Brigham Young University Faculty Development Plan

June 13, 2014

Overview

This document constitutes my Faculty Development Plan as described in section 3.1.2 of the "University Policy on Rank and Status." Sections 1, 2 and 3 each contain 1) self-assessment of areas for improvement and possible growth, 2) current short and long-term goals related to those assessments, and 3) progress towards those goals in the areas of Scholarship, Citizenship, and Teaching which are the criteria used to determine my continuing faculty status at the three and five year reviews. Sections 4, 5 and 6 contain some redundant information in the form of “development projects” as requested by the Faculty Center in the same areas of Scholarship, Citizenship and Teaching. Finally, Section X is a grant proposal that I am submitting to the Faculty Center for funds to complete the course development project.

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1 Scholarship

1.1 Self-assessment and Identifying Areas of Improvement or Growth

As a scholar, I have had the opportunity of publishing and doing research within three different research groups. This opportunity has shown me different approaches and priorities that have been successful. However, although I have published eight peer-reviewed articles (two of which were in journals), I think publishing is a major area where I need to make progress. This is especially the case since I did not hold a post-doctoral position before coming to BYU. In terms of seeking funding, I have participated in writing and renewing a grant that funded my dissertation work as a graduate student and gave our laboratory around $600,000 over a period of three years. During the last 2 years of that grant, I was also managing the budget in large part and making recommendations to my adviser about how much money we had left and how we might spend it. This experience in grant writing and management is limited, but gave me the confidence I need to at least begin writing proposals and managing them when my students and I are awarded grants.

In terms of themes in my future research, I will focus on the overarching goal of making robots more capable for tasks in close proximity to people. Our approach will range from introducing new sensors, to new control and estimation methods, to new computational methods. We will take this approach in order to reduce risk to people while improving efficacy of robots for tasks ranging from in-home assistance to search and rescue. The common thread among these applications is the ability for robots to deal with unmodeled and uncertain environments that may include significant unknown dynamics. Many of our proposed directions and approaches will be dependent on recent advances in efficient optimization as well as improvements in computational power and its smaller physical form factor. Although there is an enormous opportunity for research to be done in this area, I am also young academically and my knowledge of the robotics literature as a whole is also a possible area of improvement.

Personal contacts for collaboration is a major area in which I can improve. Developing contacts with researchers at BYU and elsewhere will help my understanding of my own field and the important research questions that need to be addressed. Related to this is the fact that I need to improve my efforts to ask for feedback on my research ideas, grants and writing which is a difficult thing for me. This feedback could come internally initially, but should also eventually come from people external to BYU.

1.2 Professional Goals

1.2.1 Short-term plan for improvement

- Submit to the following grant opportunities for funding: NSF National Robotics Initiative, NASA Early Career Award, NSF Catalyzing New International Collaborations, MEG grant.
- Work with Conrad Monson to identify other relevant targeted funding from PIVOT for 2014.
- Submit a one page summary on GPU-based model predictive control using interval analysis for robotics to different NSF program managers to gauge interest.
- Prepare a proposal for the DARPA Early Career Award for submission in 2015 and subsequently thereafter until it is awarded or I am ineligible.
- Volunteer for NSF review panels to meet program managers and learn about the process.
- Cultivate relationships with past colleagues (Jeff Trinkle at NSF) and industry partners (Aaron Edsinger and Advait Jain at Google Robotics), and reach out to new possible partners (General Electric).
- Encourage at least 2 undergraduates to apply for ORCA grants related to our research.
- Help 2 students (Phillip Hyatt and Levi Rupert) apply for NASA Space Grant fellowship.
- Submit at least 2 conference papers to international, peer-reviewed robotics conferences in 2014 and beginning of 2015 (ICRA or RSS).
- Submit 2 journal papers to IEEE Transactions on Robotics (TRO) or the International Journal on Robotics Research (IJRR) by beginning of 2015.
1.2.2 Long-term plan for improvement

- Read relevant literature for at least 30 minutes every day.
- Write for an average of at least 30 minutes every day (papers, proposals, etc.).
- Make a conscious effort to collaborate with Drs. McLain, Beard, Colton, Howell, Charles, Farrell and Goodrich who work at BYU in robotics, controls and computer vision.
- Use international collaboration grants (both from BYU and externally) to develop contacts outside of BYU with whom to collaborate (DLR in Germany is a possible option).
- Attempt to submit 2-5 articles to peer-reviewed venues (journals or conferences) yearly where at least 1-2 of them are for journals with increasing amounts if possible after the first 2-3 years.
- Prepare a proposal for the NSF Career Award for submission in 2016 and subsequently thereafter until it is awarded or I am ineligible.

1.3 Relationship to Department Goals and Needs

Successful grant writing will bring in more funds for graduate students and equipment that will encourage more talented students to stay at BYU. In addition, this will allow me to give more undergraduate students the possibility of paid research positions, thus increasing the likelihood of them successfully doing research in graduate school at BYU or elsewhere.

1.4 Required Resources

I will need time from other colleagues at BYU for feedback on grants and paper submissions.

1.5 Progress to Date

- I successfully submitted proposals to the NSF National Robotics Initiative and NASA Early Career Award grants.
- Levi Rupert and Phillip Hyatt successfully submitted proposals for the NASA Space Grant Fellowship.
- I have reached out to another team that participated in the DARPA M3 program (which funded my dissertation research) and I am currently beginning a new collaboration with them on inflatable robots.

2 Citizenship

2.1 Self-assessment and Identifying Areas of Improvement or Growth

In the area of citizenship, I have a tendency to focus on working with my students or working in my office rather than attending graduate student or college seminars. This tunnel vision is unhealthy for departmental collaboration and expansion of my own knowledge base. This is an area that can be easily and measurably improved. Being a young faculty member and not having completed a post-doctoral position also means that I am less known in the international robotics community. I need to reach out to and develop good relationships with colleagues not at BYU. Finally, among the undergraduate students at BYU and secondary school students in Utah County, I believe there is great interest in robotics. This is confirmed by the theme of two recent BYU ASME undergraduate activities as well as the success of the BYU SplashLab’s underwater robot competition with over 450 middle and elementary school-age students participating.
2.2 Professional Goals

2.2.1 Short-term plan for improvement

- Participate more actively in college and department seminars.
- Seek to organize and participate in workshops at IEEE International Conference on Robotics and Automation or the Robotics: Science and Systems conference.

2.2.2 Long-term plan for improvement

- Either contribute to existing STEM and robotics programs or organize another opportunity for students.
- Volunteer at the international level for robotics conference organization.
- Volunteer to serve on technical committees of interest related to my research.
- Accept and accomplish department committee assignments.
- Accept the opportunity to review papers in robotics conferences and journals and/or help teach my students how to review when I am unable to do so.

2.3 Relationship to Department Goals and Needs

As I attempt to establish a personal reputation (not only in terms of scholarship, but also in terms of collegiality and reliability) in the international robotics community, this will also help BYU to be recognized as a world-class institution with incredible students and faculty.

2.4 Required Resources

For conferences, I will need no additional resources beyond support already offered by the college in terms of travel money. For future outreach and STEM activities, I may need to find sponsors similar to what Dr. Tadd Truscott has done for his underwater robot competition.

2.5 Progress to Date

- Winter 2014 semester I attended three graduate student seminars.
- I’ve made contact with Peter Rich at BYU who organizes an after-school robotics outreach program which has ME student volunteers who help to run the program.

3 Teaching

3.1 Self-assessment and Identifying Areas of Improvement or Growth

I have had approximately 10 years of experience in either classroom or one-on-one instructional settings with undergraduate-age students. This means that I am fairly comfortable presenting to and talking in front of a class or mentoring students in research. I also believe that I am able to quickly build a good relationship with a group of students. However, two of my main struggles as I have taught this first year are 1) managing time in the classroom for each lecture and 2) allowing enough time in class for students to participate in “active” learning. These two areas of improvement are definitely related and can be addressed with specific goals that are listed below. To some extent, I also lack industry experience in the broader field of Mechanical Engineering. Although I cannot remedy this through working for a company, I can make efforts to educate myself about industry needs and include these as well as more practical aspects of my class subject for the students’ benefit. I can also ask for feedback from other teachers to improve other aspects of my teaching.
For other areas of possible growth in my teaching, I would like to be involved at the undergraduate level in developing content for classes that will help students prepare for robotics or controls research if they have that interest. I would also like to teach graduate courses related to my research.

In terms of mentoring students for research, I need to better manage my time during one-on-one mentoring sessions. Although my current meetings with students tend to be very productive, I believe they are not focused enough and sometimes last too long (i.e. over an hour). In the coming Fall 2014 semester, I expect to have four new Masters students and will need to use time with students more efficiently. Having expectations that I communicate clearly as I meet with each student will help. These expectations can include deliverables on their research as well as background reading or exploration to better understand a concept related to their research.

3.2 Professional Goals

3.2.1 Short-term plan for improvement

- During lecture preparation, specifically plan time for AT LEAST one practice problem or other “active” learning technique per major topic beyond whatever in-class examples I give. This may mean making my presented material more direct and concise.

- Prepare my instrumentation class (ME 363) for Fall 2014 with the new ME curriculum and Measurements class in mind.

- Attempt to secure interest and enrollment of at least 3 more graduate students for Fall 2014 (in addition to Levi Rupert who started in January 2014).

- Try to get at least one Ph.D. student by Fall 2015 (this may be one of my Masters students enrolling in the Ph.D. program).

- By Fall 2015, have at least 2-3 undergraduates involved directly in research or in skill development (learning Linux, Python, C++, etc.) in order to be able to do robotics research.

- Start each one-on-one student research meeting with a prayer and a plan in mind to make the most use of that time which includes follow-up from previous meetings and goals for our next meeting.

- Ask for evaluation of my teaching from my mentor (Brian Jensen) at least twice in the Fall 2014 semester, ask for feedback from one other professor as well in either the Fall 2014 or Winter 2015 semesters.

3.2.2 Long-term plan for improvement

- Have students evaluate me twice a semester (one evaluation that I would administer and the final one by the school).

- Make concrete and measurable updates to material, clarity and examples according to feedback received from students, especially according to feedback that is repeated often.

- Plan to spend at least 30 minutes weekly with each student I am mentoring and make it effective time.

- Educate myself on more careers and companies directly related to my research and to the goals of the students I will mentor. Try to make contacts to help them achieve their educational goals.

- Compile notes, examples and tutorials for teaching an advanced robotics class as I meet with my new graduate students once a week for one hour (this will help me develop class material for the future or have materials to at least help my students be more efficient as they begin research in robotics).

- Follow the same type of preparation for topics on optimal control and estimation.

- Attend both of the teaching and learning luncheons every semester.

- Request to teach graduate classes on control theory and robotics that are already in the course catalog.
3.3 Relationship to Department Goals and Needs

The proposed goals relating to active learning and in-class time management improvement will increase the quality of instruction for all students in the department that take my classes. In addition, I expect that this will help the students to better understand and retain what they are learning for use in subsequent classes. At the graduate level, I expect that an increased offering of courses related to robotics and control may help to attract more talented students to stay in our graduate program. In addition, my own students will be better placed and prepared if I achieve my goals which will reflect well on the department and possibly result in future funding in collaboration with certain companies.

3.4 Required Resources

The only required resources for my teaching may be a small budget (or required fee) for undergraduate classes that I would teach. For the graduate level course, I would expect that students would have access to either their own research hardware or could use our robot platforms (2 Baxter robots from Rethink Robotics and 1 pneumatically actuated inflatable robot from Otherlab) for implementation of theory that we learn in class.

3.5 Progress to Date

- I gave the students the opportunity to evaluate my teaching for ME 335 mid-way through Winter 2014 semester as well as reviewing their end-of-semester evaluations.
- By Fall 2014 I will have 5 Masters students in my research group and at least 2 undergraduates.
- So far I have met with one Masters student and three undergraduate students on a weekly basis for 30 minutes.

4 Scholarship Strategies Project Proposal

Overview: In terms of themes in my future research, I will focus on the overarching goal of making robots more capable for tasks in close proximity to people. Our lab approach will range from introducing new sensors, to new control and estimation methods, to new computational approaches. We will take this approach in order to reduce risk to people while improving efficacy of robots for tasks from in-home assistance to search and rescue. The common thread among these applications is the ability for robots to deal with unmodeled and uncertain environments that may include significant unknown dynamics. Many of our proposed directions and approaches will be dependent on recent advances in efficient optimization as well as improvements in computational power and its smaller physical form factor. Below are goals and metrics that I can use to improve and evaluate my progress between now and February 2015.

Goals:

- Submit to the following grant opportunities for student funding and equipment for research: NSF National Robotics Initiative, NASA Early Career Award, NSF Catalyzing New International Collaborations, MEG grant.
- Work with Conrad Monson to identify other relevant targeted funding from PIVOT for 2014.
- Submit a one page summary on GPU-based model predictive control using interval analysis for robotics to different NSF program managers to gauge interest.
- Prepare a proposal for the DARPA Early Career Award for submission in 2015 and subsequently thereafter until it is awarded or I am ineligible.
- Volunteer for NSF review panels to meet program managers and learn about the process.
• Cultivate relationships with past colleagues (Jeff Trinkle at NSF) and industry partners (Aaron Edsinger and Advait Jain at Google Robotics), and reach out to new possible partners (General Electric).

• Encourage at least 2 undergraduates to apply for ORCA grants related to our research.

• Help 2 students (Phillip Hyatt and Levi Rupert) apply for NASA Space Grant fellowship.

• Submit at least 2 conference papers to international, peer-reviewed robotics conferences in 2014 (ICRA or RSS).

• Submit 2 journal papers to IEEE Transactions on Robotics (TRO) or the International Journal on Robotics Research (IJRR) by beginning of 2015.

• Read relevant literature for at least 30 minutes every day.

• Write for an average of at least 30 minutes every day (papers, proposals, etc.).

• Make a conscious effort to collaborate with Drs. McLain, Beard, Colton, Howell, Charles, Farrell and Goodrich who work at BYU in robotics, controls and computer vision.

• Use international collaboration grants (both from BYU and externally) to develop contacts outside of BYU with whom to collaborate (DLR in Germany is a possible option).

**Evaluation:** I can use the following metrics to help evaluate my progress for my scholarship project:

• The number of articles submitted to peer-reviewed publications

• The number of accepted articles

• The number of proposals submitted

• The number of proposals accepted

• The average number of days per month that I read and wrote for 30 minutes each

5 **Citizenship Project Proposal**

**Overview:** Successful citizenship can be divided into service within 1) the BYU and local Provo community, and 2) my field of research throughout the world. I fully expect to participate in both by completing department, college and university assignments at BYU, working on outreach programs to increase interest in robotics at BYU and STEM in general in Utah, and volunteering to serve on international committees for robotics conferences. The goals listed below reflect this overall plan.

**Goals:**

• Participate more actively in college and department seminars.

• Seek to organize and participate in workshops at IEEE International Conference on Robotics and Automation or the Robotics: Science and Systems conference.

• Either contribute to existing STEM and robotics programs or organize another opportunity for students.

• Volunteer at the international level for robotics conference organization.

• Volunteer to serve on technical committees of interest related to my research.

• Accept and accomplish department committee assignments.

• Accept the opportunity to review papers in robotics conferences and journals and/or help teach my students how to review when I am unable to do so.
Evaluation: To evaluate my progress in citizenship, I can examine the following:

- Look at the number of workshops or programs that I am slated to participate in or have already done so by February 2015
- The number of college seminars attended
- Success of robotics outreach programs in terms of number of students participating and the number of students that return each year
- Number of articles reviewed before February 2015

6 Course Development Project Proposal

Overview: For the course development project, I am developing a syllabus and course material for the Instrumentation (ME 363) class that I’ll be teaching in Fall 2014. This course will soon be changed to a Measurements class as the undergraduate curriculum in the Mechanical Engineering department is updated. Part of my goal in developing my course materials is to help the department as they make this transition so that myself and other teachers who teach the new class will have most of the necessary resources already in place.

In addition to goals and approaches listed in Section 3, specific forms of “active learning” that I would like to include are the following:

- Using “clickers” or other polling system to get real-time feedback on comprehension
- Have students work through practice problems in class in small groups while I am available to answer questions
- Use “fish bowl” technique for review sessions before tests
- Use groups to learn about a single sensor type and then teach the rest of the class about it

Organization: Below is the syllabus for the ME 363 course that I will be teaching in the Fall, but which will soon be transitioned into a 2 credit Measurements class.
MeEn 363 Elementary Instrumentation – Fall 2014

Lecture:

Instructor: ← This is the best way to contact me!
Office:
Phone:
Office Hours:
Other times by appointment (email me first please!)

TA: PUT EMAILS AND NAMES HERE
TA hours (TBA) will be held in ?

Text Book:
Course Notes: Will be made available online on Learning Suite

Prerequisites:
A course in differential equations (Math 303 or 334).
ECEn 301: provides background in electrical circuits and components
Eng T 231: gives understanding of teamwork and leadership required in labs and project
Engl 316: gives experience in necessary technical writing skills (concurrent enrollment required)

What Comes Next? (courses that follow MeEn 363):
MeEn 335: System Dynamics (required for ME program)
MeEn 475,476: Capstone (required for ME program)
MeEn 431: Design of Control Systems → MeEn 533: Digital Control Systems (electives)

Catalog Description of MeEn 363:
Fundamentals of mechanical measuring systems; sensors, signal conditioning, statistical error analysis, dynamic response, standards.

Course Objectives:
At the conclusion of this class, you should be able to design and use a measurement system (sensor, electrical components, and data acquisition system), develop a model of the sensor’s physical response, know how to quantify the measurement uncertainty, and succinctly and clearly document your results. Related to this are the department-mandated course outcomes, which are:

1. Students should have a knowledge of fundamental concepts of measurement including accuracy, precision, bias error, random error, DC offset, static sensitivity (DC gain), etc. Students should be able to calibrate (statically) a measurement system.

2. Students should understand the concept of time and frequency response as it applies to measurement systems. Students should understand the fundamentals of first- and second-
order systems and should be able to characterize the behavior of such systems through the measurement of the time constant, natural frequency, and damping ratio.

3. Students should be familiar with the fundamental theory and techniques of data acquisition and signal conditioning. Students should understand the sampling process, how aliasing can occur, and how to prevent aliasing with analog prefilters. Students should be able to use a Wheatstone bridge to condition signals from variable resistance devices. Students should be able to construct basic signal conditioning circuits using op-amps and electrical components (e.g., voltage divider, amplifier, differential amplifier, low-pass filter).

4. Through laboratory exercises and projects, students should gain hands-on familiarity with a variety of transducers, such as strain gages, thermocouples, and optical sensors. Students should understand the governing principles of their operation and how they influence their behavior.

5. Students should know basic statistical analysis principles that apply to measurement. Students should be able to apply concepts of infinite statistics to characterize large populations of measurement data. Similarly, they should be able to apply concepts of finite statistics to small samples of measurement data. Students should be able to apply least-squares analysis for curve-fitting purposes.

6. Students should be able to perform a basic uncertainty analysis for a measurement system. This includes the ability to perform a design-stage uncertainty analysis for a component of a sensor system, the ability to apply root-sum-of-squares methods to estimate uncertainty for multi-component systems, and the ability to determine how uncertainties are propagated in a calculated result.

7. Students should gain experience in documenting experimental work. Students should learn how to write a memo report and a full formal report.

Course Policies:
Grading:

- homework and quizzes: 15%
- lab: 20%
- project: 20%
- mid-term exam: 20%
- final exam: 25%

Petitions for regrading must be made within one week of return date.

Homework
Homework is to be turned into the homework box outside the ME office before 4:55 p.m. on the due date. There will normally be one homework assignment due each week. **Homework will not be accepted late without extremely extenuating circumstances!** If you believe you will need to turn in homework late for any reason, you must contact me **before** the due date (not after, except for emergencies).
Working together on homework in small teams of 2 or 3 students is encouraged. Such team efforts should include discussion of the problems assigned and the important concepts involved. Remember — the goal is learning, and discussion facilitates the achievement of this goal. Copying (cheating) does not! Though team efforts are encouraged, students must write out their solutions individually.

**Weekly Quizzes**
There will be two weekly quizzes on the Learning Suite site. Both quizzes will normally be available each Friday, and must be taken by the following Monday at 10:30 a.m. The quizzes are designed to give me weekly feedback on how well the class is getting the course concepts. The first quiz covers concepts covered in lectures and reading. The second quiz is to check if you have completed the required reading assignments. Partial credit will be given for reading portions of the reading assignment.

**Labs**
There will be a weekly lab session covering an experiment that will last between 1-2 weeks. You will work in groups of approximately three students to complete each lab and write the required report for it. See Learning Suite for more details for each individual lab.

**Project**
There will be a semester-long design project as part of this class. The project will be described early in the class, and it will culminate in an in-class presentation the last week in class.

**Midterm Exam**
There will be one midterm exam, worth 20% of the final grade. This midterm examination will consist of two parts. One part will be a timed exam. The other part will require you to use digital simulation techniques using a computer, and will not be timed.

**Final Exam**
The final exam will be held on ? in 250 CTB and is worth 25% of your final grade.

**CAEDM computer account**
A computer account on the CAEDM system will likely be necessary. Accounts on the computers in 425 CB and 450 CTB are available to all engineering undergraduates. Consult the TA or knowledgeable classmates for further information about obtaining a CAEDM account.

**Use of email**
Each student is expected to have their preferred email address updated in myBYU. Especially important class announcements or changes to the homework will be emailed to each student through Learning Suite which uses your email address listed in myBYU. You should check your email regularly so that you don’t miss these announcements.

Office hours are available for the instructor and the TAs, and their use for personal one-on-one assistance is encouraged. The TAs and I will also respond in a timely manner to email from any student. Email is also helpful for setting appointments for help outside normal office hours. For emails you send to me, I would ask that you have the following text "[me335]" (without the
quotation marks) in the subject line. This will help me respond to you more quickly.

**Class Web Page**
A course web page has been set up on Learning Suite. Please let me know if you are unable to access it! Course announcements, homework assignments, and other resources will be placed there. I encourage you to check the page regularly, at least several times each week. This will be your main source for getting assignments and other resources, since I will not normally print copies for you.

**Note from the instructor**
I believe that it is a privilege for us (both professors and students) to be here at BYU. I am excited about the opportunity to teach and learn principles of science and engineering framed in the eternal truth of the gospel of Jesus Christ. I will do my best to come to class prepared to teach and I expect that you will also come to class prepared so that we can learn together. I enjoy teaching and especially enjoy the subject matter of this class. I want you to also enjoy the material in this class and I want you to succeed. I will do anything I can to help you in that regard. If you have concerns, questions, problems with material or ways in which I can improve my teaching or the class, please let me know.

**Preventing Sexual Harassment**
Title IX of the Education Amendments of 1972 prohibits sex discrimination against any participant in an educational program or activity that receives federal funds. The act is intended to eliminate sex discrimination in education and pertains to admissions, academic and athletic programs, and university-sponsored activities. Title IX also prohibits sexual harassment of students by university employees, other students, and visitors to campus. If you encounter sexual harassment or gender-based discrimination, please talk to your professor or contact one of the following: the Title IX Coordinator at 801-422-2130; the Honor Code Office at 801-422-2847; the Equal Employment Office at 801-422-5895; or Ethics Point at http://www.ethicspoint.com, or 1-888-238-1062 (24-hours). If you feel comfortable doing so, I encourage you to contact me as well concerning any harassment or discrimination you encounter in this class.

**Students with Disabilities**
Brigham Young University is committed to providing a working and learning atmosphere that reasonably accommodates qualified persons with disabilities. If you have any disability which may impair your ability to complete this course successfully, please contact the University Accessibility Center (UAC), 2170 WSC or 422-2767. Reasonable academic accommodations are reviewed for all students who have qualified, documented disabilities. The UAC can also assess students for learning, attention, and emotional concerns. Services are coordinated with the student and instructor by the UAC. If you need assistance or if you feel you have been unlawfully discriminated against on the basis of disability, you may seek resolution through established grievance policy and procedures by contacting the Equal Employment Office at 422-5895, D-285 ASB.

**Church Educational System Honor Code**
In keeping with the principles of the BYU Honor Code, students are expected to be honest in all of their academic work. Academic honesty means, most fundamentally, that any work you
present as your own must in fact be your own work and not that of another. Violations of this principle may result in a failing grade in the course and additional disciplinary action by the university. Students are also expected to adhere to the Dress and Grooming Standards. Adherence demonstrates respect for yourself and others and ensures an effective learning and working environment. It is the university's expectation, and my own expectation in class, that each student will abide by all Honor Code standards. Please call the Honor Code Office at 422-2847 if you have questions about those standards.

Honor Code Statement

We believe in being honest, true, chaste, benevolent, virtuous, and in doing good to all men. . . . If there is anything virtuous, lovely, or of good report or praiseworthy, we seek after these things (Thirteenth Article of Faith).

As a matter of personal commitment, faculty, administration, staff, and students of Brigham Young University, Brigham Young University—Hawaii, Brigham Young University—Idaho, and LDS Business College seek to demonstrate in daily living on and off campus those moral virtues encompassed in the gospel of Jesus Christ, and will

- Be honest
- Live a chaste and virtuous life
- Obey the law and all campus policies
- Use clean language
- Respect others
- Abstain from alcoholic beverages, tobacco, tea, coffee, and substance abuse
- Participate regularly in church services
- Observe the Dress and Grooming Standards
- Encourage others in their commitment to comply with the Honor Code

Specific policies embodied in the Honor Code include (1) the Academic Honesty Policy, (2) the Dress and Grooming Standards, (3) the Residential Living Standards, and (4) the Continuing Student Ecclesiastical Endorsement. (Refer to institutional policies for more detailed information.)
### COURSE OUTLINE (Approximate)

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<td>Introduction to course material, outcomes, and why you should care</td>
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<td></td>
<td>(Writing and IMRAD)</td>
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<td>Characteristics of signals, why filtering and signal conditioning</td>
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<td>Writing Lab Reports and IMRAD</td>
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<td>Low pass filter example</td>
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<tr>
<td>9/26</td>
<td>Frequency analysis of a signal</td>
<td>2.3-2.4</td>
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<tr>
<td>9/29</td>
<td>Fourier Series</td>
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<tr>
<td>10/1</td>
<td>Fourier Series</td>
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<tr>
<td>10/3</td>
<td>DFT and FFT and making figures in MATLAB</td>
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<tr>
<td>10/6</td>
<td>Finish up MATLAB Examples (with different filters)</td>
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<tr>
<td>10/8</td>
<td>2nd order systems – undamped</td>
<td>3.3</td>
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<tr>
<td>10/10</td>
<td>2nd order systems – underdamped</td>
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<tr>
<td>10/13</td>
<td>2nd order systems – critically damped</td>
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<td>10/15</td>
<td>2nd order systems – review do frequency response demo</td>
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<tr>
<td>10/17</td>
<td>Catch up and demonstrations</td>
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<tr>
<td>10/20</td>
<td>Review</td>
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<td>10/22</td>
<td>Midterm Exam</td>
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<td>10/24</td>
<td>Signal Conditioning – Op-Amps</td>
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<td>10/27</td>
<td>Op-Amps</td>
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<td>10/29</td>
<td>Analog Filtering (High and Low Pass)</td>
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<td>10/31</td>
<td>Digital Filtering</td>
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<tr>
<td>11/3</td>
<td>Temperature Sensors</td>
<td>8.1-8.3</td>
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<tr>
<td>11/5</td>
<td>Strain Gauges Theory and application</td>
<td>11.1-11.3</td>
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<tr>
<td>11/7</td>
<td>Other Strain Sensors</td>
<td>11.4-11.5, 11.7</td>
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<td>11/10</td>
<td>Pressure Sensors</td>
<td>9.2-9.4</td>
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<td>11/12</td>
<td>Velocity and Position Sensors</td>
<td>12.2</td>
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<td>11/14</td>
<td>Flow Sensors</td>
<td>10.4, 10.7</td>
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<td>11/17</td>
<td>2D and 3D Sensors</td>
<td>7.10</td>
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<td>11/19</td>
<td>Measurement Error</td>
<td>5.1-5.2</td>
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<tr>
<td>11/21</td>
<td>Statistics</td>
<td>4.1-4.3</td>
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<tr>
<td>11/24</td>
<td>Uncertainty and Statistics</td>
<td>4.4, 5.5</td>
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<tr>
<td>11/25</td>
<td>Curve Fitting and Log decrement method for System Identification</td>
<td>4.6</td>
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<tr>
<td>11/26-28</td>
<td>Thanksgiving break (no class)</td>
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<tr>
<td>12/1</td>
<td>Uncertainty Analysis</td>
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<td>12/5</td>
<td>Uncertainty Analysis</td>
<td>5.6</td>
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<tr>
<td>12/8</td>
<td>Putting it all together</td>
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<tr>
<td>12/10</td>
<td>Review</td>
<td></td>
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<tr>
<td>12/17</td>
<td>Final Exam, in-class</td>
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</table>
Evaluation:

- I will have my mentor attend class twice during the Fall semester to give feedback
- I will also request that at least one other teacher who has taught ME 363 attend class once to give me feedback
- I will use student evaluators from the Center for Teaching and Learning
Grant Proposal for Course Development Project

Purpose: The items requested in this grant are intended to improve student learning by providing more immediate and active demonstrations of concepts and theory that we discuss in ME 363 (Instrumentation).

Description: The course that I am developing on Instrumentation and its subsequent change to a new class on Measurements is focused on the theory and implementation of measurement systems. However, I am currently not aware of small, portable hardware within our department that can be used for in-class demonstrations of different sensors or aspects of data acquisition. The materials listed below will allow me to bring a piece of hardware to class that connects to my laptop by USB and demonstrate many of the important concepts we will discuss on the white board in class about measurement and data acquisition. I am planning on paying for the difference between the items listed and the $300 limit prescribed for this grant.

Requested Funds for the Following Items:

<table>
<thead>
<tr>
<th>Item</th>
<th>Location</th>
<th>Cost</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student NI myDAQ and Protoboard Bundle</td>
<td><a href="http://www.studica.com/">http://www.studica.com/</a></td>
<td>$239.95</td>
<td>Can be used to interface directly with a laptop through USB for data acquisition and filtering demonstrations.</td>
</tr>
<tr>
<td>Basic Parts Kit for NI myDAQ</td>
<td><a href="http://www.studica.com/">http://www.studica.com/</a></td>
<td>$69.95</td>
<td>This kit contains basic wires, resistors, etc. needed to use the first item listed.</td>
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</tbody>
</table>