Faculty Development Plan  
Feb 21, 2013  
Revised June 10, 2013

Overview

This is the Faculty Development Plan (FDP) for an Associate Professor in Chemical Engineering. This plan will serve as a guideline for success in the three areas of faculty evaluation as outlined in section 3.1.5 of the BYU “Policy on Faculty Rank and Status” (Citizenship, Teaching, and Scholarship). Each category below includes a self-assessment and goals for my 3-year evaluation. In order to ensure success, I have enrolled in the BYU Faculty Development Series (FDS) program as my mentor.

Teaching

*Self Assessment.* I have a great appreciation for the insights I have gained from studying and applying the principles of Chemical Engineering throughout my career. For the past 17 years, I have been privileged to work in Industry to apply basic principles to medical device and tissue engineering product development. I truly believe that I understand the world much better and have enjoyed a very full life because of studying Chemical Engineering.

My philosophy for teaching is based on sharing the enthusiasm and insights I have gained through my study of Chemical Engineering with the students. I plan to minimize lecture time and maximize skill building and practice time. I will seek to support the students in their quest for knowledge and assist them as they develop the skills that will allow them to excel in their careers. These skills include leadership and spirituality in addition to engineering knowledge. I will encourage the students to remain active in church, seek an eternal marriage, and accept all callings, as they will grow tremendously from these experiences as well.

I will use class time to work on solving problems together, and provide an environment of cooperation and teamwork. I will implement a case method of learning, and emphasize verbal communication skills. I will provide every student with ample opportunities to speak in class and teach the other students. Employers greatly value those who can express their ideas effectively, and teach and lead others.
I will emphasize creativity in approaching problems and reward innovation. I will use real-world problems and seek inventive solutions from the students. We will work together to address the unmet needs in medicine and engineering.

I plan to teach many subjects in Chemical Engineering. I am particularly interested in teaching Materials, Polymers, Introduction to Chemical Engineering and the Graduate Course in Biomedical Engineering. In my first semester, I taught Unit Operations. This was a great experience to refresh my knowledge of the application of the engineering principles of transport, kinetics and thermodynamics. I will read every student’s evaluation and implement their suggestions into my future teaching experiences. I will continue to maintain an “open door policy”, as I have had the opportunity already to review resumes, and provide career guidance and encouragement to many of the students.

I will continue to seek opportunities to improve my teaching skills by participating in the seminars and workshops offered by the University.

I will work closely with the Teaching Assistants to help them develop their teaching abilities.

**Professional Goals.** I seek to be recognized as an outstanding teacher, and will work to receive the Chemical Engineering Outstanding Teacher’s Award once in the next 3 years.

I will improve my evaluation scores each semester until they are above 7.

My short-term plans (2013-2014 academic year) for achieving some of the goals mentioned above are:

- Teach UO Lab (Winter 2013)
- Teach the tissue engineering section of the Biomedical Engineering ChEn 518 Course.
- Teach the Materials Class (Fall 2013)
- Teach UO Lab (Winter 2014)
- Obtain faculty feedback on my teaching in each semester by having them attend my lectures
- Report to my Department Chair on changes made associated with feedback from faculty
- Mentor 5 undergraduate students in research each semester
- Offer one seminar talk in the student chapter of AICHE at BYU.
- I plan on using the services of Students Consulting on Teaching (SCOT) to provide mid-semester feedback on my teaching and course organization for the Materials course taught this Fall. Specifically, I will ask the student consultants to solicit anonymous feedback from students and provide candid feedback by observing class lectures.
My long-term plans for achieving these goals are:

- Accept requests by student groups, i.e., seminars and workshops, for presenting biomedical engineering related topics.
- Attend seminars and workshops on teaching (like those prepared by the Faculty Center) to refresh my lectures and labs. I will incorporate one new idea from each seminar into my teaching and document the effect of that change.
- Specifically to improve my examination writing skills, I plan on attending at least two teaching seminars during 2013. I will incorporate the learnings from these seminars and document the results.
- I intend to continuously improve my teaching skills by attending seminars, soliciting advice from colleagues and obtaining feedback from students. I will document the effect of the input on my teaching.
- Attend, as frequently as possible, local and national level professional meetings to update my knowledge in biomedical engineering subjects to incorporate the ideas obtained in these meetings into my classes. I will keep track of ideas from these meetings and document when they are used in my classes.
- Work with other faculty members to prepare a coherent biomedical engineering program.
- Incorporate material from my research into my teaching.

Resources needed. I expect that the department will be willing to support the cost of Teaching Assistants and incidental resources needed to complete my teaching goals.

Scholarship

Self Assessment. I have been active in research in medical devices and tissue engineering during my employment in Industry, having published over 30 peer-reviewed papers and presentation abstracts. In addition, I have over 10 issued and pending US patents. I have sufficient lab space and funding from BYU to begin a research program. Currently, I am supervising 1 PhD students and 15 undergraduate students. I have submitted one R21 Grant Application for additional funding. I will plan to submit at least 6 applications for funding each year to various agencies, such as the NIH, NSF and Utah. I will build interdisciplinary teams by supervising undergraduate students majoring in Biology and Pre-med. I will continue to involve undergraduate and graduate students in the research. I will attend national and international conferences. I have presented many times at conferences and will continue to seek opportunities to present my work by submitting abstracts. The conferences are a
great opportunity for networking and contributing to the field of tissue engineering. I will be active in the Tissue Engineering Regenerative Medicine International Society (TERMIS). I will continue to read journal articles, serve as a reviewer of manuscripts, and collaborate with co-investigators in academia and industry.

**Professional Goals.** The following goals have been defined for the 2013-2014 and 2014-2015 academic years. Although these goals are specified for the next two years, continuation of developing a strong tissue engineering lab, integrating undergraduate students into my research, developing interdisciplinary relationships, publishing on a regular basis, and writing grant proposals will be continued thereafter.

My goals for research (or scholarly activities) in the coming two to three years are:

- Develop tissue engineering labs at BYU involving interdisciplinary work. The labs will initially focus on heart regeneration research. I have already developed the initial lab that includes bioreactors, cell preparation equipment, and analytical equipment. I have recently established collaborations with Dr. Jeffery Barrow (BYU Physiology and Developmental Biology) and Dr. Beverly Roeder (BYU Biology). Fifteen undergraduate students are currently working in the laboratory from many disciplines across campus. I have also developed collaborations for the kidney project with Dr. Jon Wisco (BYU Physiology and Developmental Biology) and for the peripheral nerve project with Dr. Scott Steffensen (BYU Neuroscience).
- Work with the local businesses and state government in Utah to receive additional funding for research.
- Obtain national funding through writing proposals. The goal is to obtain approximately $100,000 to $150,000 per year in funding. I plan on writing proposals including 1) heart research and 2) kidney research. Additional proposal opportunities will be identified as the research progresses. Preliminary studies are being performed in several areas that will provide strength to the proposals. Proposal agencies include the NIH and NSF. I will be integrating educational opportunities with the research. I will also attend seminars sponsored by NIH and NSF to hone my grant writing skills, and document the learnings from these seminars, and how I applied them to improve my grant writing.
- I will apply for a MEG grant from BYU in 2013, to sponsor undergraduate research in my lab.
- Publish one paper my first year, two papers my second year, and three peer-reviewed research papers in my third year.
- Attend the 2013 TERMIS meeting in November and present a poster or podium presentation.
- Present research at two national and/or international conferences a year (on the average).
• Involve good undergraduate and graduate students in my own research.
• Keep up-to-date with research in my fields (tissue engineering, biomedical engineering).
• Develop a well-defined research agenda.
• Get involved with other faculty members in and outside the department.
• I will continue to lead a writing group on a weekly basis that will help me refine the thoughts and ideas in the papers I am writing.

My long-term plans to accomplish these goals are:

• NSF CAREER Award, planned submission: June 2014. NSF offers a generous award for new faculty early in their career. As a new faculty, I intend to submit a proposal for this award next summer. I will use the coming year to prepare for the proposal by publishing my current work and making appropriate contacts in my research field.
• Continue to explore external funding both at state and national levels (About $100,000 to $150,000/year funding is my goal).
• Set aside a minimum of 30 minutes for writing papers, book chapters, reports, etc. every day.
• Continue dialogue with my former colleagues to develop research projects.
• Attract good undergraduate and graduate students to collaborative research projects.
• Work with colleagues and other faculty member on future interdisciplinary projects.
• Attend up to two conferences and/or workshops a year.
• Set aside a half-day a week to browse journals related to my research topics to collect information for lectures and for research assistants to read.
• Become involved in the Biomedical Engineering Club on campus.

My short-term plans for achieving some of these goals are:

• Send one or two abstracts to the 2013 TERMIS Annual Meeting.
• Send one paper to Tissue Engineering Journal and one paper to Biomaterials.
• Send at least 3 proposals to NIH.
• Send two proposals: one for the State USTAR and another for a federal agency (NSF).
• Mentor two graduate students working for funded projects.

Resources needed. Equipment. I would eventually like to obtain funding for a bioprinter and HPLC. Ideally, it would be beneficial to create a core facility at BYU for bioengineering efforts (biomedical, biochemical, etc.) Currently I have connections to the BYU Biology department that allows me to utilize equipment I do not have to pursue appropriate research. Although I currently have funding available for research and travel, it is necessary for me to have a small budget for travel funds to
allow me to attend conferences or meetings not associated with my current research funding. A small, marginal travel budget will allow me to continue to meet new people, target new publications, and explore new opportunities unrelated to my current research.

**Citizenship**

**Self Assessment.** I am currently serving on the Undergraduate Committee and will plan to continue to serve on that committee for the next 3 years. I am willing to assist in any other committee assignment deemed necessary by the Chemical Engineering Department or College of Engineering and Technology.

**Professional Goals.** The following goals have been defined for the 2013-14 and 2014-15 academic years.

My goals for citizenship are:

- To build relationships with colleagues in the Chemical Engineering department.
- To strive to achieve the mission of BYU - "to assist individuals in their quest for perfection and eternal life."
- To assimilate BYU’s high standards in my teaching and research.
- To be active in departmental functions and duties.
- To get actively involved in local and national professional organization activities, in organizing conferences of such organizations and in leading committee activities.
- To promote the biomedical engineering program of BYU at local, national, and international venues to expand the potential graduate student pool and funding organization pool.
- To assist students in finding jobs in the biomedical engineering field.
- To accept committee assignments in the Department and graduate students within limits.
- To get acquainted with both undergraduate and graduate students.

Short-term plans to achieve some of the goals are:

- Find membership position in one committee in TERMIS.
- Volunteer to become a mentor to two to three students taking a 3.0 credit hour project course.
- Chair a session at a National meeting.
• Continue as Chair of the Clinical and Scientific Advisory Board for the NSF-funded Engineering Research Center for Revolutionizing Metallic Biomaterials at NC A&T.

Long-term plans to accomplish these goals are:

• Continue involvement in church activities.
• Attend devotionals and assemblies.
• Attend undergraduate and graduate seminars.
• Attend local and national professional meetings within limits (my goal is to attend two national conferences a year).
• Participate as a member of TERMIS committees.
• Participate as a panel member for an NIH Study Section.
• Accept graduate students as RA’s for funded projects and become mentors to undergraduate students who conduct 3.0 credit hour projects as well as to those working on funded research projects.

Resources needed, over the next two years, to accomplish my goals are as follows:

• The Department keeps my teaching commitment to one course each semester, and to be released from teaching during both spring and summer terms for the first two years.

Summary

I am confident that I will achieve the goals outlined in this document and that I will meet the high expectations set by my department. With continued support from colleagues, the department, college, and university, I should have all the help necessary to complete my goals and improve the department and university. I look forward to this challenge and opportunity.
Citizenship Project Proposal
May 23, 2013

As a member of the Undergraduate Committee in the Chemical Engineering Department, I currently have the responsibility for the Chemical Engineering Undergraduate Scholarships and I represent the department on the college committee for Women in Engineering. For each of these responsibilities, I will continue to fulfill my responsibilities in a timely and efficient manner.

We are in the process of making changes in the types and amounts of scholarships awarded by the department. We introduced a Leadership award this year, and plan to eliminate the Freshman scholarship. The annual deadline for submitting scholarships is April 1st. This year we received approximately 80 applications, and awarded $37,000 in scholarships to 47 recipients. I read all the applications and prioritized the applicants and calculated the amounts to be awarded, and presented the results to the Undergraduate Committee. I was complemented on the thoroughness and efficiency of my analysis. I will strive to be just as efficient and thorough in the next few years as we continue to revamp the Scholarship program.

The Chemical Engineering department has the largest number of women in any of the engineering departments at BYU. We have organized events for the Chemical Engineering women in the past and have found it to be very helpful. The previous faculty advisor to WE from ChemE recently retired, and it is important to provide a smooth transition. I attended the Women in Engineering (WE) dinner at the end of the winter semester and was impressed by the need that the women have to associate with their peers. In the Fall, I will work with the WE representatives from the Chemical Engineering department to plan a dinner and other activities to support the WE organization within Chemical Engineering.

In addition to my roles and responsibilities to fully support the Chemical Engineering department, I will continue to seek opportunities to contribute to the broader BYU community and to the international organizations to which I belong. I will attend the Tissue Engineering and Regenerative Medicine International Society (TERMIS) meeting in November, and I plan to volunteer to serve on an organizing committee for the following year, and chair a session.

I have also been serving in a volunteer role as the Chair of the Clinical and Scientific Advisory Board for the National Science Foundation Engineering Research Center for Revolutionizing Metallic Biomaterials (ERC RMB). This involves attendance at the annual site visit to North Carolina A&T State University in Greensboro, North Carolina and regular teleconferences with the leadership of the ERC. My responsibilities include the coordination of a Strength, Weaknesses, Opportunities and Threats (SWOT) analysis, and participation in discussions with clinicians and faculty that participate in the ERC RMB. The contributions that I have made have been greatly appreciated. I will continue in this role.
In my Faculty Development Plan, I set the goal of publishing one paper in the first year, 2 papers in the second year, and three peer-reviewed papers in my third year. The first paper to be published will be a review of the use of decellularized extracellular matrix scaffolds for tissue engineering of cardiac tissue. This paper is in draft form, and I intend to submit it by August. In subsequent papers, I will publish the progress of our development of a process for recellularizing tissue and discuss the possibilities for adding growth factors and adhesion peptides to promote the growth of new hearts. I will also publish the use of an in-vitro thrombosis assay as a method for confirming the quality of the new heart prior to implantation. Many of the papers that have previously been published have indicated that complete reendothelialization is critical to the success of the regenerated organ, but they have not identified the specific methods to test this hypothesis. We are developing these methods and will be able to contribute to the literature in this area.

Additional papers that I will write in the future will be based on the results of the research on the hearts, kidneys, eyes and nerves that we are working on in the laboratory now. I will include students as authors on all of the papers and will include other faculty at BYU as well as collaborators outside of BYU as coauthors.

In order to accomplish my publication goals, I will engage the editors of the journals that would be most likely to receive these papers, such as the Journal of Tissue Engineering, and let them know of my plans. I will send them outlines of the articles and request their input and guidance.

I will continue to lead a writing group on a weekly basis that will help me refine the thoughts and ideas in the papers I am writing. We have been meeting as a group since January, and I have found it very helpful to have a commitment that needs to be met each week.

I will also continue to require the students in my laboratory to produce a written summary of their experiments and I will include the students in writing proposals that can be used to fund the research.

I will dedicate at least 2 hours a day throughout the summer, and fall and winter semesters for writing.
I will teach Chem Eng 378: Fundamentals of Materials Science and Engineering this fall semester. I have attached the syllabus for Fall Semester 2013. I have been attending the Materials class that is being taught by my mentor, Dr. Bill Pitt, during Spring semester. I have read the textbook and other materials for the course, and I have worked many of the homework and test problems. In order to prepare for teaching the course, I will continue to attend the lectures, read the textbook, work the homework, quiz and test problems, and I will read the following three books and implement ideas from each of the books into my lesson plans:

Brookfield, S.D., *Becoming a Critically Reflective Teacher*

Harb, J.N., Terry, R.E., *Teaching through the Cycle*

Silberman, M., *Active Learning 101 Strategies to Teach Any Subject*

These three books were obtained at the book fair during the Spring Seminar. One example from *Teaching through the Cycle* is implementing the Kolb Learning cycle of teaching from all 4 quadrants, so that all the learning styles present in the class can be addressed. I also will incorporate the advice and instruction I received at the Spring Seminar into my teaching style. In addition, I will attend the Fall Seminar Series and continue to seek input and guidance for improving my teaching abilities.

I would also like to purchase some new materials and models of materials for the class. We currently have some 3D models that demonstrate, for example, the differences in Face-centered Cubic and Body-centered Cubic materials. I request $300 in funding to purchase additional materials and models. One example is a model that demonstrates dislocations in the lattice structure of materials. Another material that could be acquired is an example of the ceramics used to construct a metallic Cobalt-Chrome knee prosthesis. Another is Nitinol wire that can be used to demonstrate the principle of shape-memory. I also have reagents for demonstrating the polymerization of nylon, and could use the money to replenish the reagents. I could also purchase videos that demonstrate the use of polymers, ceramics and metals in Industry. I will coordinate these purchases with Dr. Pitt.
Course Purpose:

Raise awareness of engineering materials and their proper application so that the student can confidently select the proper materials for the required real-world applications.

Course Description:

This course examines the fundamentals of materials science and their applications to engineering design; it is especially geared to chemical engineers. Topics include electronic, molecular structure and forces; crystalline and amorphous structure of solids; phase transformations; thermodynamics of solids; defects; diffusion; crystallization; interfacial phenomena; mechanical properties; chemical and physical metallurgy of ferrous alloys; corrosion; and applications of metals, ceramics, glasses, polymers, composites and semiconductors.

Inappropriate Use of Course Materials:

All course materials (e.g., outlines, handouts, syllabi, exams, quizzes, PowerPoint presentations, lectures, audio and video recordings, etc.) are proprietary and the property of Dr. Cook. Students are prohibited from posting or selling any such course materials without the express written permission of the professor teaching this course. To do so is a violation of the Brigham Young University Honor Code.

Prerequisites:

Students must have completed the freshman chemistry sequence (Chem 111, 112 or Chem 105, 106, 107). Completion of the calculus sequence and Chem 351 is recommended.

Required Texts:

2. Fall 2013 Course Notes, by Dr. Cook, BYU Bookstore, ChEn 378 Course Packet.

Course Objectives:

1. Stimulate each student to learn and understand (a) the fundamental principles of material science, (b) the properties, preparation and applications of important engineering materials, and (c) the relationships of these properties to electronic, atomic, molecular, and phase structures and composition.
2. Help equip each student with the skills they will need as engineers to prepare, select, specify, use, purchase, and design materials.
3. Provide each student during each lecture with specific learning objectives, important fundamentals and their applications, examples of calculations, active learning activities and discussion, and a perspective of how the materials we are studying fit into the general context of our curriculum, engineering practice, and societal needs.
4. Prepare each student to meet ABET 2000 competencies in the area of Material Science and Engineering.

ABET Evaluation: This year I need to collect samples of student homework that address the required ABET Competencies on the next page. I will collect photocopies of selected homework and of selected exam problems and compile these examples in a folder. If you DO NOT want me to use your work as examples, then complete the attached sheet and return it to me. If I don’t get a sheet from you, that will indicate that you have given permission for your work to be copied.

**Required ABET Competencies:** This course has been designed to assist you in learning the following competencies through the learning methods shown below. The table below also shows how your competency in these subject areas will be assessed. This list has been prepared by the undergraduate committee and accepted by vote of the faculty. A more comprehensive list of attributes and competencies has been prepared specifically for this class (see your course notes).

<table>
<thead>
<tr>
<th>Competency</th>
<th>Level</th>
<th>Usage</th>
<th>Expectation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1.5</td>
<td>2</td>
<td>M</td>
<td>Students will be able to read liquid-solid mixture phase diagrams involving liquid-solid and solid-solid equilibria and construct mass balances from them using the lever rule, tie lines, etc.</td>
</tr>
<tr>
<td>3.2.2</td>
<td>2</td>
<td>M</td>
<td>Students will understand the relationship of molecular interactions, including potential energy and intermolecular forces, to the properties and behaviors of materials.</td>
</tr>
<tr>
<td>3.2.3</td>
<td>2</td>
<td>M</td>
<td>Students will understand crystal structure including nomenclature, packing, and defects.</td>
</tr>
<tr>
<td>3.2.4</td>
<td>2</td>
<td>M</td>
<td>Students will understand mechanical behavior of materials including elastic, plastic, viscous, glass, surface, and stress/strain phenomena and how they are affected by molecular structure and/or microstructure.</td>
</tr>
<tr>
<td>3.2.5</td>
<td>2</td>
<td>M</td>
<td>Students will understand the physical/chemical behaviors of metals, ceramics, and polymers including effects of molecular weight, crystallinity, crystallite size defects, surface energy, heat-treating, and corrosion.</td>
</tr>
<tr>
<td>3.2.6</td>
<td>1</td>
<td>M</td>
<td>Students will understand the electronic behaviors of metals, semiconductors, and insulators.</td>
</tr>
<tr>
<td>3.2.7</td>
<td>2</td>
<td>M</td>
<td>Students will be able to match the physical and chemical characteristics of a material to process conditions/variables in order to evaluate its suitability for use with the process.</td>
</tr>
<tr>
<td>4.9</td>
<td>1</td>
<td>P</td>
<td>Students will demonstrate effective interpretation of graphical data.</td>
</tr>
<tr>
<td>6.1</td>
<td>3</td>
<td>P</td>
<td>Students will demonstrate an ability to solve engineering problems.</td>
</tr>
<tr>
<td>6.4</td>
<td>2</td>
<td>P</td>
<td>Students will exhibit critical and creative thinking skills for analysis and evaluation of problems and cause-effect relationships.</td>
</tr>
<tr>
<td>6.6</td>
<td>2</td>
<td>P</td>
<td>Students will be able to rationalize units, make order of magnitude estimates, assess reasonableness of solutions, and select appropriate levels of solution sophistication.</td>
</tr>
<tr>
<td>12.8</td>
<td>2</td>
<td>P</td>
<td>Students will demonstrate effective reading of technical material.</td>
</tr>
</tbody>
</table>

Competency Levels
Level 3 (Mandatory): Fixed minimum level of competency with individual multipoint assessment and recycle for inadequate performance
Level 2 (Measured): Fixed minimum level of competency with individual assessment, and systematic feedback
Level 1 (Exposure): Required competency, but no minimum expectation or individual assessment
Level 0 (Optional): Desirable competency, but not required
I = introductory
R = review
M = main learning forum
P = programmatic throughout many classes
Subject Philosophy

Materials Science is a highly interdisciplinary, constantly evolving field, and thus all relevant information for chemical engineers is not contained within any one textbook. We will use the leading engineering text (by Callister) which is also the most appropriate text for chemical engineers with your chemistry background, and we will supplement it with notes, figures and tables available in the Course Notes. Your chemistry, physics, and basic engineering texts will also be helpful at times, as we will integrate concepts from these other classes into this one. The course requires a variety of learning skills and is geared to stimulate higher thinking levels. Don’t expect this to be an easy class. Do expect it to be stimulating and fun. The nature of this class is more descriptive and less mathematical than other engineering classes. You are required to learn many new concepts that will serve you throughout your engineering career.

Teaching Style

**Style.** My style is to present fundamental principles in the context of the general body of scientific and engineering knowledge and to illustrate them with applications and practical examples. I expect every student to **read** the required material before class, and be prepared to discuss it. Therefore I will not repeat all that material that you have read. If you did not understand the reading, then ask me to review that material in particular during class. I will highlight the most important or most difficult material, and will give some examples of solving problems. I plan to spend about 40% of class time presenting this information and the remaining 60% in a stimulating discussion, group work, and of working examples and questions that come up. I have found that learning is stimulated by active learning activities such as demos, technology updates, by having weekly quizzes and by my addressing questions to students somewhat randomly during the lectures; this tends to keep students alert and awake. You are responsible to know all of the material, whether or not I discuss it in class.

**Learning Philosophy.** Learning should be a joyful, exciting, never-ending experience. The role of a professor is to profess--to be a worthy example of learning. His job is to (a) stimulate excitement of learning in his students, (b) present fundamentals in an organized fashion that provides a framework and perspective for the students’ further learning and research, and (c) stretch his students to learn and be their best. I enjoy teaching very much and love working with students. I look forward to getting to know each of you better. I am committed to doing my very best as your professor to help you learn this important material; to prepare interesting, organized lectures and to be available to help each of you.

**My Plans to Help You.** I have set up five office hours per week and have asked our TA(s) to set up another 9 office hours per week. We are available to help you with any aspect of the course including giving you assistance to understand principles involved and hints on the problems. However, we will expect that you have read the relevant material in the text and tried to work the problem before you ask for help. We will not work the problems for you; however, in problem study sessions we will work pertinent examples and give you hints and helps. Please feel free to come in to talk to me about anything here at BYU that you need help with. If you can't come during office hours please make an appointment with me personally or through the department secretaries. I am open to your suggestions for improving the course or use of class time. You can help me be a better teacher by politely pointing out mistakes that I make (in class or on written material) and visiting with me privately to discuss how to make the teaching and
learning experience better. I give 1 point extra credit for being the first to find mistakes in the
text or my notes. Send them by email (oral doesn’t get you any points).

Expectations of Students
1. Each student is responsible for his or her own learning. I expect each of you to come to class
having read the assigned pages in the book and notes and thereby being prepared to answer
questions and participate in active learning activities. But there is also much you can do to help
each other to learn course principles and applications, while learning to work in groups. You are
encouraged to discuss homework together in groups (if this is efficient for you), but each person
is required to write-up and hand-in his or her own work. Copying all or part of another student’s
assignment (or the answer key) is not allowed; however much discussion and teaching each other
is highly encouraged. If you don’t have a group to work with, please contact me.
2. Professional Conduct: Please act professionally and respectfully of others in class. I will
commit to do the same. Please do not whisper, talk, read, work problems, or eat during class; if
you have a question or comment please raise your hand. Keeping the noise down is critical due
to the size of our class and the lively acoustics of the room; it avoids your missing important
information and/or our wasting time because I have to ask someone to repeat a question or
answer the same question twice. Turn off your cell phones during class. If a cell phone rings
during class, I will keep it until the end of class for the first offense. Repeated offenders will lose
points and may lose their phone for a day or a week.
3. Adherence to Honor Code: We are all committed to living by the BYU Honor and Dress
Code. It is expected that each of us will honor our commitments. Please maintain your integrity
by following the dress and grooming standards in class. Cheating on exams is unacceptable and
will result in an E grade and possibly dismissal from the program. Copying someone’s
homework or quiz or test notes is unacceptable and unethical and will result in reduced scores.

Homework and Reading Comprehension:
Homework is due at the beginning of class on the due date. Late homework will receive
credit as follows: 0-24 hrs late: 75% credit; 24-48 hrs late: 50% credit; more than 48 hrs late: no
credit. If you have truly extenuating circumstances, you need to contact Professor Cook as soon
as possible for his authorization to hand in homework late for full credit. Please put your name
and assignment number on the outside of each homework set. It is the responsibility of each
student to turn in late homework to the Professor--with a note of explanation in the case of
extenuating circumstances. Each homework assignment is worth 100 points. There are hints and
helps published for selected homework in the syllabus. Answers to the homework will be placed
in the answer-key book kept by the department secretary 2-3 days after the assignments have
been handed in. Graded homework will be handed out during class and will be otherwise
available for pick-up in the bottom slot of my mailbox. The TA(s) will grade the assignments. If
you feel your homework was not graded properly, please see him or email him. I will not change
the grade that the TA has given you. Scores will be posted on Learning Suite.

To help you prepare for class, I have prepared reading comprehension questions that are due
at the beginning of each class requiring reading material. These questions will also point out to
you which concepts I feel are the most important.

This year I want feedback on the length of time required for this class. At the end of each
assignment, as you turn in the reading questions, please state the amount of time the homework
required. Also state the length of time doing reading preparing for class. I compare these
numbers with those you report to the department at the end of the semester.
To help you see examples of solving homework, I will request some students to write the answers to the homework problems on the board at the beginning of the class. You will get extra credit points when we do this activity.

**Quizzes:**

**Class Quiz.** A short (5-10 min.) quiz will be given at the beginning of class each Friday unless otherwise announced. The quiz will generally be taken from the assigned reading in the text or course notes. Most quizzes will be closed book; however, you may use up to 1 page of your own notes. Missed quizzes cannot be made up unless prior arrangements are made and then only for extenuating circumstances. Each quiz is worth up to 10 points. Using someone else’s notes is a violation of the Honor Code.

**Personal Quiz.** On Monday and Wednesday I will call upon 5 to 10 students to answer questions taken from the reading material. You will be graded on your response, so be prepared. If during subsequent class discussion it becomes apparent that you have read or not read the assigned reading material, I will award points appropriately.

**Exams:**

Three in-term closed-book exams and a final exam will be given. The times for these exams are listed on the attached schedule; in-term exams will be given in the testing center, and are timed (2 hours). The extent of knowledge that will be examined will be everything that you have learned (or should have learned) since kindergarten, but emphasis will be placed on the material covered since the last exam, and will be based mainly on homework, required reading, notes and examples worked in class. Because I realize that everybody has a bad day on an exam day every once in a while, I will weight the lowest score of your in-term exams only half as much as I weight the other two. The exams are closed book, but you may use 1 page of your own handwritten notes. You may not use the notes of other student or copies of notes of another student. Turn the notes in with the exam. The final exam will be in the classroom during the time assigned to us by the University.

**Extra Credit:**

It is possible to make up missed points in the “Quiz” category by doing extra credit. I will announce these opportunities as they come along. Course grades will be calculated before the extra credit is incorporated. Then the grade distribution will be fixed, and the extra credit added in. Therefore extra credit may bump you up a grade, but will never change any grade downward. One type of extra credit work that is always possible is to read an article in a published journal and turn in a 1-page report of what you learned. Many of these you can download for free on the internet. A good starting journal is “Materials Today”. I do not want you to copy the abstract of the article (that would be plagiarism). The website is: [http://www.materialstoday.com/](http://www.materialstoday.com/). There is a maximum of one report per week that I will accept. These must be published journal articles, and not just website stuff like from Wikipedia or Howstuffworks.com, although these can be helpful for understanding the article you are reading. You need to give me a full citation of what you read, including title, authors, journal title, issue, pages and year (see the example in the packet and at the end of this syllabus).

**Grading:**

The final grade will be based on homework and quizzes, in-term exams, and final exam and will be weighted as follows:
Homework 20%
Quizzes 5%
In-term exams (lowest 10%, 2 highest 17.5% each) 45%
Final exam 30%

Grades will be assigned on the basis of final scores using a modified curve scale. I will try to adhere to the college and departmental guidelines of giving an average GPA of around 2.9 for junior level classes.

A summary of scores will be available on Learning Suite during the semester. Check this summary often to make sure your scores are recorded properly.

**Website and Email**

I will use Learning Suite for posting announcements, homework scores, exams scores, etc. There are also some special readings that can be found on Learning Suite. I will correspond with you on a regular basis by email using the address that Learning Suite gives me—if you prefer another address, please set up Learning Suite so that you get the e-mail.

**Expected Time**

The students in the fall semester 2002 reported daily their time spent on homework and reading. The time spent on homework was $74 \pm 21$ minutes per assignment; the time spent on reading was $43 \pm 7$ minutes per assignment. This is about 5.9 hours per week assuming an assignment each day (which is an overestimate). This is about right for a junior level class. In 2003, the homework time reported to the department was 6.1 hrs/week. In 2006 the numbers were about the same. Same in 2010 and 2012.
This article, “Diamond cells and new materials,”\(^1\) discusses how scientists use diamonds to study the behavior of materials at high temperature and pressures. The main tool used is a diamond anvil, or an apparatus that has two anvil-shaped diamonds that can be pressed together. A laser is also used to obtain high temperatures. When these are coupled, it creates an environment that can be ideal for studying phase changes of a material, synthesizing new hard materials, and recreating conditions underneath the earth’s crust.

It was very interesting to read about the phase changes of noble gases and nitrogen at high pressures. Kr and Xe exist in two phases (face-centered cubic and hexagonal close-packed) over a very long pressure range. Xe begins to change from fcc to hcp at 14 GPa and doesn’t transform completely to hcp until 75 GPa. Nitrogen also can begin forming a “new, single-bonded cubic form” under high pressure and temperature. Because of the large difference in bond energy between the single-bonded N and the ambient N\(_2\) triple-bond, this material could further be studied as a high energy material.

Hard new materials have also been studied and synthesized using the diamond anvils. Silicone nitride (Si\(_3\)N\(_4\)), for example, occurs naturally in meteorites and is known for its resistance to wear and heat. Si and Ge nitrides are synthesized by putting the respective material in the diamond apparatus and subjecting it to high temperatures and pressures. At high pressures, new structures of Si\(_3\)N\(_4\) have been found to exist “with potentially superior properties.” Transmission electron microscopy is used to determine the crystal structures after synthesis.

It also intrigued me how the diamond anvils can recreate the conditions that exist at the center of the earth. The melting point of iron was measured at these conditions (around 200-400 GPa). Results are more reproducible because of the diamond apparatus, although they still vary due to different approaches to estimating the melting temperatures. The estimates of the earth’s core temperature, therefore, range from 3,000 K to 8,000 K, depending both on the depth into the earth’s core and the approach used to estimate the temperature.

NAME:

LOCAL ADDRESS: LOCAL PHONE:

MARITAL STATUS: Single or Married? EMAIL:

MISSION/MILITARY SERVICE:

PREVIOUS EDUCATIONAL EXPERIENCE:

WORK EXPERIENCE (include summer and part-time jobs):

ORGANIZATIONS:

HOBBIES, INTERESTS:

PROFESSIONAL & TECHNICAL INTERESTS:

CAREER PLANS:

WHAT DO YOU HOPE TO GET FROM TAKING THIS CLASS?

I DO ______ (leave blank or write in ‘not’) give permission for Dr. Cook to copy and keep examples of my homework, quizzes and exams for ABET evaluation purposes.

I DO ______ (leave blank or write in ‘not’) give permission for Dr. Cook to pass back my homework and quizzes in class where there is the possibility that other students may see my scores.

Signed: _______________________________