up. That's fine. I want you to succeed, but I cannot help you with issues that I do not know about. We also do not always have to agree with each other, but we must listen to each other and be respectful in our discussions.

Community computing cluster. I have purchased access to the COE community computing clusters Farber and Caviness (https://sites.udel.edu/research-computing/community-cluster/). I have a password-protected group called *disasters*. I will get you access to it, and you should take some time to learn how to use it as it offers a vast improvement in computing capability and storage over your PC, especially when there is an opportunity for parallel processing. There are lots of in-person and online training resources available and previous students and the IT staff can help as well.

Conferences. I encourage students to present their research at national or international conferences. Learning to speak in public settings is critical for your future career. In addition, conference attendance allows you to build your network of peers. However, it is important to target conferences strategically because each one requires time and money. I encourage students to keep an eye out for potentially relevant conferences and workshops. I will do the same. We can then discuss possibilities and decide which make the most sense in terms of timing, potential benefit, and cost. There are often funds available through the conference itself, the Graduate College, the Women in Engineering group, or the DRC, and I encourage students to apply for those to help offset the costs. Grant funds can also help cover the remaining need.

Disaster Research Center. We are fortunate to be part of the world-renowned Disaster Research Center (https://www.drc.udel.edu/). I encourage students to participate fully in DRC activities—seminars, holiday parties, field work opportunities, etc. DRC offers unique resources and a vast network, and students should take advantage of them. The DRC handbook outlines all policies and procedures. Be sure you have a copy. Each student should be on the DRC website and DRC email list to stay informed of opportunities, and should participate in supporting the center when asked.

Documentation. You must document all your work clearly and completely. When in doubt, write it down! This includes documenting differences in versions of a model or model runs, fully commenting computer code, and naming files in a way that previous work can be located and understood. It is important for communicating with me and other members of the research team, and it is nearly impossible even for you to remember details months after you do something. It may feel like you are wasting time by documenting carefully, but believe me, in the long run it is worth it. This point cannot be overstated! Before each student graduates, they will be required to clean up and organize their files so the next student on the project can understand what they have done and pick it up. This includes writing a comprehensive user manual for any code the student has written. I will provide examples of what that should look like.

English. Students should be fluent in English (both oral and written), as a significant portion of research involves presenting and publishing the research and results. Almost all students (and researchers in general) can benefit from improvement of their oral and written communication skills. Students are encouraged to seek extra help with writing through courses and/or the Writing Center on campus (https://www.writingcenter.udel.edu/).

Excellence. I have the highest standards for our work because that is what it takes to get published in peer-reviewed journals and to build a strong reputation. At the same time, I think we can have those standards within a respectful, supportive, and collaborative environment.

File storage and backup. Students are responsible for backing up their own computer files and data. There are at least three options for storing your files so we never have problems losing files. I will also purchase external hard drives if needed.

- *My shared drive*. Is backed up automatically. Free. Lots of space. I can see items you put here, so I would like all "final" results here. Each of you has a folder with your name where you can put things. It only takes a minute to set up the connection.
- *OneDrive–University of Delaware–o365*. Is backed up automatically. Free. Lots of space. I will not be able to see files, but you can store a lot there. 5 TB I think. For more info on it: https://www1.udel.edu/it/help/microsoft/onedrive/index.html
- *Hard drive on your PC*. Is NOT backed up, so I very strongly suggest you do not store things there only unless you regularly, consistently back it up yourself.

Independence and initiative. Much of your graduate studies will be spent performing advanced research where you will operate with considerably greater independence than you did as an undergraduate student. This can be a significant paradigm shift for students who just earned their undergraduate degree and are unfamiliar with performing independent research. In graduate school you are encouraged to be independent and take initiative. In general, you should seek a balance between on the one hand, asking questions too quickly without trying on your own to figure out the answer and on the other, not asking enough questions and thus wasting a lot of time when I could provide an answer quickly. You will not always hit that balance perfectly, but that is the aim.

Integrity. I expect you to demonstrate the highest ethical standards in your research, studies, and interactions with fellow students and faculty. Examples of unethical behavior include plagiarism, cheating on coursework, fabricating data, and behaving dishonestly or rudely with other students or university staff. Unethical behavior will result in dismissal from my research group.

Reading. Students should actively and continuously read the literature to independently locate and share relevant journal articles and other resources.

Teamwork. Students should understand that the collective output of the research team is a key component of the student's own success. Within reason, you should willingly assist others when asked.

Work habits. Each student should work the expected number of hours and use this time efficiently, while ensuring work is performed to the highest standards. Students should be dependable and self-motivated, be willing to work non-standard hours when necessary to complete urgent requirements, demonstrate attention to detail in research and in the documentation of it, work on research consistently, keep research tasks and output well organized, and act as the project manager for their research.

Work hours. It takes a lot of work to earn a graduate degree. Many students spend about 50-60 hours a week on classwork and research, and perhaps 40-50 hours per week when classes are not in session. However, I do not require a set number of hours for work each week, nor do I want to micro-manage your time, nor do I want you to become a "slave" to your work. It is important to take time off; your work is not your life, but an important part of your life. As long as you are making good progress and staying in close communication, you can work whatever hours and wherever you want. I only ask that you let me know if you want to go away so that I am not counting on you during that time. I will offer you the same courtesy, and I try to lead by example.