1 Teaching

1.1 Self-assessment of strengths, skills and competencies  I enjoy the teaching and learning dynamic as well as the environment. For the most part, I am comfortable up in front of a class when I have appropriately prepared. I feel that I am a good listener, which is important in identifying the needs of students. Although there is room for improvement, I feel that I can explain concepts in plain terms for students to understand. I believe that I am approachable and that when students come to me with questions that they feel comfortable in returning to my office again.

1.2 Areas of Improvement  I understand that I have a high level of expectation. As I feel the need to help students be prepared to contribute in the area that I am asked to teach, I recognize that I need an appropriate level of expectation as well. As a new teacher, I am working to identify what this appropriate but high level is. Improvement areas include:
    • Determining the appropriate load of required work
    • Provide a better balance of class time
    • Demonstrate topics through examples
    • Effective time management
    • Familiarity with courses and material

1.3 Professional goals  There are four key educational outcomes, which I intend to personally work on and try to instill in students:
    • Communication – Transfer of information is critical for learning to occur. While it is paramount that a teacher be able to effectively delineate course concepts through the use of analogies, language, technology, and experience, it is also important that this quality be instilled in the student. Opportunities for communicating technical information should be offered to students.
    • Knowledge – Knowledge does not come without effort. While access to knowledge has improved greatly, it will always require individual work to obtain knowledge and understanding. Work is also expected of the instructor in order to prepare for teaching. Once the material has been sufficiently presented, it is also expected that the student put forth the effort to review, recall and apply the principles. Clearly, this is one area in which raising and maintaining a high level of expectation can help motivate students to put forth the effort required in order to gain knowledge.
    • Critical thinking – Empowering students to develop critical thinking skills is necessary. While critical thinking skills are not a nicely packaged nugget of information that you can simply hand off and are usually developed over time
through consistent effort, there is an important role for instructors to play in assisting the development of this attribute. This role is found in knowing when and maybe more importantly, when not to provide help. Critical thinking cannot be achieved if the way is always laid out before a student. A good teacher does not always give all that students may request.

• Responsible conduct of research – Applicable to both undergraduate and graduate students, the conduct of research must be performed in a responsible manner. This responsibility takes many forms and includes originality of work, accurate and precise record keeping, professional ethics, seeking graduate training, following safety protocol, curbing bias, and conscientious practice. It is expected that this tone be set and adhered to by the faculty in instruction and research.

In addition to these 4 outcomes, I want to be a successful mentor. Mentoring is much more personal and tailored to individuals. I aspire to be the kind of person that provides useful and critical feedback that improves work. I also want those that I mentor to know that their total development - not just their academic development - is important to me.

1.3.1 Short term plans
• Hold a mid-course and end-of-term evaluation to get early feedback for course corrections.
• Learn student names.
• Participate in several Teaching and Learning Luncheons to improve instruction.
• Seek informal feedback from students as they use my office hours.
• Prepare course notes for ME 340 using texts and other faculty notes.
• Request teaching cycle of graduate level classes 540, 643.
• Incorporate doctrinal topics that apply to current student needs in class time - decision making, faith, sacrifice.

1.3.2 Long term plans
• Support a learning environment
• Mentor 45 graduate students and 2 additional undergraduate students in the pipeline.
• Reduce class prep time through repeated teaching of a course and developing a strategy for test preparation.
• Limit number of new preps initially to 34 classes.
• Establish feedback improvement loop by implementing helpful suggestions in course/instructor evaluations.
• Study advanced heat transfer topics for teaching graduate level courses.
• Incorporate life lessons and heat transfer related analogies.

1.4 Outcomes to date
• Identified the need for lighter homework loads in ME 340.
• Shared ME 340 student feedback with Scott Thomson, May 2013.
• Teaching and Learning Luncheon attendance
  o February 5, 2013, “Immediacy”
  o March 5, 2013, “Communicating expectations and assessment”
• Mid course evaluation completed March 4, 2013
  o Adjusted homework load
  o Removed heat exchanger chapter
  o Gave timed take home exam
• Offered RA position to two graduate students, March 2013.
  o One accepted, one declined.

2 Scholarship

2.1 Self assessment of strengths, skills and competencies I have experience with many fabrication methodologies and have been exposed to many others through collaborative work environments. The collaborative efforts I have participated in the past have been successful as I am open and willing to work with others. I have the vision for utilization of small scale structures in industrial settings having experienced both the lab scale and industry scale work environments. I strongly feel that interdisciplinary teams are valuable in research.

2.2 Areas of Improvement In order to successfully address two of my proposed research topics, I need to develop processes for electrode position and gain experience with amperometric sensing. Although these topics are new to me, I intend to involve collaborators that can assist me in getting these capabilities established. Some initial lab space has been acquired to perform this work. A critical area for improvement is obtaining a track record of research funding. Although I have submitted a few things to secure internal funding for graduate students and have plans to submit a MEG grant in the fall, a priority for me is to develop the funding ideas I have already started to draft on paper into full proposals with collaborators that can assist me in achieving the proposed work. Time management is another key area for improvement. Dedicated and regular research time is necessary for having success in the area of scholarship. In my opinion, I have some things to learn in identifying the balance between my role as advisor and my students’ role as a researcher. I believe that with experience I can more effectively use and assist students in their research work.

2.3 Professional goals
• Establish an externally funded research program including high aspect ratio structures for use in thermal and mass transport systems with a target funding goal of approximately $200k per year 2 grad students + summer funding + 2 undergraduate RA’s.
• Establish internal and external collaborations for successful research.
• Successfully publish and establish a position in the research community where I am able to contribute to developing areas of research.
• Regularly attend national and international conferences with submitted work from my own research group and through collaborative efforts.
• Seek out opportunities to get feedback from others. This is one way to generate new ideas and/or eliminate poor ones.
• Establish a habit of regular writing. This would include papers for submission to journals but also help me to communicate new research ideas to others for review/collaboration.

2.3.1 Short term plans

Research work:
• Attend NMIG group meeting organized by Roger Harrison with the intent to get connected with people here at BYU and elsewhere in the areas of characterization and novel structures that can be used in my research.
• Attend Milton Lee group meetings.
• Hire 12 graduate students to start by Fall 2013.
• Nominate 3 students for graduate TA fellowship, February 2013.
• Request sample CNT structure to analyze for use in my research from Physics Rob Davis. Learn processing steps and discuss target applications with them.
• Pursue collaboration with Jonathan Claussen NRL U Minnesota for assistance with glucose based amperometric sensing.
• Pursue collaboration with Matt Jones for radiation characterization techniques and Vladimir Soloviev for nanoscale effects on radiation.

Funding:
• Draft 2 proposals during summer 2013 of NSF submission quality.
• Compile a list of funding agencies and proposal deadlines to approach with my topics of research. Submit drafted proposals.
• Submit an ORCA MEG grant in October 2013.
• Submit a proposal for high aspect ratio insulating structures for thermal management of electronics to the Cooling Technologies Research Center at Purdue, an NSF IUCRC.

2.3.2 Long term plans
• Maintain old and establish new connections with Sandia groups that work in related fields.
• Establish genre of work and not only intermediate, project based research.
• Apply for the NSF CAREER Award in 2014 and subsequent years.
• Attract highly qualified undergraduate students for undergraduate research and potential graduate studies.
• Have at least one PhD student starting on or before September 2014. Assuming 4 years to graduation, this student would be at least in his or her 3rd year of a PhD when I submit my dossier for tenure.

2.4 Outcomes to date
• Paper submitted to Renewable and Sustainable Energy Reviews, November 2012.
• Paper accepted to ASME Energy Sustainability conference, April 2013.
• Have developed connections with Richard Vanfleet and Robert Davis in Physics with plans to implement a CNT based, porous film for sensing.
• Regularly attending writing group with Lon Cook, Chem E, Paul Richards, Civil E and Greg Carling, Geology, January 2013 to present.
• Submitted paragraph description of proposed research topic to NSF program directors to identify appropriate program 5/2/13.
  o Rezvan Nano Biosensing, CBET
  o Wellek Eddie Chang Interfacial Processes and Thermodynamics, CBET
  o Prentice Dimitrios Papavassiliou Fluid Dynamics, CBET
• NMIG presentations attended
  • Jeff Farrer, January 10, 2013 – SEM
  • Robert Langer, MIT, February 7, 2013 – Novel drug delivery
  • Greg Nordin, March 7, 2013 – Cantilever biosensing
  • Matthew Linford April 4, 2013 – Data storage
• Submitted two 1 pager descriptions of proposed work to:
  • Sandia CSP group – potential collaborator/funder
  • BYU faculty – potential collaborators
  • BYU foundation – potential funder
  • Jonathan Claussen – potential collaborator
• Two candidate students nominated by me were awarded a TA fellowship, March 2013.
• Assisted in a graduate research proposal application from BYU Graduate Studies Office, submitted February 2013.
• Potential funding sources:

<table>
<thead>
<tr>
<th>Radiation Absorption</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal Sciences BAA</td>
<td>?</td>
</tr>
</tbody>
</table>
Thermal Transport Processes Feb 20, 2014

**Chemical Sensing**

**Secondary**
Nanomanufacturing Oct 1, 2013
Particulate and Multiphase Processes Feb 20, 2014

**Others**
Young Investigator Research Program YIP ?
CAREER July 2014 NSF
MRI equipment grant January 2014

### 3 Citizenship

#### 3.1 Self assessment of strengths, skills and competencies
I have organized research seminar series, conference sessions and conducted constructive discussions regarding needed improvements within organizations. I am happy to contribute where I am needed in the department, though I am also happy for the early reprieve from these duties while I get established.

#### 3.2 Areas of Improvement
I recognize that I lack much of the experience that has come to people who have been working in the ME department for longer periods of time. Experience will come with time and I look forward to contributing to the excellence already established in the department.

#### 3.3 Professional goals
- Strive to incorporate the mission of BYU in my work, including assisting individuals in their quest for perfection and eternal life.
- Perform service in the department, college and university when requested.
- Volunteer for conference organization committees.
- Review conference and journal submissions when requested.
- Develop my interactions with ASME and AIAA.
3.3.1 Short term plans

- Chair the energy storage session at Energy Sustainability, July 2013. Organize session and manage the review process for submitted works.
- Review grant, conference and journal submission as invited.
  - Check with Chris Mattson and Anton Bowden for avenue to invitation of grant reviews.

3.3.2 Long term plans

- Get integrated in ASME heat transfer committees
- Serve on an NSF review panel.
- Investigate AIAA conferences and committees for additional avenues to service and publication.
- Contribute to ME department goals and planned improvements.

3.4 Outcomes to date

- Organized paper reviews for energy storage session at Energy Sustainability 2013.
- Reviewed paper for ASME Turbo Expo, December 2012
- Completed SBIR review for low temperature energy harvesting, March 2013.
- Reviewed Infinia thermal storage proposal, May 2013.

4 Relationship to department/university

The sections outlined above are intended to address the focus areas used for faculty evaluation identified by the Mechanical Engineering department and the university. Success in these areas will ensure a productive learning environment for the students as well as continuing faculty status. Our department has excellent faculty examples and a high standard. I expect to contribute to the growth of our department and will strive to make a positive impact on the students, both spiritually and intellectually.

5 Resource needs

- In the near term, funding for graduate students is critical. While I am working to secure external funding, I am offsetting my startup funds with department, college and university fellowships to attract students. I will also apply for college funds as needed.
• Additional lab space. I currently have some space near an acid hood in the CB, which will be convenient if access to the cleanroom becomes necessary. As research expand with more students, I expect to need some additional space.
• Travel funds to meet with NSF program managers, if necessary. Startup travel funds are allocated to Energy Sustainability and ASME IMECE during 2013.
• Introductions to key researchers as appropriate to help jump start my work and develop collaborations.
6 Course Development Project complete by February 2014

I have selected Heat Transfer 340 as the class I will focus on for course development. The following areas have been identified for attention based on student feedback from a midcourse evaluation and student ratings:

- I will work more examples in class in order to:
  - Address concerns that class time directly reviewed the book sections.
  - Provide variability in use of class time.
  - Give students practice at setting up and solving problems together as a class.
  - Reduce homework load by helping the students better prepared for homework.

- I will reduce homework load by:
  - Carefully review homework problems assigned through the semester to address essential topics and minimize extraneous work.
  - Cut out several homework problems based on experience. The intent here is to eliminate those that become an algebraic exercise in favor of those that reinforce heat transfer.
  - Considering swapping homework problems for lab experience.
  - Allowing students to drop 2 3 homework assignments each semester to accommodate travel, illness, etc.

- I will provide context to topics by:
  - Introducing real world examples or applications in the introduction of new topics to substantiate the work.
  - Demonstrate heat transfer principles through simplified experiments or demos in class boiling, etc.

In addition to the points above based on student feedback, I intend to consider implementing the following based on my experience:

- Explain philosophies upfront so that students understand why I have homework assignments due each class period.
- Increase student involvement during class by asking students by name for answers.
- Evaluate the utility of equation derivation to determine whether necessary for some topics.
- Identify students to submit sample work notes, hw, exams, etc. This will be used for ABET accreditation and my own feedback on the class.
- Continue to use mid course evaluations as a mechanism for intermediate course corrections and provide a voice to students.

Progress to date:
- Incorporated info from my teaching statement on learning philosophy and approach in the syllabus.
• Obtained 2 students work from Winter 2013.
• Developed a learning centered syllabus by incorporating elements from the Spring Seminar.
7 Scholarship Strategies Project complete by February 2014

Organizing framework for scholarship: Macro and meso scale structures that increase surface area have been used ubiquitously for improving convective transport. With capabilities of smaller feature sizes using micro and nano fabrication techniques, very high aspect ratio geometries are now possible that drastically increase surface area to volume ratios. My work will include exploiting these high aspect ratio geometries for improvement or control of heat and mass transport. Applications of this work includes: thermal management of electronics, chemical sensors and radiation absorption.

Scholarly goals by February 2014

Research:

- Attend Joint Energy Sustainability and Summer Heat Transfer conference July 2013
  - Chair energy storage session for energy sustainability
- Attend International Mechanical Engineering Congress and Exposition November 2013
  - Submit posters chemical sensing and origami based radiation absorption
- Submit thermocline bed property paper to JSEE, Solar Energy or Applied Energy Summer 2013
- Complete revisions and have Applied Energy submission accepted June 2013.
- Prepare radiation absorption test setup in combination with origami work.

Funding:

- Submit short outlines of proposal ideas to NSF program managers to determine best fit.
- Submit a proposal for high aspect ratio insulating structures for thermal management of electronics to the Cooling Technologies Research Center at Purdue, an NSF I/UCRC if pre proposal is selected June 2013.
- Draft 2 proposals during summer 2013 of NSF submission quality.
- Submit an ORCA MEG grant in October 2013.
- Seek out additional funding opportunities.

Strategies:

- Discuss proposal ideas with colleagues.
  - Milton Lee – June 12, 2013
  - Dan Maynes May 31, 2013
- Continue participation in weekly writing group through summer 2013.
  - Use this as an opportunity to improve writing, seek feedback and have accountability.
- Obtain assistance through undergraduate researchers hire or volunteer work.
- Develop and stick to time management plan.
  - Discuss with Larry Howell.
Evaluation:
• Conference attendance
• Articles submitted/accepted
• Proposals submitted
• Track writing time
8 Citizenship Project complete by February 2014

Framework: In an effort to make a lasting contribution to the BYU faculty and students, I intend to provide service through departmental assignments and collaborative efforts. Early on, I intend to only serve on committees where needed so as to establish my research and teaching. These committees have yet to be determined. However, in the mean time, I intend to develop collaborative efforts where I can benefit others and develop resources for my own work.

Collaborative Goals:

• Participate in regular mentoring meeting with Scott Thomson
  o Use this as an accountability mechanism for my development
• Develop collaboration on chemical sensing with:
  o John Claussen, U.S. Naval Research Facility
  o Lon Cook, Chem E
  o Brian Mazzeo, ECE
  o Milton Lee and/or Adam Wooley, Chemistry
• Develop the collaboration begun with Brian Jensen, Richard Vanfleet and Robert Davis by:
  o Attending CNT group meetings
  o Supporting the thermal barrier work with Jason Lund
  o Pursuing sensing with high aspect ratio surfaces.
• Develop the collaboration begun with Matt Jones and Larry Howell
  o Developing a test platform for absorption.
  o Obtaining experimental data on absorption of angular surfaces in summer 2013.
• Participate in department assignments.
• Attend devotionals with the Mechanical Engineering faculty.
• Solicit feedback:
  o Share proposals and ideas with mentor and faculty.


Course Development Grant Proposal

**Purpose:** The following items are intended to assist student learning through demonstration in the classroom and for use by the students in a lab setting or project work.

**Description:** During Winter 2013, I taught heat transfer and gave students the opportunity to work on open ended heat transfer problems through self-selection of a heat transfer project. It is necessary for students to benchmark their work in some way; typically, this takes the form of some physical measurement including temperature sensing. The thermocouple reader selected below provides contact and non-contact IR temperature sensing for greater flexibility. Further, suitable heaters for creating temperature gradients for study was lacking in several semester projects. The flexible and cartridge heaters below are intended for this purpose.

<table>
<thead>
<tr>
<th>Item</th>
<th>Location</th>
<th>Cost</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galilean Thermometer</td>
<td>Amazon.com</td>
<td>$40</td>
<td>This demonstration piece illustrates the principle of heat transfer induced by free convection and density gradients</td>
</tr>
<tr>
<td>Thermocouple reader</td>
<td>Omega.com HHM2 0</td>
<td>$175</td>
<td>This unit can be used by students for course projects where they are expected to measure temperature and/or voltage</td>
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<tr>
<td>Flexible heaters 1“x2”</td>
<td>McMaster.com 35765K15</td>
<td>$22.84</td>
<td>These heaters can be used by students to generate temperature gradients for semester projects</td>
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<tr>
<td>Cartridge heaters 0.25” dia x 2”</td>
<td>McMaster.com 3618K412</td>
<td>$15.47</td>
<td>These heaters can be used by students to generate temperature gradients for semester projects</td>
</tr>
</tbody>
</table>

**Total Requested:**

$300
ME EN 340 - Heat Transfer

Fall 2013

Section 001
Name:
Office Phone:
Office Location:
Email:

Course Information

Description
This is an introductory course regarding the transfer of energy in the form of heat and will cover topics including conduction, convection and radiation.

Course Purpose: Unlike thermodynamics, heat transfer concentrates on the mechanism by which the heat is transferred and the associated rate at which it is transferred. Mastery of the content in this course will make you better prepared to address common engineering problems related to heat transfer including: thermal management of electronics equipment, efficient energy usage, insulation, heat removal, heat exchange, power systems, etc.

Material

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<th>Item</th>
<th>Vendor</th>
<th>Price new</th>
<th>Price used</th>
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Prerequisite
MeEn 321 and concurrent or prior enrollment in MeEn 312.

Teaching Philosophy
It is my belief that learning methods can generally be clustered into three groups: by study, application, and the Spirit.

Study is essentially a repetition process that should be thought of as stages of sequential learning as opposed to tedious review. Certainly, students learn by processing information as they see, hear and write, which involves three cognitive processes. You'll find that I encourage writing down what we do in class so that you get the benefit from processing from eyes --> brain --> hand --> paper. As information is presented to a student, a balance needs to be struck between modern digital slides, video and traditional forms of display, chalkboards, whiteboards, etc. I have found that when modern forms are appropriately used, they can help to stimulate interest and appeal. However, if not regulated, it can result in students neglecting the thought process that occurs through physically recording the information and reduces their ability to communicate the information to others. As different students have different learning styles, a good mix of these media can better reach the full student population. Group work, collaboration and the opportunity for students to present their own work are all key to providing repeated learning experiences that help strengthen their personal knowledge.

Application of learning is also paramount. Unless this step is also included, too often the information that has been learned lies dormant, not having had the opportunity to transition from mere information to knowledge. Application of learning can take many forms including running an experiment, working example problems, taking exams, etc. It is my belief that this step is critical for engineering students who will be expected to identify problems and simplify the solution approach to arrive at a reasonable result. Further, if
an instructor can also help students identify with the information to be learned using applications, this can help generate interest and give them a contextual basis for their understanding.

Inclusion of the Spirit is critical in achieving the pinnacle of learning. When we have prepared ourselves through study, have sought to apply our learning in practice, and seek to include the Spirit in our living, the Spirit can help us recognize extensions or avenues that elevate us and our work beyond what may have been achieved if left to ourselves. Further, it can assist us in the preliminary stages of study and application. "In our quest for truth, we need to seek the help of our loving Heavenly Father. His Spirit can direct and intensify our efforts to learn and magnify our ability to assimilate truth. This learning with the Spirit is not confined to classrooms or preparation for school examinations. It applies to everything we do in life and every place we do it—at home, at work, and at church"—Oaks, Learning and Latter Days Saints, Ensign, April 200.

Excellence requires diligent work. Generally speaking, each of us is able to accomplish what we believe we can accomplish. The challenge for the educator is to inspire students to reach beyond what they feel is their limit by raising or maintaining a high level of expectation. Challenging students in this way takes many forms and may be specific to the individual but includes constructive criticism, timely grading policies, identifying and discussing errors made, maintaining flexibility but without capitulation, among others. Further, weekly one-on-one meetings between graduate student and advisor, fostering classroom discussion or conversation, and a dedication to the role of a teacher can help to gauge the appropriate level of expectation. As a personal goal, I hope to cultivate in students an interest in the red marks on a paper more than the grade at the top so that their focus is on learning rather than temporary success or failure.

Classroom Procedures
It is expected that you come to class prepared having read the assigned sections from the textbook beforehand. We will often have "celebrations of learning" at the beginning on class on topics covered in the reading. We'll spend time addressing topics in the text that can be challenging as well as mathematically outline where some heat transfer rate equations come from. We'll also discuss the physics of heat transfer and then work practice problems together in an effort to help you be prepared to address homework problems.

Learning Outcomes

**Conservation Principles**

1. Each student can apply conservation of mass and energy to a control volume or control surface.

**Fundamentals of Conduction**

2. Each student understands the phenomenological origin of Fourier’s law and is familiar with the development of the general heat diffusion equation based on Fourier’s law and the principle of conservation of energy. Each student can model boundary conditions and can reduce and solve the general heat diffusion equation for one-dimensional, steady state problems. Each student can analyze steady state systems using thermal circuits.

**Extended Surfaces**

3. Each student can analyze extended surfaces—fins and fin arrays. Each student can evaluate a fin or a fin array using fin performance parameters.

**Two-dimensional Conduction**

4. Each student can describe the analytical and numerical methods commonly used to analyze two-dimensional, steady state heat conduction. Each student can use finite difference methods to solve two-dimensional, steady state problems.

**Transient Conduction**

5. Each student can analyze transient problems using the lumped capacitance method, one-dimensional analytical solutions and transient finite difference methods.

**Fundamentals of Convection**

6. Each student understands the physical phenomena associated with convection, Newton’s law of cooling, and the significance of non-dimensional parameters in convection heat transfer.

**Methodology for a Convection Analysis**

7. Each student can implement the methodology for a convection analysis in the treatment of external and internal, forced and free convection problems.
Fundamentals of Radiation

8. Each student understands the physical mechanisms involved in radiation heat transfer. Each student can calculate total, hemispherical radiative properties of real surfaces from their spectral, directional counterparts.

Radiative Surface Exchange

Each student can analyze the radiative heat exchange between surfaces and in diffuse, gray enclosures.

Grading Policy

Homework: 

Homework will come from selected problems at the end of each chapter and are provided in the class schedule. Homework assigned on a given day is due by midnight on the next lecture day and is to be submitted/retrieved from the ME 340 Section 1 boxes outside the Mechanical Engineering office 435 CTB. All of the homework problems will be collected. A subset of problems will be selected for grading but credit will be given for all problems completed. Homework grading will be based upon the correct answer as well as your methodology to get the answer. To receive full credit, clearly show all work, state assumptions, and identify your answer. The TA will hold regular office hours to assist students with concepts related to homework. Late homework will be accepted with a penalty of 20% per weekday but no later than two class periods after the due date. Please use the analysis format outlined in section 1.5 for your homework problems. We will hold you accountable for using this approach. If your work is difficult to understand or follow, your homework grade will be affected.

Celebrations of Learning:

These celebrations of learning are intended to aid students in preparing for class by learning on their own. Some might label these celebrations as a quiz but it is much more than that. They will provide an opportunity for students to demonstrate that they have understood basic concepts from the reading and prepare us for material covered in class. The topics for the celebrations of learning will come from current and past reading assignments; read the sections assigned on the schedule before coming to class. Celebrations of learning cannot be made up for any reason. However, you'll be able to drop your two lowest celebrations. Bring a calculator to each lecture to assist you on celebrations of learning.

Pictures:

There are two personally obtained pictures due during the semester. The intent is for students to look at the world around them and identify examples of heat and mass transfer. They by the end of the day should be submitted through the Learning Suite website for this course learningsuite.byu.edu. Submit the picture as a single pdf file titled as follows: lastnameFirstnamePic1 or 2 with a one paragraph description of the picture that includes: where the picture was taken, modes of relevant heat transfer, and any other interesting information about the picture. Be creative! This may also help you begin to think about the type of problem you'd like to consider for your project later in the semester. To the extent possible, submit pictures with differing modes of heat transfer for the two assignments.

Project:

Choose a scenario of interest to you where heat transfer plays a role. You may consider additional topics covered in the text micro/nano heat transfer, bio heat transfer, heat exchangers, etc. Ideas generated from your heat transfer pictures, Capstone topics or others. If you choose a topic from Capstone, you may NOT simply submit work required for the capstone project. You must do something beyond what is required for Capstone i.e. the work may not be dual use. However, you may share the work you do for ME 340 to Capstone sponsors as additional supporting work. Ideas/examples from past semesters can be found here http://www.et.byu.edu/~vps/ME340/ME340.htm. If you choose to build upon a previous teams’ work, you must identify the limitations of their contribution and clearly state your advancement. Project teams should include 2 people. A team of 3 is acceptable if you justify the role of a third student by identifying the additional work accomplished. Several groups will have the opportunity to present their project to the class on Apr 3; the in-class delivery will not affect the scoring of the project in a positive or negative way. Reference any and all sources of information including texts, properties, personal communication, websites, etc. The project is due on Apr 3 by 11am before class and should be submitted as a ‘Powerpoint’ file through Learning Suite learningsuite.byu.edu. Calculation files eg. matlab, excel, mathcad, etc. should also be submitted. If learning suite does not allow more than one file submission per assignment, zip it. Name the file as follows: lastnameFirstname_project. The Powerpoint file will be graded based on the fulfillment of the criteria below.
Project presentation ppt:
1. Title, names possibly team photo
2. Introduction description of the problem and the objectives
3. Problem setup assumptions, simplifications, known, control volume, control surface, etc.
4. Solution and procedure
5. Presentation and discussion of results may include demonstration or prototype
6. Conclusion and recommendations
7. Appendix references, properties, derivation, details of solution, photos, acknowledgements, etc.

Exams:
There are two midterms and one final exam. The mid-terms are comprehensive; students will need to be prepared to address questions from topics covered from the beginning of the semester until the time of the exam. Exams cannot be made up unless ‘prior’ arrangements are made. Please notify me in the event of an emergency. Only under ‘unusual’ circumstances may a student arrange to take an exam after the scheduled time. Students have one week to petition the grading after receiving their graded test. Petitions will necessitate re-grading of the entire exam. The comprehensive final is already scheduled for Monday, December 16th from 2-5p in 240 CTB and may not be taken early.

Grading:
- Homework 20%
- Celebrations of learning 8%
- Pictures 2%
- Labs/project 10%
- Mid-terms 40%
- Final 20%

Note: the grading scale on Learning Suite is a default grading scale and may not necessarily be what is applied for the class.

Citizenship:
Students should understand that this class is designed to help them learn heat transfer in an environment where the Spirit can be. Behaviors and practices that detract from that aim are discouraged. Upon leaving the university, students will be expected to perform in a professional environment where tardiness, poor attendance, whining in any form, etc., are not acceptable. We will uphold the same level of expectation in this class. Failure to act in a professional manner may cost you up to 5% of your grade.

Please don't cheat. It simply isn't worth it. Cheating will result in a failing grade. If you feel the pressure to be dishonest to get through the class, come see me.

Generally speaking, you are some of the best students coming from your respective areas around the country and world. Live up to the standard that you have already begun.

Participation Policy
It is expected that you participate actively in class and ask questions that can help you and others understand the material. We will practice the material both through examples in class as well as assigned homework practice. Your understanding of the material will be assessed through the answers you provide to questions I ask as well as the questions that you ask in class. When it comes time to work through example problems, it is expected that we work through the problems together.

Study Habits
Recommendations and Tips for Success:
• Read the textbook. It is an excellent book.
• I highly recommend that each of you find a group of people to work with on your assignments. Heat transfer is a rigorous course that covers a lot of material. You are required to do your own work. However, it will be to your benefit to work with others in order to discuss the material, work through challenging problems, get immediate feedback and teach each other.
• I also recommend that when you do your work that you put aside your social media tools and communication devices so that you can concentrate unless you are using them only to communicate with others about your work. Psychology studies indicate that it takes 25 minutes to return to a task after an interruption and that employees spend an average of 11 minutes on task before an interruption. David Rock, *Your Brain at Work*, HarperCollins Publishers, New York, NY. If you want to get your work done quickly, set these distractions aside.

**Assignment Descriptions**

**HT picture 1**
Due: Friday, Oct 04 at 11:5 pm
Submit a 1 paragraph description with your picture that includes the mode of heat transfer observed.

**HT picture 2**
Due: Friday, Nov 08 at 11:5 pm
Submit a 1 paragraph description with your picture that includes the mode of heat transfer observed.

**Heat Transfer Project**
Due: Tuesday, Nov 26 at 11:00 am
Elements of a good project analysis:

• Clear statement of assumptions
• Clear definition of control volume or surface
• A discussion of attempts at benchmarking or at least rationally considering your solution in light of what is known or reasonable
• See full list in the grading policy.

**Midterm 2**
Due: Tuesday, Nov 12 at 11:5 pm
Chapters 1-10

**Midterm 1**
Due: Tuesday, Oct 08 at 11:5 pm
Chapters 1-5

**Final**
Due: Monday, Dec 16 at 5:00 pm
The first question on the exam will be whether you completed your online course survey.

**HW #1: 1.7, 12, 18**
Due: Friday, Sep 06 at 12:5 am

**HW #2: 1.22, 40, 44, 4 a, 71a**
Due: Monday, Sep 0 at 12:5 am

**HW #3: 2.11, 14, 23, 28**
Due: Wednesday, Sep 11 at 12:5 am

HW #4: 2.30,34ab,44,47
Due: Friday, Sep 13 at 12:5 am

HW #5: 3.6ab,15,18,2
Due: Monday, Sep 16 at 12:5 am

HW #6: 3.33,40a,57,68
Due: Wednesday, Sep 18 at 12:5 am

HW #7: 3.84ab, 3,104ab
Due: Friday, Sep 20 at 12:5 am

HW #8: 3.143a,150,158
Due: Monday, Sep 23 at 12:5 am

HW # : 4.2,13,33a
Due: Wednesday, Sep 25 at 12:5 am

HW #10: 4.47,52,62,64ab
Due: Friday, Sep 27 at 12:5 am

HW #11: 5. ,16,2
Due: Monday, Sep 30 at 12:5 am

HW #12: 5.51,61a,85
Due: Wednesday, Oct 02 at 12:5 am

HW #13: 5. 0,10 ,125
Due: Friday, Oct 04 at 12:5 am

HW #14: 6.2,7,1 ,28
Due: Friday, Oct 11 at 12:5 am

HW #15: 6.46
Due: Monday, Oct 14 at 12:5 am

HW #16: 7.2abc,13a,20ab,27
Due: Wednesday, Oct 16 at 12:5 am

HW #17: 7.35,4 ,52,54abc
Due: Friday, Oct 18 at 12:5 am

HW #18: 7.77,86ab, 0
Due: Monday, Oct 21 at 12:5 am
HW #1: 8.4, 8, 12
Due: Wednesday, Oct 23 at 12:5 am

HW #20: 8.16, 18abc, 20 +5 pt. xc
Due: Friday, Oct 25 at 12:5 am

HW #21: 8.26a, 27, 30
Due: Monday, Oct 28 at 12:5 am

HW #22: 8.42a, 71, 107
Due: Wednesday, Oct 30 at 12:5 am

HW #23: .3,
Due: Friday, Nov 01 at 12:5 am

HW #24: .27a, 45a
Due: Monday, Nov 04 at 11:5 pm

HW #25: .55, 87
Due: Wednesday, Nov 06 at 11:5 pm

HW #26: 10.13, 16a, 30
Due: Friday, Nov 08 at 11:5 pm

HW #27: 12.7ab, 15, 16
Due: Monday, Nov 18 at 11:5 pm

HW #28: 12.20, 24, 28
Due: Wednesday, Nov 20 at 11:5 pm

HW #2: 12.37a, 3, 48
Due: Friday, Nov 22 at 11:5 pm

HW #30: 12.4, 58, 64
Due: Monday, Nov 25 at 11:5 pm

HW #31: 12.7 ab, 102a, 130
Due: Monday, Dec 02 at 11:5 pm

HW #32: 13.1, 7, 11
Due: Wednesday, Dec 04 at 11:5 pm

HW #33: 13.17, 21, 23a
Due: Friday, Dec 06 at 11:5 pm

HW #34: 13.4, 60, 75
Due: Monday, Dec 0 at 11:5 pm

**HW #35: 13. 0,11 a**
Due: Wednesday, Dec 11 at 11:5 pm

### Point Breakdown

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<th>Assignments</th>
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### Assignments Percent of Grade

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### Schedule

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<tr>
<th>Date</th>
<th>Topics</th>
<th>Readings before class</th>
<th>Learning Outcomes</th>
<th>Assignments Due</th>
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<td>W - Sep 04</td>
<td>Course introduction Rate equations</td>
<td>Read: 1.1-2</td>
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<td>F - Sep 06</td>
<td>Rate equations Conservation laws</td>
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<td>M - Sep 0</td>
<td>Introduction to conduction Heat diffusion equation</td>
<td>Read: 2.1-3</td>
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<td>Heat diffusion equation Boundary conditions</td>
<td>Read: 2.4-5</td>
<td>Addresses #2</td>
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<td>1D steady state conduction Thermal resistance</td>
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<td>1D steady state conduction - radial systems</td>
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<td>Addresses #2</td>
<td>HW #5: 3,6ab,15,18,2</td>
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<td>Conduction with thermal energy generation</td>
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<td>Addresses #2</td>
<td>HW #6: 3,33,40a,57,68</td>
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<td>Extended surfaces</td>
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<td>Transient conduction</td>
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<td>Transient conduction Analytical methods</td>
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<td>Boundary layer equations, similarity, analogies</td>
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<td>External flow - spheres and tube banks</td>
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<td>Convection correlations - turbulent non-circular</td>
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University Policies

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.

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 801-422-585; or Ethics Point at http://www.ethicspoint.com, or 1-888-238-1062 24-hours.

Student Disability
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 422-585, D-285 ASB.

Academic Honesty
The first injunction of the Honor Code is the call to "be honest." Students come to the university not only to improve their minds, gain knowledge, and develop skills that will assist them in their life’s work, but also to build character. *President David O. McKay taught that character is the highest aim of education* The Aims of a BYU Education, p.6. It is the purpose of the BYU Academic Honesty Policy to assist in fulfilling that aim. BYU students should seek to be totally honest in their dealings with others. They should complete their own work and be evaluated based upon that work. They should avoid academic dishonesty and misconduct in all its forms, including but not limited to plagiarism, fabrication or falsification, cheating, and other academic misconduct.

Plagiarism
Intentional plagiarism is a form of intellectual theft that violates widely recognized principles of academic integrity as well as the Honor Code. Such plagiarism may subdue the student to appropriate disciplinary action administered through the university Honor Code Office, in addition to academic sanctions that may be applied by an instructor. Inadvertent plagiarism, which may not be a violation of the Honor Code, is nevertheless a form of intellectual carelessness that is unacceptable in the academic community. Plagiarism of any kind is completely contrary to the established practices of higher education where all members of the university are expected to acknowledge the original intellectual work of others that is included in their own work. In some cases, plagiarism may also involve violations of copyright law. Intentional Plagiarism—Intentional plagiarism is the deliberate act of representing the words, ideas, or data of another as one’s own without providing proper attribution to the author through quotation, reference, or footnote. Inadvertent Plagiarism—Inadvertent plagiarism involves the inappropriate, but non-deliberate, use of another’s words, ideas, or data without proper attribution. Inadvertent plagiarism usually results from an ignorant failure to follow established rules for documenting sources or from simply not being sufficiently careful in research and writing. Although not a violation of the Honor Code, inadvertent plagiarism is a form of academic misconduct for which an instructor can impose appropriate academic sanctions. Students who are in doubt as to whether they are providing proper attribution have the responsibility to consult with their instructor and obtain guidance. Examples of plagiarism include: Direct Plagiarism—The verbatim copying of an original source without acknowledging the source. Paraphrased Plagiarism—The paraphrasing, without acknowledgement, of ideas from another that the reader might mistake for the author’s own. Plagiarism Mosaic—The borrowing of words, ideas, or data from an original source and blending this original material with one’s own without acknowledging the source. Insufficient Acknowledgement—The partial or incomplete attribution of words, ideas, or data from an original source. Plagiarism may occur with respect to unpublished as well as published material. Copying another student’s work and submitting it as one’s own individual work without proper attribution is a serious form of plagiarism.
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. 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.