Promotion Dossier

Catherine Hamel

Keystone Program, University of Maryland

Promotion Dossier for Senior Lecturer

February 2022

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Catherine Marie Hamel

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Academic Appointments at UMD

Lecturer, *Keystone Program* *August 2018 - Present*

- Develop, coordinate and instruct various courses taught by the Keystone Department
  - ENES232 Thermodynamics – *Actively teaching*
  - ENES100 Introduction to Engineering Design – *Actively teaching*

Adjunct Lecturer, *Fire Protection Engineering (FPE) Department* *August 2019 – Present*

- Develop the course curriculum and instruct senior undergraduates and graduate students in the FPE Department for ENFP405/621 Structural Fire Protection

Instructor, *Women in Engineering (WIE)* *July 2019 - Present*

- Instruct high school and freshman women-identifying students in various programs and courses
  - ENES115 FLEXUS Seminar– *Fall 2021*
  - WIE Change the World: An Introduction to Engineering Program – *Summer 2021*
  - Exploring Engineering Summer Program – *Summer 2019*

Other Employment

AcuTech Group Inc.

Associate Engineer *April 2018 – August 2018*
Engineer *January 2016 – April 2018*

- Advised high-risk chemical and petrochemical facilities on their process safety management programs and instructed how they can reduce their safety or security risks at their facility
- Developed emergency response plans for high-risk facilities
- Ran and analyzed complex consequence modeling cases for accidental or intentional releases leading to fire, smoke, explosion, and toxic exposures
- Conducted safety and security risk assessments for chemical and petrochemical companies, including for water-front facilities requiring approval by the U.S. Coast Guard

Department of Fire Protection Engineering, A. James Clark School of Engineering

Graduate Research Assistant *June 2015- December 2016*

- Worked with Prof. Stanislov Stoliarov to fortify a non-intrusive method for temperature and radiative fraction measurements in laminar flames of gaseous and solid fuels

Graduate Teaching Assistant (TA), Risk-Informed Performance-Based Design *January 2016- May 2016*

- Assisted in the teaching, grading and advising of senior students in ENFP411 as they prepared a risk-based performance-based fire protection design for their capstone course

Undergraduate TA, ENFP320 Fire Assessment Methods and Laboratory *January 2015-May 2015*

- Assisted in the development and carrying out of ASTM-standard fire laboratories for junior-level students
- Guided students while they write lab reports, and grade these reports, in addition to bi-weekly quizzes

Undergraduate Teaching Fellow (TF), Heat and Mass Transfer Processes *January 2013-May 2015*

- Served as a UTF for both the Mechanical Engineering (ENME332: 1/2013 – 5/2015) and Fire Protection (ENFP312: 9/2014-12/2014) offerings, assisting with teaching, office hours, grading, and logistics
- In ENFP312, led 16 students through practice problems during weekly discussion sessions, graded weekly homework and two numerical analysis projects, held weekly office hours and held exam review sessions
- Taught heat transfer applications of MATLAB to students for their use during the numerical analysis projects

Fire Protection Engineering (FPE) Undergraduate Research Mentor *September 2013-May 2014*

- Managed team of sophomores conducting group research on beam smoke detectors and nuisance rejection
- Served as liaison between the research team and Xtralis, whose product was being tested during the project

CERIB Concrete Industry Study and Research Center, Epernon, France
Fire Testing Center Intern *August 2014*

- Conducted a comparative analysis of equivalent steel and concrete design buildings using the MATLAB program developed at Imperial College, analyzing the structural integrity of the structural members under consideration

Imperial College London, London, UK
Undergraduate Research Assistant *June 2014-July 2014*

- Helped fortify a finite-difference analysis tool using MATLAB to study the temperature gradients of travelling fires within concrete and steel members and determine the temperature distributions throughout these structural members

Department of Mechanical Engineering, A. James Clark School of Engineering
Undergraduate TF, ENME332 Heat and Mass Transfer Processes *January 2014 – December 2014*

- Assist in the instruction of Transfer Processes for over 150 mechanical engineering students by holding weekly office hours, grading homework and examinations, and hosting review sessions for exams

Education

University of Maryland, College Park, MD
A. James Clark School of Engineering
Fire Protection Engineering (M.S. December 2016, B.S. May 2015) M.S./B.S. GPA: 4.0/3.93

Books Authored

Co-Author and Editor – *Center for Chemical Process Safety Guidelines - Revision*
Center for Chemical Process Safety. (2019). *Guidelines for Inherently Safer Chemical Processes: A Life Cycle Approach, 3rd Edition.* Retrieved from https://www.aiche.org/ccps/resources/publications/books/guidelines-inherently-safer-chemical-processes-life-cycle-approach-3rd-edition ISBN: 978-1-119-52922-4.

Refereed Journal Articles

Hamel, C., Raffan, F., & Stoliarov, S., "A method for measurement of spatially resolved radiation intensity and radiative fraction of laminar flames of gaseous and solid fuels," *Experimental Thermal and Fluid Science*, Vol. 104, p. 153-163, 2019.

Rackauskaite, E., Hamel, C., Law, A., Rein, G., "Improved Formulation of Travelling Fires and Application to Concrete and Steel Structures," *Structures*, Vol. 3, p. 250-260, 2015.

Published Conference Proceedings

Hamel, C. M., & Eagle, W. E. (2020, June), *The Conceptual Fluency Approach for Introductory Thermodynamics.* Paper presented at 2020 ASEE Virtual Annual Conference Content Access, Virtual Online . 10.18260/1-2—35299

Hamel, C.M. (2017, February), *A Method for Measurement of Spatially Resolved Radiation Intensity and Radiative Fraction of Laminar Flames of Gaseous and Solid Fuels*. Paper presented at 2017 Fire and Materials Conference, San Francisco, USA.

Conference Presentations

Hamel, C.M., & Eagle, W.E. (2020, June), *The Conceptual Fluency Approach for Introductory Thermodynamics*. Presentation at 2020 ASEE Virtual Annual Conference, Virtual Online.

Hamel, C.M. (Presenter), Raffan-Montoya, F., & Stoliarov, S. (2017, April), *A method for measurement of spatially resolved radiation intensity and radiative fraction of laminar flames of gaseous and solid fuels.* Presentation at the 2017 10th US National Combustion Meeting, College Park, MD.

Moore, D.A. & Hamel, C.M. (2017, October), *Achieving Excellence in PSM Through Competency*. Presented at 2017 CCPS Middle East Process Safety Conference, Bahrain International Exhibition and Convention Centre.

Grants and Funded Research

National Science Foundation (NSF #2013268), *Investigating the Effects of a Mastery-based Assessment Approach on Undergraduate Engineering Education*, $199,996. 08/01/2020 – 07/31/2022. Senior personnel.

The Lemelson Foundation *Engineering for One Planet (EOP) Framework Integration Pilot Program*, $30,000. 09/09/2022 -09/09/2024. Faculty contributor (Collaborated with PIs to integrate EOP concepts into ENES232, and collect data from the students as part of this grant).

University of Maryland Office of the Senior Vice President and Provost. *Teaching Innovation Grant: Adaption of Introduction to Thermodynamics to an Online Environment,* $11,625. 06/18/2020 – 9/30/2020. Grant Lead.

Courses Taught [Enrollment shown]

ENES232: F18 [97], S19 [56], F19 [45], S20 [174 (1/2 online)], F21 [111], S22 [100]
ENES232 ONLINE: Sum20 [42], F20 [112], S21 [99], Sum21 [25]
ENES100: S19 [80], S22 [40]
ENES115: F21 [30]
ENFP405: F19 [37], F20 [20 (online)]
ENFP621: F19 [9], F20 [14 (online)]

Instructional Workshops Established

Training Developer and Implementor, *Engineering IT, Clark School of Engineering* August 2020

- Developed, recorded, edited and shared a demonstration video and training for "*Using an iPad Pro and Apple Pencil with Zoom for Content Delivery*" for the Engineering IT Department
- Demo can be accessed on EIT's website here: https://ask.eng.umd.edu/105098

Training Developer and Co-Facilitator, *Engineering IT, Clark School of Engineering* March 2020

- Coordinated with Dr. Patrick McAvoy and Kevin Calabro to develop, organize and deliver an online webinar training on "*Using Gradescope with Canvas"* for Engineering Faculty Members
- Development of this training was expedited by the onset of COVID-19, and the training was instrumental for allowing some engineering faculty to migrate to an online teaching environment for exams and grading
- Demo can be access on EIT's website here: https://ask.eng.umd.edu/page.php?id=99216

Mentorship

Faculty Mentor, *Salamander Honor Society, Beta Chapter, FPE, UMD* August 2020

- Proposed a research topic, mentored and supported two 'newts' during their research project for induction into Salamander, the Fire Protection Engineering Honor Society
- Met with the pair to assist with research, review their paper, practice their presentation, and finally watch their presentation on Fire/Explosion Risk of Chemical Storage

Course or Curriculum Development

Developer and First-time Implementor of Conceptual Fluency at UMD August 2019 - Present

- Developed, implemented and lead the instructional team for ENES232 in a new assessment approach at UMD called the Conceptual Fluency Approach
- Assisted with the development of the Conceptual Fluency Approach being implemented in other Keystone courses

Online Canvas Module and Level 1 Conceptual Quiz and Question Bank June 2020 – September 2020

- Directed a team of undergraduate and graduate students to develop a brand-new Canvas training module for teaching a numeric solver software, Engineering Equation Solver (EES)
- Managed a team of undergraduate and graduate students to integrate Level 1 Conceptual Questions into an online question bank and online quizzes that allowed randomization and multiple attempts by users

Computational Thinking Assessments, *Keystone Program* June 2019 – August 2019

- Analyzed the exposure to and progression through computational thinking for all departments in the Clark School

- Developed a survey for incoming Clark students to assess their exposure to computational thinking concepts
- Drafted example computational thinking projects that could be integrated into Keystone courses

Workshops Attended to Improve Instruction

Workshop on Active Learning Techniques for Large Classes, *TLTC UMD* October 2021
Participated in a 75-minute workshop to develop techniques for integrating active learning tools into ENES232

Ta-Da Workshop, *Academy for Innovation and Entrepreneurship* Summer 2019
- Participated in a week-long workshop (by-invite), dedicated to redesigning ENES100 for STS Students

Workshop on Alternate Summative Assessments for Online Courses, *TLTC UMD* October 2021
- Participated in a workshop to develop alternate and creative options for midterm and final exams in online courses while instructing online during the COVID-19 pandemic

Guest Lecture

Guest Lecturer, *ENES115/ENES113, WIE Clark School of Engineering* Fall 2019, Fall 2020
- Developed and facilitated a special lecture on *Implicit Bias and Group Dynamics in Engineering* for the first-year seminar course for Flexus and Virtus

Committees and Campus Service

Course Coordinator – ENES232 Thermodynamics, *Keystone Program* 1/2019 - Present
- Coordinate facilitation of ENES232, which includes directing 1-4 faculty members, 4-6 UTFs, and 2-4 GTAs in a given semester
- Administer the training of UTFs and GTAs; aid Keystone with the selection of UTFs and GTAs; schedule and facilitate weekly meetings; manage the course PORTAL on Canvas and publish all student-facing documentation; coordinate with non-faculty parties for demonstrations or off-site visits

Curriculum Advisory Committee, *Fire Protection Engineering Department* *January 2018 – Present*
- Work alongside a group of 20 industry experts to review and provide feedback on the direction of the academic program of the Fire Protection Engineering Department at the University of Maryland

Transfer Course Evaluator – ENES232 Thermodynamics*, Keystone Program* 8/2019 – 12/2020
- Responsible for reviewing all Thermodynamics offerings from other institutions to make a determination on equivalency to ENES232 at UMD

External Service and Consulting

Strategic Planning Committee, *Elizabeth Seton High School* *January 2019-June 2019*
- Assisted the Board of Trustees for Elizabeth Seton High School with the Strategic Plan for the high school
- Led the Student/Alumnae Subcommittee to examine the role of current students and alumnae in order to understand the strategic goals that needed to be established to enhance the student experience and connect alumnae to the school

Elizabeth Seton High School LEAD Program Advisory Board *September 2012 – May 2016*
- As a Founding Board Member, worked with a board of engineering and education professionals to enhance the LEAD Engineering Program at Elizabeth Seton High School, my alma mater, and serve as an E-Mentor for Seton students
- Bridged together the FPE program to the LEAD program, introducing a fire design competition with Seton students

Curriculum Vitae Notarization

I hereby certify that this curriculum vitae is an accurate and current statement of my professional record.

Signature: Date: 1/30/2022

Professional Statement

Executive Summary and Background:

The Keystone Program at the University of Maryland's (UMD) Clark School intends to "bring beginning engineers an enhanced educational experience, reinforce and recognize outstanding teaching, and serve as a national model for increasing engineering student retention and graduation rates."[1] When I came back to UMD in 2018 to teach for Keystone, it was this mission statement that drew me back. In my last four years as a Keystone Instructor, I believe that I have had a tremendous impact on the 1000+ students I have taught and advised, the colleagues with whom I have worked, and the greater Clark School community. This Personal and Professional statement is a summary of that impact.

Reflecting on my time before becoming a Professional Track Faculty (PTK) member, I recall taking fundamental engineering courses as an undergraduate and graduate student. Although I came to college with no physics or engineering background, the introductory Keystone courses helped me gain fundamental knowledge and gave me an empowering view of the world through the lens of engineering. I could finally explain the processes around me and I wanted to help other would-be engineers acclimate to their college classes and find the same type of support and inspiration that I had received. I became an undergraduate teaching fellow for ENME332 Heat and Mass Transfer and served as an undergraduate Teaching Fellow (UTF) for two and a half years, which was my first experience assisting others in their process of learning. While I went into a consulting role in Process Safety Management after receiving my bachelors and masters degrees, I hoped that I would one day make my return back to teaching. When I heard of an opening in the Keystone Program for a teaching role with a primary focus on Thermodynamics, I jumped at the opportunity to return to my alma mater.

Impact Through Instruction: Accomplishing Five Primary Teaching Goals:

Since being at UMD, I have had five primary teaching goals, which I will lay out below. I have proudly been able to make meaningful progress towards achieving these goals in my four years as a lecturer.

Goal 1: Relatable and Exciting Course Material: One of the primary ways that I have been able to make my courses engaging and relatable is by utilizing innovative teaching practices. By using an iPad to lecture, I am able to create colorful, image-filled, dynamic notes that capture students' attention and provide clarity that cannot be achieved on a blackboard or a PowerPoint. As one student put it in an end-of-term course evaluation: "the visuals (slides), commentary, and follow–along drawing over the slides helped me stay focused during lectures and kept me from getting lost." I've also gotten in the habit of arriving to class 5 minutes early to play music and share cartoons or memes about the material with students, and I find that this practice not only allows students to destress a bit when they arrive at my classroom, but also gives space for me to relate to my students about their life outside of the class. I believe that these practices shift students' mindsets from one of intimidation to one of excitement, which for some students changes their whole perspective of learning. Another previous student shared that "[Catherine] kept the class engaging with jokes, games and pictures [...]. She relates to her students and genuinely wants the best for each of us, so she holds her standards high. She will always help her students reach those standards if they are willing to ask for help." I've also strived to continuously improve my teaching, and have attended multiple TLTC and AEI workshops on how to enhance my students' learning

[1] https://eng.umd.edu/keystone/about

with active learning techniques or assignment redesigns. An example of a practice that came out of one of these workshops is daily conceptual clicker questions given at the beginning of class using MentiMeter.com. I have found that these questions are not only good for building conceptual understanding, but also getting students engaged and primed to ask questions in class.

Goals 2 and 3: Promote fluency in fundamental engineering topics & develop a growth mindset: One of my biggest undertakings while being a lecturer with Keystone has been integrating the Conceptual Fluency Methodology (CFM) into the ENES232 Course. Although there is still work to be done to improve CFM, I do appreciate that the method has allowed me to focus on two of my teaching goals: empowering students with fundamental engineering concepts, and allowing students to learn from their failures and develop a growth mindset. In essence, I challenge my students to master the fundamental concepts of the courses I teach, while also serving as their cheerleader and coach when they fail this challenge. My approach is always to get back to the basics, to have students critically analyze their own work, and to provide students with examples of how to reason through problems with fundamental knowledge. In CFM, we give students a second attempt at any assessments, and I work diligently with the students after their first attempt to be sure that they figure out exactly what they did wrong the first time. By challenging them to master the material in the class and supporting them to reach conceptual understanding, students gain confidence in themselves and they build the skills needed to be a resilient engineer. A student quote from an end-of-semester course evaluation sums it up concisely: "Our teacher's particular focus seemed to be keeping student morale up throughout the semester; nothing was a lasting failure, but there was also no shortcut to achieving a conceptual understanding of the material."

With the guidance of the Associate Dean of the Clark School, ENES232 was the first course at UMD to introduce the CFM grading system. As the course coordinator for ENES232, I was responsible for a large part of this implementation, including developing the documentation explaining the method, developing the training system for the teaching assistants for the course, compiling the exams into a format that worked with CFM, and coaching the students on how to navigate this new grading method. The materials that were developed ended up being used as a blueprint for the implementation of CFM in Dynamics, ENES221. I am continuously trying to improve this method, including through funded research like the multi-university NSF Grant #2013268 *Investigating the Effects of a Mastery-based Assessment Approach on Undergraduate Engineering Education*, where I serve as senior personnel and collaborate with faculty from University of Maryland, Michigan State, and University of Illinois at Urbana-Champaign. Additionally, in 2020 I proposed and was awarded a grant from the Provost's Office that focused on Teaching Innovation and transitioning ENES232 to an online environment during COVID-19. As Grant Lead, I hired and managed a team of undergraduate and graduate students, developing an online training module for Engineering Equation Solver (EES) and a set of online conceptual question practice quizzes that students can use to prepare for exams. Students have used and benefited from these tools for the last 4 terms: in Fall 2021, there were 111 students enrolled in ENES232; all 111 students went through the seven-module EES training module; for Exam 1, 62 students (56%) utilized the conceptual question practice quizzes in preparation for the midterm; 91 students (82%) utilized the practice quizzes for Midterm 2; 95 students (86%) utilized the practice quizzes for Midterm 3; and 91 students (82%) utilized the practice quizzes for the Final Exam. Although I do not have data to claim that these conceptual quizzes result in higher exam scores, one possible explanation for the growth in percentage of students

utilizing the resource from a majority to a large majority is that the students find them to be a helpful study tool to prepare them for exams.

Goal 4: Relate fundamental concepts to real-world societal issues: Another way that I have strived towards teaching excellence is by integrating my experience from industry to relate the technical content taught in class to complex global issues that need solving. In my previous role as a process safety consultant, many of my clients were petroleum or chemical companies that centered around fuel distribution and energy applications. Although my focus as a consultant was mitigating the risks of fire and explosion, I gained insight on how the concepts taught in engineering curriculum are applied in practice, as well as how energy applications play a critical role in geopolitical and environmental issues. When I share work-related pictures of a refinery in Turkey, I not only explain how the distillation process at that plant utilizes the concepts of phase change that we learn in ENES232, but also that the distribution network of products from Turkey into the surrounding region carries highly-charged geopolitical repercussions that students might read about in the news. My hope is to connect the dots between the equations in their notes and the complex problems in the world around them, because I have confidence that they will be a part of the solutions to these problems.

In the Fall 2021 semester, I decided to improve the final design project for ENES232 and develop a new project that challenges students to tackle an alternative energy solution. When starting to brainstorm on this new project idea, I collaborated with Elisabeth Smela, Natasha Andrade, David Bigio, and Sami Ainane, who are currently working on a Lemelson Foundation Grant focused on *Engineering for One Planet (EOP) Framework Integration*. Their hope is to bring social issues and the impact of engineering solutions into the classrooms of our courses, and they helped guide me towards my reimagined project: designing a residential geothermal heat pump system. I then collaborated with Dr. Eric Waschman of the Maryland Energy Innovation Institute to discuss his practical experiences with geothermal energy and hear what he thought would be important for the students to analyze in their design. By receiving feedback from both the practical angle and the societal angle, I was able to roll out a new design project that asked students to not only design a 3.5 ton residential geothermal heat pump, but also investigate the economic, societal, and environmental impact of their design. This project redesign was largely driven by the hopes of challenging Clark School students to tackle big, complex problems, and I hope that the impact on the students is something that they will carry with them throughout their career.

Goal 5: Serve as a relatable role model and mentor: When I was offered the Keystone position and I was making a decision on whether to take the job, I called three women to consult: Dr. Sheryl Ehrman, who had been my ENES100 instructor; Dr. Paige Smith, who had been the Director of Women in Engineering and Flexus when I was coming through the Clark School; and Dr. Elaine Oran, who had been the only female faculty instructor I had while in graduate school. Upon reflection, I found it interesting that I unintentionally gravitated towards the women who had taught me in my college years when making this decision. As a faculty member now, I understand my role as a mentor and role model for my students, particularly for women and underrepresented minority students. I have made it a point to become involved with the Women in Engineering office, not only as an instructor for the Flexus seminar course, but as an instructor for the summer overnight and online camps for high school women. As the faculty instructor for this camp, I developed a brand new week-long project, where groups of high-school women ‘designed a world without cell phones,’ and manufactured innovative products to this difficult problem

using our engineering labs. I believe that my young age and gender are assets that allow me to be relatable to my students - I understand my unique position and to have an impact on young adults through the work I do through mentorship. As such, I am very intentional about encouraging students of all backgrounds to pursue engineering careers, highlighting the value that their particular identity brings to the field.

Impact Through Administrative Keystone and College-wide Activities:

Achieving the five primary teaching goals laid out above has shown the most visible impact in my role as a lecturer. However, there are additional responsibilities that have been equally important to the success of Keystone and my personal development, and which make a promotion to Senior Lecturer appropriate. As course coordinator for ENES232, there is a lot of 'behind the scenes' work that I do to provide organization for both the students and the instructional team. These responsibilities include developing and managing course documentation, facilitating weekly instructional team meetings, reserving all needed spaces for exams/review sessions/office hours, training the UTFs and GTAs on their responsibilities (it should be noted that training of GTAs is a substantial effort in ENES232, given they are the primary graders of exams and we use a very particular grading rubric), compiling and publishing the exams for the course, and sending all student-facing course-wide communication.

My organizational skills and management skills have been instrumental to not only migrating ENES232 to the Conceptual Fluency Methodology, but also migrating the course to an online environment in Spring 2020. The grading method used for ENES232 utilizes frequent exams, so when classes suddenly transitioned online in Spring 2020, I immediately began brainstorming with colleagues and developing exam protocols for delivering and proctoring exams online through Zoom. My instructional team facilitated a 'fireside chat' with the students to address their concerns and questions about the transition, and we offered a 'mock online exam' before the first online exam to prepare the students for the logistical process of online exams. The online exam protocols developed in Spring 2020 were used as a standard for other engineering courses in Keystone and the College, and multiple students shared gratitude for the course organization and communication during a time of so much unknown. During the time teaching online, I was also able to give back to the college community by developing and facilitating two workshops for the College[2] to aid other faculty members with integration of technologies that would help with the transition online. Overall, the transition to online courses was seamless for ENES232, and I am very proud of the work that I did to make it so.

Closing Statement

In summary, I hope that I've showcased what I have been able to achieve in the last 4 years at UMD and the impact that I have had on my students, my colleagues and the greater Clark School community. I've been able to impact over 1000 students by focusing on making my courses exciting and accessible, empowering my students with fundamental engineering knowledge, supporting students to develop a growth mindset, bringing in my experience from industry to tie concepts to applications, and serving as a mentor for my students. I have impacted my peers by coordinating courses, leading workshops, collaborating on research projects, and sharing online protocols. And I have impacted the greater UMD community through my service activities and knowledge sharing. It is with pride that I reflect on what I've accomplished since starting as an instructor in 2018, and I greatly look forward to all of the work that I will be able to do as a PTK faculty member moving forward.

[2] https://ask.eng.umd.edu/105098; https://ask.eng.umd.edu/page.php?id=99216

Clarifying Information

At the time of review of this promotion dossier (Spring 2022), I will have four (4) years of teaching experience in the Lecturer position with Keystone (August 2018 - May 2022). It is important to note that the two years of experience working with AcuTech Consulting (2016-2018) prior to coming to UMD is relevant experience that has been instrumental to my abilities as an instructor. There are many examples from my time as a process safety engineer that I bring into the classroom as 'real-world examples' of thermodynamic behavior, fire safety concepts, heat transfer challenges, and engineering design constraints. I believe that these two years of experience have supplemented my abilities as a lecturer and have helped me accomplish my teaching goal of relating fundamental engineering concepts to real-world societal problems. Additionally, the students have benefited from the examples referenced from that time period, and are referenced in course evaluations as meaningful contributions to my teaching style. As such, my cumulative time of relevant experience to be considered for promotion is not four years, but rather 6 years.

Teaching Portfolio

Catherine Hamel

Keystone Program, University of Maryland

Promotion Dossier for Senior Lecturer

February 2022

Summary of Instructional Activities and Contractual Obligations

Listing of Courses Taught:

ENES100/ENES100A Introduction to Engineering Design: *Taught Spring 2019 and Spring 2022*
ENES100 is a Keystone course that is required for all first-year engineering students from all disciplines, where students apply the engineering design process in a semester-long team project building an Over-Terrain Vehicle (OTV). Because ENES100 is structured as a project-based course where students work in teams of eight students, the role of the instructor is to first instruct the students about the engineering design process and project management, and then provide them with instruction on technical concepts necessary to complete the design project. After about 7 weeks of instruction, the instructor's role shifts to a course manager, technical consultant, and team cheerleader as they assist the teams with their progress through the design project. A key role is to observe individual contributions and team dynamics, and provide critical feedback to students and their teams about how they can improve their communication, troubleshooting, project management, and technical skills.

ENES232 Thermodynamics: *Taught every Fall and Spring since Fall 2018, and Summer 2020 and 2021*
ENES232 is a Keystone course that is a degree requirement for mechanical engineering, aerospace engineering, and fire protection engineering majors. Thermodynamics is typically offered in the sophomore or junior year, and focuses on the thermodynamic properties of matter, the thermodynamic definitions of work and heat transfer, and the first and second laws of thermodynamics. Applications of these thermodynamic principles are explored, such as power and refrigeration cycles for both vapor and ideal gas systems. As course coordinator for this course, my role extends beyond the instruction of the course, but also the coordination of all sections of the course, including coordination with the other instructors, GTAs and UTFs, and training of the GTAs and UTFs.

ENFP405 Structural Fire Protection: *Taught Fall 2019 and Fall 2020*
In ENFP405, senior undergraduate fire protection students explore the effects of elevated temperatures on structural members. In this course, a number of structural materials are studied, including steel, concrete, wood, gypsum and glass. The testing and rating procedures for fire-rated structural members are defined, and students carry out analytical methods for analyzing the fire resistance of structural members in a wide array of design fire scenarios. These analyses include the development of computational models showing the time-dependent growth of fires, and the transient response of structural members' internal temperatures, where temperature-dependent stresses can be analyzed.

ENFP621 Structural Fire Protection: *Taught Fall 2019 and Fall 2020*
This is the graduate-level offering of Structural Fire Protection, and the topics covered are the same as laid out above for ENFP405. It should be noted that the lectures for ENFP405 and 621 are taught simultaneously, but the number/difficulty of assignments and the rigor of assessment is higher for the graduate offering of this course (ENFP621).

ENES115 Flexus Seminar I: *Taught Fall 2021*
This first-year seminar for students in the Flexus Living and Learning Program introduces students to the University and has students focus on personal and professional development and the field of engineering.

There is a focus on understanding the resources available to Clark School students, defining and exploring their identities as women in the field of engineering, introducing them to career and research opportunities, and discussing the issues faced by many first-year students. Students have the opportunity to hear from a number of guest speakers about topics such as engineering ethics, learning from failure, and Career Services.

Summary of Duties

Per the contract agreement for a non-tenure track instructional faculty appointment, the following duties are expected of me as a Lecturer for Keystone:

> Based on your current FTE of 100%, you are required to teach the equivalent of 8 sections of Keystone courses (ENES 100, 102, 220, 221, 232, BIOE 120, and/or ENEE 205) during the academic year. A reduction in teaching load may be provided to permit you time to participate in the professional learning communities of the course(s) you are teaching, to teach other non-Keystone courses as assigned by your unit, to serve as course leader or course coordinator for a course, to lead teaching assistant activities / training, to develop new courses or course projects, to mentor and advise students and student teams, to mentor new or less experienced faculty, to participate in service activities, to assist in laboratory operations and improvements, and/or to pursue other initiatives as assigned by your unit. It is expected that you will only be asked to teach 5 sections of courses for this academic year and to use the remainder of your time contributing to the undergraduate education mission of the institution and the success of your unit through your participation in the types of activities described above.

It should be noted that in addition to the 5 sections of Keystone courses taught in a given academic year, additional duties completed for Keystone include serving as course coordinator for ENES232, leading teaching assistant activities and training, developing new course projects, evaluating transfer credits for ENES232 equivalency, coordinating with external parties for technical demonstrations for ENES232 students, and leading workshops or retreat sessions for Keystone personnel.

In addition to my duties for Keystone, my responsibilities as a Professional Track Faculty member include:

- Contributing to pedagogical research projects such as the NSF *Investigating the Effects of a Mastery-based Assessment Approach on Undergraduate Engineering Education* project (PI: Ken Kiger) and The Lemelson Foundation *Engineering for One Planet (EOP) Framework Integration Pilot Program* (PI: Elisabeth Smela)
- Developing and rolling out the first implementation of Conceptual Fluency at the University of Maryland in ENES232
- Mentoring student groups (such as Salamander Honor Society for Fire Protection Engineering)
- Participating in service activities for the Women in Engineering Department and other departments
- Teaching as an adjunct faculty member for Fire Protection Engineering and WIE
- Developing and delivering technical workshops for the Clark School and Engineering IT
- Serving on the Curriculum Advisory Committee for the Fire Protection Engineering Department

Summary of Student Evaluations and Course Enrollments

An Introduction to Student Evaluations

In this section, a summary of student evaluations is presented, including the response rate, the main summary evaluation categories, and a comparison to similar courses at the college level for all courses taught. A summary of course enrollments is also provided. It should be noted that comparison data for other college courses have not been made available for terms beyond Fall 2019, so there is no comparative data presented for Spring 2020 onwards. Additionally, there is one course (ENES100A, Spring 2019) where data is not available due to only three (Section 0102A) or four (Section 0402A) students being enrolled in this course, making data statistically insignificant.

There are some key trends in student evaluations that I would like to point out, including (1) growth as time has progressed, (2) strong comparison to available college-wide data, (3) high evaluation scores, and (4) student comments on teaching style and support for students.

(1) ***Growth***: There are three courses where data is available to show growth from one offering to the next: ENES232, ENFP405 and ENFP621. **In all three of these courses, the mean average score has increased from the first offering to the most recent offering.** For ENES232, the average score has increased from a 3.71 in the first offering of the course (Fall 2018) to a 3.90 in the most recent offering (Fall 2021). For ENFP405, the average increased from 3.60 (Fall 2019) to 3.80 (Fall 2020). In ENFP621, the average increased from 3.70 (Fall 2019) to 3.80 (Fall 2020). This showcases my commitment to continuously improve the courses that I teach, through iterating the methods that I use for presenting material, engaging students, and assessing understanding.

(2) ***Comparison to College Peers***: For all course offerings where data is available, my students evaluations have been higher than the comparative data for similar courses at the college level. It should be noted that **even in my first semester of teaching at the university (Fall 2018), my evaluation was 20% higher than the college average (ENES232, Section 0101)**. For the four semesters where data is available, my evaluation was 18% higher than the college average for ENES232, 14% higher than the college average for ENES100, 10% higher for ENFP405, and 7% higher for ENFP621.

(3) ***High Scores*:** It is worth noting that for all 3-credit courses taught (all courses except ENES115), my evaluations are above a 3.4, and that for ENES232 (my primary course), my average evaluation has been above a 3.8 since Fall 2019. I am particularly proud that **I have received a total of 26 "perfect score" (4.0) evaluations in the five primary teaching categories since starting at UMD** [21 in ENES232, and 5 in ENFP621]. These trends persisted even during the transition to online courses in Spring 2020, Fall 2020, and Spring 2021. In my most recent offering of ENES232 (Fall 2021), I received a perfect score in four of the five teaching categories. Although I am continuously looking for room to improve the way that I teach my courses, it is reassuring to know that my students recognize my teaching methods as exemplary.

(4) ***Student Comments*:** I have included the "Additional comments" section of my course evaluations from the *most recent offering* of each class that I teach on Page 22 of this Teaching Portfolio. I hope to highlight the number of comments about the effectiveness of my teaching methods, the care for student well-being, and my support for students learning the material. Note:

Course Enrollment Summary

Table 1 shows a summary of all courses taught, in addition to the number of sections taught of that course, and the number of students taught. This summary shows a total of seven courses and twenty-four (24) sections of these courses taught, and 952 students taught over the last four years.

Table 1. Course Enrollment Summary

Course	Course Title	Sections Taught	Students Taught
ENES 100	Introduction to Engineering Design	3	108
ENES 100A	Introduction to Engineering Design	3	12
ENES 232	Thermodynamics	17	863
ENFP 405	Structural Fire Protection	2	57
ENFP 621	Analytical Procedures of Structural Fire Protection	2	23
ENES115	Flexus Seminar I	1	30
	TOTAL	**28**	**1093**

Table 2 presents course enrollment at a more granular level, showing the total number of students taught in each section of the course, presented by each term of the year.

Table 2. Overall Course Enrollment

		ENES 100		ENES 100A		ENES 232		ENFP 405		ENFP 621		ENES 115	
		Sections	Students	Sections	Students	Sections	Students	Sections	Students	Sections	Students	Sections	Students
2018	Fall	---	---	---	---	2	97						
2019	Spring	2	74	2	7	1	56						
	Fall	---	---	---	---	1	45	1	37	1	9	---	---
2020	Spring	---	---	---	---	3	174	---	---	---	---	---	---
	Summer I	---	---	---	---	1	42	---	---	---	---	---	---
	Fall	---	---	---	---	2	112	1	20	1	14	---	---
2021	Spring	---	---	---	---	2	99	---	---	---	---	---	---
	Summer I	---	---	---	---	1	25	---	---	---	---	---	---
	Fall	---	---	---	---	2	111	---	---	---	---	1	30
2022	Spring	1	34	1	5	2	102	---	---	---	---	---	---
SUMMARY		3	108	3	12	17	863	2	57	2	23	1	30
Sections Taught		28											
Students Taught		1093											

Course Evaluation Summary

Table 3 presents a summary of the evaluation scores for all courses, where data has been averaged over all offerings (sections) of the course. The number of sections of the course taught and number of students taught are also included. It should be noted that the scale is "Strongly Disagree (0) to Strongly Agree (4) with a Neutral midpoint." It should also be noted that the Spring 2022 courses are not included in this table, as evaluations have not yet been collected.

Table 3. Course Evaluation Summary

Course	Course Title	Sections Taught	Students Taught	Intellectually Challenging	Learned a Lot	Treated with Respect	Well-prepared	Effective Teacher	Average
ENES 100	Introduction to Engineering Design	2	108	3.18	3.00	3.88	3.75	3.55	3.47
ENES 100A	Introduction to Engineering Design	2	12	data not available					
ENES 232	Thermodynamics	15	863	3.62	3.70	3.92	3.92	3.89	3.81
ENFP 405	Structural Fire Protection	2	57	3.5	3.85	3.85	3.85	3.7	3.75
ENFP 621	Analytical Procedures of Structural Fire Protection	2	23	3.25	3.85	4	4	3.7	3.75
ENES 115	FLEXUS - Seminar I	1	30	1.4	2.2	3.2	3.4	3	2.6
	SUMMARY	**24**	**1093**	**2.99**	**3.32**	**3.77**	**3.78**	**3.57**	**3.48**

ENES232 Thermodynamics Evaluation Summary

Table 4 shows the course evaluation summary for ENES232 Thermodynamics on a section-specific basis for all offerings of the course. It should be noted that the scale for evaluation is "Strongly Disagree (0) to Strongly Agree (4) with a Neutral midpoint" and that the Comparison* provided is the "Average rating for all similarly leveled course sections in that college in that semester (i.e., all ENGR_200 courses)." As pointed out previously, the comparison data is only available for Fall 2018 through Fall 2019. It should also be noted that the 2 sections of ENES232 offered in Spring 2022 are not included in this table, as evaluations have not yet been collected.

Table 4. ENES232 Evaluation Summary

ENES 232 - Thermodynamics

Semester	Section	Number of Students	Evaluation Response Rate (%)	The course was intellectually challenging.		I learned a lot from this course.		The instructor treated students with respect.		The instructor was well-prepared for class.		Overall, this instructor was an effective teacher.		Average		
				Mean	Comparison*	Mean	Comparison*	Mean	Comparison*	Mean	Comparison*	Mean	Comparison*	Mean	Comparison*	
Fall 2018	0101	49	73.5	3.58	2.99	3.61	3.02	3.86	3.35	3.83	3.28	3.81	2.96	3.74	3.12	
	0301	48	83.3	3.63	2.99	3.63	3.02	3.73	3.35	3.78	3.28	3.78	2.96	3.71	3.12	
Spring 2019	0301	56	67.9	3.58	2.97	3.53	3.11	3.76	3.47	3.71	3.40	3.66	3.14	3.65	3.22	
Fall 2019	0301	45	42.2	3.70	3.00	3.50	3.20	3.90	3.40	3.90	3.30	3.80	3.00	3.80	3.18	
Spring 2020	0101	58	50.0	3.60		3.60		3.90		3.90		3.90		3.80	0.00	not available due to COVID
	0102	58	43.1	3.60		3.70		4.00		4.00		3.90		3.80	0.00	
	0201	58	51.7	3.60		3.70		4.00		3.90		3.80		3.80	0.00	
Summer 2020	WB11	42	33.3	3.70		4.00		4.00		4.00		4.00		3.90	0.00	data not available
Fall 2020	0101	57	52.6	3.50		3.70		3.90		3.90		3.90		3.80	0.00	
	0301	55	65.5	3.60		3.70		4.00		4.00		4.00		3.90	0.00	
Spring 2021	0201	50	58.0	3.60		3.60		3.90		4.00		4.00		3.80	0.00	
	0601	49	49.0	3.70		3.70		4.00		4.00		3.90		3.80	0.00	
Summer 2021	WB11	25	44.0	3.5		3.8		3.9		3.9		3.9		3.8	0.0	
Fall 2021	0101	54	48.1	3.7		3.8		4.0		4.0		4.0		3.9	0.0	
	0301	57	45.6	3.70		4.00		4.00		4.00		4.00		3.90	0.0	
SUMMARY	**15**	**761**		**3.62**		**3.70**		**3.92**		**3.92**		**3.89**		**3.81**		

ENES100 Introduction to Engineering Design Evaluation Summary

Table 5 shows the course evaluation summary for ENES100 Introduction to Engineering Design on a section-specific basis for all offerings of the course. It should be noted that the scale for evaluation is "Strongly Disagree (0) to Strongly Agree (4) with a Neutral midpoint" and that the Comparison* provided is the "Average rating for all similarly leveled course sections in that college in that semester (i.e., all ENGR_200 courses)." As pointed out previously, the comparison data is only available for Fall 2018 through Fall 2019. It should also be noted that the 1 section of ENES100 offered in Spring 2022 is not included in this table, as evaluations have not yet been collected.

Table 5. ENES100 Evaluation Summary

ENES 100 - Introduction to Engineering Design

Semester	Section	Number of Students	Evaluation Response Rate (%)	The course was intellectually challenging.		I learned a lot from this course.		The instructor treated students with respect.		The instructor was well-prepared for class.		Overall, this instructor was an effective teacher.		Average	
				Mean	Comparison*	Mean	Comparison*	Mean	Comparison*	Mean	Comparison*	Mean	Comparison*	Mean	Comparison*
Spring 2019	0102	37	73.0	3.11	2.92	2.96	2.90	3.89	3.29	3.78	3.17	3.56	2.96	3.46	3.05
	0402	37	75.7	3.25	2.92	3.04	2.90	3.86	3.29	3.71	3.17	3.54	2.96	3.48	3.05
SUMMARY	**2**	**74**		**3.18**		**3.00**		**3.88**		**3.75**		**3.55**		**3.47**	

ENFP405 Structural Fire Protection Evaluation Summary

Table 6 shows the course evaluation summary for ENFP405 Structural Fire Protection on a section-specific basis for all offerings of the course. It should be noted that the scale for evaluation is "Strongly Disagree (0) to Strongly Agree (4) with a Neutral midpoint" and that the Comparison* provided is the "Average rating for all similarly leveled course sections in that college in that semester (i.e., all ENGR_200 courses)." As pointed out previously, the comparison data is only available for Fall 2018 through Fall 2019.

Table 6. ENFP405 Evaluation Summary

ENFP 405 - Stuctural Fire Protection

Semester	Section	Number of Students	Evaluation Response Rate (%)	The course was intellectually challenging.		I learned a lot from this course.		The instructor treated students with respect.		The instructor was well-prepared for class.		Overall, this instructor was an effective teacher.		Average		
				Mean	Comparison*	Mean	Comparison*	Mean	Comparison*	Mean	Comparison*	Mean	Comparison*	Mean	Comparison*	
Fall 2019	0101	37	45.9	3.40	3.20	3.50	3.20	3.80	3.50	3.80	3.50	3.80	3.00	3.60	3.28	
Fall 2020	0101	20	75.0	3.60		3.70		3.90		3.90		3.90		3.80		data not available
SUMMARY	**2**	**57**		**3.50**		**3.60**		**3.85**		**3.85**		**3.85**		**3.70**		

ENFP621 Structural Fire Protection Evaluation Summary

Table 7 shows the course evaluation summary for ENFP621 Structural Fire Protection on a section-specific basis for all offerings of the course. It should be noted that the scale for evaluation is "Strongly Disagree (0) to Strongly Agree (4) with a Neutral midpoint" and that the Comparison* provided is the "Average rating for all similarly leveled course sections in that college in that semester (i.e., all ENGR_200 courses)." As pointed out previously, the comparison data is only available for Fall 2018 through Fall 2019.

Table 7. ENFP621 Evaluation Summary

ENFP 621 - Analytical Procedures of Structural Fire Protection

Semester	Section	Number of Students	Evaluation Response Rate (%)	The course was intellectually challenging.		I learned a lot from this course.		The instructor treated students with respect.		The instructor was well-prepared for class.		Overall, this instructor was an effective teacher.		Average		
				Mean	Comparison*	Mean	Comparison*	Mean	Comparison*	Mean	Comparison*	Mean	Comparison*	Mean	Comparison*	
Fall 2019	0101	9	22.2	3.00	3.30	4.00	3.40	4.00	3.70	4.00	3.50	3.50	3.40	3.70	3.46	
Fall 2020	101	14	78.6	3.50		3.70		4.00		4.00		3.90		3.80		data not available
SUMMARY	**2**	**23**		**3.25**		**3.85**		**4.00**		**4.00**		**3.70**		**3.75**		

ENES115 FLEXUS Seminar I Evaluation Summary

Table 8 shows the course evaluation summary for ENES115 FLEXUS Seminar I on a section-specific basis for all offerings of the course. It should be noted that the scale for evaluation is "Strongly Disagree (0) to Strongly Agree (4) with a Neutral midpoint" and that the Comparison* provided is the "Average rating for all similarly leveled course sections in that college in that semester (i.e., all ENGR_200 courses)." As pointed out previously, no comparison data is available for Fall 2021.

Table 8. ENES115 Evaluation Summary

ENES 115 - FLEXUS Seminar I

Semester	Section	Number of Students	Evaluation Response Rate (%)	The course was intellectually challenging.		I learned a lot from this course.		The instructor treated students with respect.		The instructor was well-prepared for class.		Overall, this instructor was an effective teacher.		Average	
				Mean	Comparison*	Mean	Comparison*	Mean	Comparison*	Mean	Comparison*	Mean	Comparison*	Mean	Comparison*
Fall 2021	0101	30	63.3	1.40		2.20		3.20		3.40		3.00		2.60	0.00
SUMMARY	**1**	**30**		**1.40**		**2.20**		**3.20**		**3.40**		**3.00**		**2.60**	

"Additional Comments" from Course Evaluations

The most recent course evaluation student comments for all courses I have taught are included on the following six pages. Older course offering comments are not included for the sake of brevity. I have highlighted comments that I believe capture the student sentiment of strong teaching methods, instructor care for students, and support of students in their struggle towards mastering the material of the course.

ENES232 Fall 2021, Section 0101

Additional comments (e.g. about course content/materials, teaching style, etc.):

Comments
Course path was well planned I never felt too overwhelmed at one time. While I had previously disliked the conceptual fluency in other courses, I actually felt it greatly improved my understanding of topics during this semester, although that may have also been because we were back in person.
Catherine Hamel is the best teacher/professor I have had thus far in my life. She is engaging and truly cares about students. She goes above and beyond to give every student the tools to succeed.
I thought the teaching style for this course was truly amazing. It was effective and Professor Hamel taught in a way that appeared designed to try and help us make connections between the topics of the course and reinforce those connections over and over and over again. I also felt like the course itself is a decently thorough introduction to thermodynamics. I liked that it followed the usual "ENES" format of midterms and a final that covers the final portion of content in the class.
Professor Hamel is the best engineering professor that I have had at this school. She cares about her students and what they get out of the class. She is very organized and and clear in providing content to the class. During office hours she always was understanding of students concerns and questions which made her very approachable. The homework assignments for this class is set up very well and I felt very prepared for the exams based on my completion of the homework assignments. I think that the conceptual fluency for this class is very demoralizing. Also, I feel like the final project was more busy work than anything helpful, it just took away time from studying for an exam that is graded very difficultly because of the grading method in this class.
This was the vest engineering class o babe taken. Catherine was the best teacher and put in a bunch of work. She was so nice and helpful every time I came to class. This was an amazing class
The course was taught very well. Instructions were clear and to the point, and the professor was great at breaking down complex topics into simple ones that we could all understand. Professor feedback and engagement with the class went the extra mile, and I appreciate what I got out of the course a lot.
professor hamel is an excelllent professor and she truly cares about her students. With that being said implementing the final project was probably one of her worst decisions in my opinion. I really did not like the final project. Overall, She is a great teacher.
I feel like the final project was kind of thrown at us in the midst of preparing for finals and learning the last of the course content. In addition to the homework already and the timing of it, the final project felt like a lot. I really appreciated all the opportunities for extra credit– they motivated me to keep working and therefore learn more.
I am currently in my fourth year of college for physics and engineering, and the teaching style used by Catherine Hamel in this course was one of the most effective I've ever experienced. She should be commended for how well she teaches the material in this course and how helpful she is to the students. She structured the course in a way that was very easy to follow with fair grading as well, especially considering that it is a challenging course. She also did a fantastic job of ensuring that each student had the opportunity to be successful, as she went above and beyond to help any student that needed it. The best part, however, was that each and every day she came to class with an incredibly vibrant attitude that radiated positivity and made every lecture a pleasure to attend. In my opinion, she should be rewarded for her effectiveness as both an engineering professor as well as a role model to the students. I hope to have her as an instructor again in the future.
Catherine Hamel has been my favorite professor at UMD this far. The weekly reminders, assignment calendar on google docs, and all the notes/examples she posts shows how much she cares about her students. Seeing her passion for teaching motivated me to come to class and learn about thermo!
10/10 fabulous professor, both as a teacher and a person. Words cannot describe how amazing Professor Hamel is. EES kinda sucks though.
The teaching style was great, Professor Hamel is very good at conveying material in an intuitive way and always provided time to answer any questions we had. The workload was just right so that we got enough practice to understand concepts which really helps with remembering the material in the long run.
Professor Hamel is one of the best professors I have had at the University of Maryland so far. She clearly understands the content and teaches it in a way that is student–focused. Professor Hamel definitely cares about the students and helping them learn the content as well as they can. I think exams were very fair, and the method of requesting partial credit helped me to understand my mistakes better. The structure of the class was also very good for learning the content. Having lecture twice a week with studio to practice once a week and a weekly homework really helped me stay on top of my work. With this structure I was able to keep up with the workload. Additionally, I thought it was really good that Professor Hamel referenced the real world applications of Thermodynamics. She introduced the class on the first day as something that could shape how we use energy in the future. Keeping the context of a class in mind is really helpful because it reminds me that what I am learning is relevant.

ENES232, Fall 2021, Section 0301

Additional comments (e.g. about course content/materials, teaching style, etc.):

Comments
I just wish that we EES was used a little more in the class for how much homework we had on it.
Hamel is an excellent teacher who is down–to–earth and made the course material very friendly to approach. Thermodynamics itself, however is a difficult topic in my opinion, so I always felt "behind" all semester long despite the in–depth care and instruction from the instructors. The TA were not as helpful as I could've hoped (though that may be due to Hamel setting higher expectations in students). The exam format, while helpful with two attempts, made it so each exam effectively lasted two weeks long, doubling the anxiety and stress – along with the "conceptual fluency" grading method, something I'm not a fan of at all. If this were the only course I was taking I'd understand the need, but as someone taking multiple courses it's asking too much to effectively answer all exam questions "perfectly" – with manually requested regrades to boot.
I like the conceptual fluency approach and have had a really effective learning experience in these classes. However, I have gotten somewhat unbelievably high grades. I do find it easy to put in effort to fully learn the content in these courses. My high grades may just reflect the success that this format allows me to reach. Sometimes the extra tries and completion grading can seem like free grades. Hamel is a very effective teacher and thoroughly understands students. Notes are well structured and easy to follow, no matter the complexity of the topic. Extra resources are always available and the class feels friendly.
Ms. Hamel gives great lectures that follow easy to read notes, her notes serve as the textbook but the textbook is also a useful resource.
I enjoyed the way this class was taught. Hamel did a good job of making it engaging and her notes always had all the information that we needed, including things she said verbally in class, which was very helpful. I strongly oppose the grading method that is being used in many engineering courses, that is my only negative comment. It doesn't seem to help much, just causes a lot of unnecessary stress and pressure on a simple exam.
Prof. Hamel was a very good teacher. She was a very fair grader. One of the best professors I've had at this university. She was very understanding when I had to deal with an issue outside of the classroom. She was very supportive and showed great care for me as a person and as a student. Nothing but good things to say about her.
Everything about the class challenged me and I could see an improvement. I really enjoyed all of the extra time out in by Catherine that allowed us to really understand the content and do the best we could.
I really appreciated Professor Hamel's teaching style throughout the semester. She never moved too fast during lectures and always stopped to answer students' questions and clear up any confusions. The way she taught always made concepts easy to learn and very clear. When leaving her class I always felt like I learned something new and understood what we learned unlike some other professor's classes.
I don;t think we should have a final project and a final exam. It should be one or the other because it takes up a lot of study time.
Professor was awesome, made a very difficult class much easier to work through and broke down information in an understandable manner. Personally I still am not a fan of the conceptual fluency grading method, but it wasn't as much of a problem as I assumed it would be.
The course was taught very well. Everything was generally taught in an effective conceptual manner and followed up with examples. Sometimes simple concepts such as mass conservation would be overcomplicated for seemingly no reason.
I appreciate the Conceptual Fluency approach. It emphasizes original thinking versus getting the right answers.
Professor Hamel is an amazing instructor. She ensures that everyone at lecture understands the concepts being introduced and is willing to stop and take the time to address any confusions before moving on. She has very productive office hours and made me feel like I can do well in this course. Homework is equally challenging but also very related to the learned material, which has made this course enjoyable. I do believe the final project could be introduced a little earlier, but understand that we must finish learning the material first. Overall, she allows you to challenge yourself and is their to support her students as best as she can.
This was my first class in which two exams were given and the higher of the two scores was kept. That seems like a solid way to let students demonstrate they've since learned material that's built on in the rest of the class. Our teacher's particular focus seemed to be keeping student morale up throughout the semester; nothing was a lasting failure, but there was also no shortcut to achieving a conceptual understanding of the material. Having to justify partial credit was new, but also required an understanding of the material, and allowed for a fast grading process (because whoever ultimately graded our tests only had to check the value we had written in for each question). Dr. Hamel particularly encouraged engagement with the material through her and her TA's office hours, with a clear schedule available in the syllabus.

ENFP405, Fall 2020

Additional comments (e.g. about course content/materials, teaching style, etc.):

Comments
The class was well–prepared even if there were slight mistakes. The thought all the assignments were evenly spaced out with the appropriate material. The lecture slides were also well done and I never felt like there were useless slides during the lectures.
I liked how each lecture was recorded and organized neatly in the Panopto Recordings. It made it very easy to go back and find information that I may have missed or needed.
This class is packed with tons of content, and yet Professor Hamel finds a way to make it manageable. Office hours are a must. Her interactive presentation style is the most engaging I've encountered while online. ,
The information in this class could sometimes be a little boring and being on zoom did not help with that but the instructor did a good job presenting the information in a way that made it less boring to listen too. Something that I think could have helped would be trying to facilitate more class participation but if it's on zoom again that's always going to be difficult. I loved having the music on before class it really brightened my mood. Overall the professor did a good job presenting the information in this class.
I really liked the teaching style. Using technology like that is definitely better than writing on paper.
I believe Catherine has one of the best teaching styles in our department. She is the most approachable professor who genuinely wants to help her students and answer any questions they have. I believe her working hard to bring in guest lecturers from Arup and HILTI gave us an insight of how applicable the material we learn is. I was unable to attend any of her office hours due to a tough semester but if I ever had a question, she responded to my emails ASAP with a detailed answer.
The course content and teaching style were both very reasonable for the course level and number of credits. I put in less work than I should have, for various reasons, and my grade reflects that. The content was easy to follow along with and it seemed to be that the instructor put a lot of effort into making it easy to understand.
Catherine was an amazing professor this semester. She explained everything in–depth, and she went over the example problems we did in class very well. Also, her skills with the iPad were awesome! It was way better than looking at powerpoint slides. The class was engaging, and the guest lecturers she brought in provided great expertise. The only recommendation I have is to have more assignments. Only having 3 homework's, quizzes, and exams was tough in that if you did poorly on one of them, it was hard to save the rest of your grade. Overall, Catherine was probably one the best professors I've ever had!
Professor Hamel really knew her stuff and i regret that i wasnt able to attend a live lecture. Course was very easy to follow and the assignment were challenging yet reasonable.
Professor Hammel is great! Her lectures are thorough and easy to understand, and she communicates the information clearly. The transition to online classes was smooth and she made the most of this format of learning. She also took advantage of this, as our exams were takehome so she could incorporate using excel/matlab to solve, as well as having us reference codes/standards.

ENFP621, Fall 2020

Additional comments (e.g. about course content/materials, teaching style, etc.):

Comments
I really enjoyed Professor Hamel's lectures and felt that her lecture style made the material quite clear and understandable. I only wish that we either had homeworks more frequently or our large homeworks were split up into smaller assignments. As I made my way through the course, I felt that I was not interacting with the course material super frequently. It was up to me to take the time to be studying the material on my own time. Had there have been a weekly or biweekly homework, I would have been sure to be keeping up with the lecture material more closely.
Catherine was an effective teacher and made sure to walk through steps in a clear and concise manner. She was also very responsive to questions when people put them in the chat during Zoom. I appreciated that she recorded the lectures as well, and the format in which she took notes for the class was very simple to follow and ended up being extremely beneficial to use for homework and studying. My only suggestion for this class would be to space out the material more evenly. We were given one third of the course material in the last week and a half of class, which wasn't ideal especially since we had a long gap between the most recent homework and this homework. Maybe assign homework 3 a week earlier?
Professor Hamel taught a great course which gave me and my classmates a deeper understanding of the fire safety considerations in common building structures and materials. She did particularly well in walking us through examples in order to solidify our approach to each unique scenario. Also, having each lecture recorded dramatically helped because I could go back and hear how she explained certain topics I was fuzzy on. She also opened a Piazza forum for the class which is a nice resource to have if specific questions arose.
Assignments near the end of the semester could have been spaced out better. The final homework assignment was given in the same time period as the time allocated for the final exam so mistakes made on the homework could not be checked before completing the final exam. Overall, Catherine Hamel did a very good job in teaching this course.
Maybe some more homeworks to practice the problems before exams and quizes. Also maybe more frequent quizes so that way there isn't as much material per quiz, which would let me know if I really know the material
The course was a great introduction to the application of the Fire engineering principles to a completely different aspect of engineering. The course instruction was great, fun and challenging. The class atmosphere was great and the instruction was aptly paced with lecture recordings to refer to afterwards. The assignment, quiz and exam loads were appropriate with moderate to low difficulty and covered the entire topics in the course.
Outstanding course content and brilliant teaching by Ms. Hamel especially the way she explained concepts and enthusiastically solved queries and doubts. I have learned a lot through this course.
I thought that Catherine was an absolutely fantastic professor – she conveyed the course material in a very effective manner, and was very approachable with questions or concerns. The only feedback I would give is that the syllabus could have been a lot more descriptive about the quantity of assignments and their deadlines. I can appreciate that deadlines often depend on when specific course material is covered so I understand the lack of initial information on that front, but just knowing that the course grade would be composed of 3 Quizzes, 3 Homework Assignments, and 3 Exams with an approximate timeline of when they would take place would have been very helpful for planning purposes.
I think that there should be more homeworks in this course. Maybe just splitting the steel homework in two? It would be nice to keep reviewing the coursework throughout.

ENES100, Spring 2019, Section 0102

Additional comments (e.g. about course content/materials, teaching style, etc.):

Comments
Course was very slow in the first half of semester and that rapidly accelerated. While I understand that the concepts needed introduction because not everyone had been exposed yet, the lessons could have been more engaging and more hands on. Any hands on experience was rushed or pushed to outside of class time. Having common OSV parts and exploring them in the lab with instructors during the first half would have been very helpful.
This course allows for too much teacher's opinion to affect grades instead of grading on technical aspects. Also, making students pay for the entire OSV on top of paying extra tuition to be an engineer seems very unfair.
This class should not be considered a 3 credit class because per week myself and my grouop members put more work in than only three credit hours
This course demanded a lot of out of class time. I enjoyed working with my team, but I felt like I did not get to know my other classmates/ share ideas with other groups. The professor did try to have groups interact, but groups did not really interact in class.
ENES100 was a fantastic course. Coming in as someone who took engineering classes in high school, I feared I was not going to get much out of this class. The first few weeks of lecture–style classes were a bit dull, as they covered information I already knew, but I recognize their importance nonetheless. Once we got into the "build stage" of the course, it was a fast–paced, exciting, challenging learning experience. The hands–on nature and extensive demands were perfect for immersing new students in engineering. I got better at many aspects of engineering, ranging from programming to circuitry to structures. It is also an essential first experience in an engineering team setting. I have conflicted feelings on the team size; I feel the teams were a bit large to maximize productivity, but at the same time I recognize the drastically vary effort levels between students and it could be dangerous to make smaller groups where one "slacker" could more substantially drag down the group. I felt the professor and TFs did a great job of balancing giving assistance while making us figure things out for ourselves. There were some frustrations regarding supplies and tools (particularly things like lack of screws and functional soldering irons), but all of these difficulties were surmountable. Overall, this was a wonderful experience that I definitely gained a lot from. I do feel that it has significantly more time commitment than that of a 3 credit class, and in my opinion it should at least be a 4 credit class, but I certainly would not try to make it a less time–intensive course. Every second I worked on this project bettered me as an engineer.
This should easily be a 4 credit class, if not more.
Way too much lecture and physics work at the beginning of the semester, didn't leave us enough time to build our OSV...no wonder why so many of them wind up being unsuccessful!
I learned a lot this semester but because it took so much time beyond the classroom, I felt it should have been worth more credits.
This course was a great way to introduce students to the engineering design process, and did teach me a couple of things about 3D printing, CAD modeling, and coding. I don't think that buying the textbook is needed, and I don't know why it was put out there – I personally never used it. I also think that the amount of time spent out of class working on the OSV is a little absurd.
I wish more of the class was hands on. There was alot of information the first half of the semester. However, I knew alot of that information abf wiuld have prefered to have more build time.
I did not like the teaching style of this course. Switching to the building phase, the professor and TA were not very helpful and I feel that objectives were not always clearly outlined. This course did not have very much structure, even in the beginning.
This course was interesting because it was a ton of work, with mostly work based on things we did not learn in class directly.

ENES100, Spring 2019, Section 0402

Additional comments (e.g. about course content/materials, teaching style, etc.):

Comments
Arduino was used for like 1 hour in class. It's a lot of work for even me who didn't do as much, but that's how the class is I guess.
This was a very exciting and challenging course. I believe that everyone really came together once we reached the build phase, but before that the workload was quite a burden. It would be helpful if the problem sets and the CAD assignment were a little shorter.
At the beginning of the semester, it was not always clear when due dates were. Due dates for quizzes and problem sets were not always clearly described, however due dates for important milestones were always very clear.
The course workload is very high considering this is a freshman level/100 level course. As a third year college student who has transferred from another 4 year college, I felt overwhelmed with the work required to succeed in this class.
Having taken a similar course in high school, this was repetitive for me. The course material was clearly explained and easy to understand. Although, having only half of the semester for a large project was challenging but I can see the reasoning behind it. Also, looking back, I am sort of disappointed that students are expected to cover the cost of their OSV project given the extensive lab fees we pay to the university each year. I understand that this is part of the project and it wasn't that big of a cost but I think there should be a project that doesn't require as many varying components between teams (with similar missions, some parts could be provided for everyone) or apply lab fees to this class. I understand that the component decision–making and budgeting is part of the project but with shipping, costs added up quickly. Other than that, this was a decent class that acted as a refresher on engineering and team skills.
I really enjoyed this class and the journey to build a functional OSV. Catherine was very supportive and helpful along the way.
I felt like this class was very rushed. We were expected to learn a lot of information in a short period of time, and then build something based on that. I felt like it would have worked much better if the course was split up a bit more, or maybe even longer(possibly a full year). We learned all the information at the beginning of the semester, and then the next half of the semester was spent building our OSV. I think things would have gone much better if right after we learned a topic, then we spent time working on that aspect of our OSV. It would have spaced everything out so that we weren't rushed to learn everything all at once, and then build something. Also, I don't remember spending much time learning about coding for our OSV, we were just expected to learn that on our own. This was a big part of the OSV project, and it seemed like we never learned about it during the part of the class where we were learning things. Finally, I feel like we were just thrown into the project, and then left to struggle. It felt like we hadn't learned enough about the topics to get everything done, and we were just expected to teach ourselves.
There should be more teaching instead of just saying "learn this yourself". If someone has no knowledge of a topic, trying to do the rest of the course's workload, the rest of their engineering class load, and learning a new thing that you've never done before is too much.
I think it was very relieving that a large chunk of our grade was based on team performance, however this was also an issue for my team. Only about 3 members would actually be contributing outside of class or on any written milestone submission, which was incredibly stressful. However, we were afraid to discuss this with our instructor because we did not want our teamwork grade to drop. It is also pretty much impossible to construct a fully functioning OSV with only 3 people doing work, even with going to all open lab hours. Not to mention the fact that some of us have already extremely difficult workloads, making for many all–nighters. I myself would go to lab as much as I could, leaving me with no time to do homework and having to stay up all night finishing it. For that I think that there should be half team performance, and half individual performance and improvement. I understand that a large goal of this class is to work as a team, but it is just not realistic that everyone will pull their weight. But by including an individual performance assessment, each team member would have to be actively learning and improving to maintain their own grade. The peer reviews are okay, but the largest flaw is that we fill them out AFTER all the work has been done by 3 members, after all the all–nighters pulled and hours spent in lab. So yes, peer reviews will result in the team members that did not do work to receive lower grades, but that does not help me or the other people that actually worked. The only thing that would help is checking up to make sure that each individual is working on something and learning by having them demonstrate individual improvement through things they worked on (prototypes, code, sensors, etc.) as part of the milestones. An individual assessment would ensure that every member will have to pull their weight throughout the course of the project in order to have something to demonstrate on milestones, therefore helping those of us who were having to make up for their lack of work.
I really enjoyed this course, the teachers ta and classmates. The only issue was that it is very time consuming.
This course was very interesting and relevant to my career. I do wish the first half of the year was more focused on teaching the people who had less of an idea about circuitry and coding. We did learn general knowledge, but it was tailored more to people who had a general idea in the first place.
I really enjoyed this class, although I wish we had more time or we made 2 osv's so we could learn from mistakes.

Evidence of Exemplary Teaching Record

Course and Curriculum Development

In addition to receiving positive teaching evaluations and student comments, I have also dedicated a great deal of effort toward continued advancement of my existing courses, and the development of new course offerings. In this section, I will highlight courses that I have developed, as well as evidence of my curriculum development in the form of assignments, teaching methods, and alternative assessments.

I am the curriculum developer for an online, asynchronous offering of ENES232 Thermodynamics. Although ENES232 is not a new offering, I have developed a new implementation of ENES232, meant to be delivered in the Summer I term (I started development of this course before COVID-19 moved courses online). In this offering, all lecture content is delivered asynchronously, and the class time is used for problem solving and assessment. Traditional written midterms are replaced with rigorous individual design projects (one of which is highlighted in Figure 2 on Page 29), where students explore complex thermodynamics problems through real-world applications. Daily Canvas quizzes keep students on pace and allow them to get real-time feedback on their understanding of the material, and multiple attempts on these quizzes allow for students to learn from failures and improve through iteration.

The four artifacts presented below in Figure 1 through Figure 4 illustrate innovation in curriculum development with respect to alternative course material delivery methods (Figure 1), alternative assessment methods through design projects (Figures 2 and 3), and active learning assessment methods through ungraded clicker-style questions at the beginning of class (Figure 4).

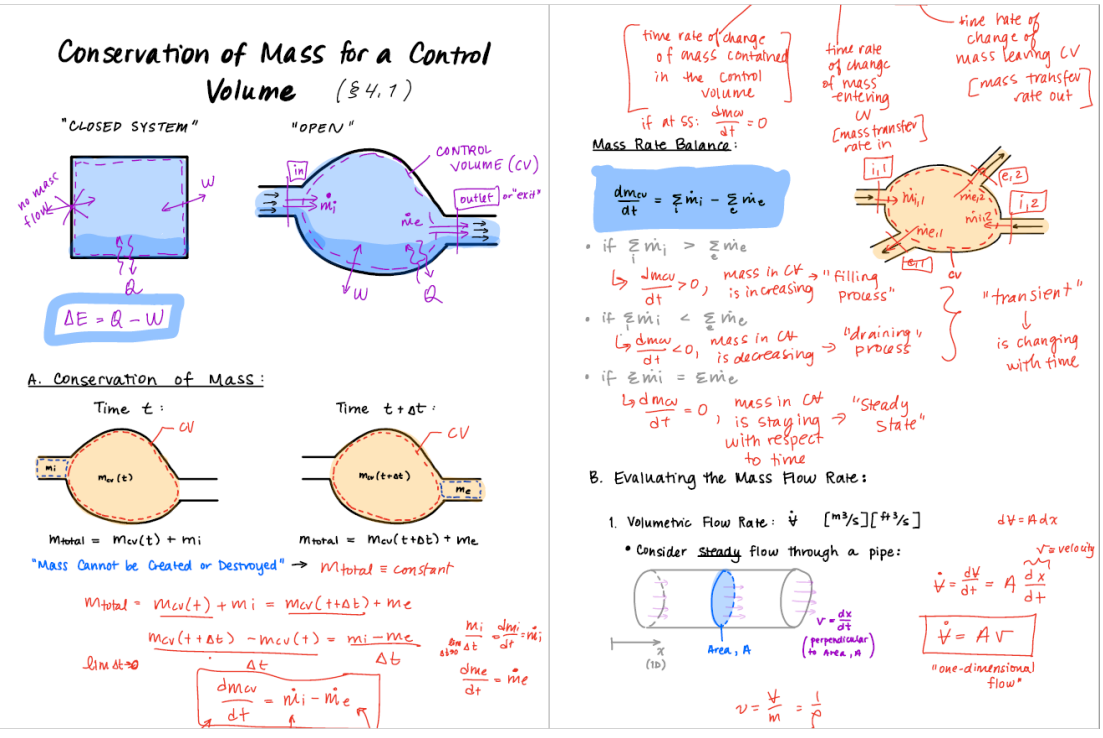

Fig. 1. Example of notes presented on iPad

As mentioned previously in this section, in the Summer 2021 offering of ENES232, traditional midterms were replaced with rigorous design projects. One of these projects was a project to design a bike pump, and to evaluate the pumping process through determining the number of pumps to fill the bike tire, the amount of work done to pump the tire, and the amount of heat transfer through the tires during this process. A snippet of the introduction to this project is shown in Figure 2. This project is a challenging, transient problem that students can relate to through their own experiences, and design according to their preferences (some students opt to design a small, compact pump, while others design a large, stand-up pump). This project allows me to test time-extensive concepts that I wouldn't be able to traditionally test in a timed, written exam as well.

ENES232 **Thermodynamics** **Summer 2021**

Project #1

1. Introduction to Project:

In this project you are tasked with designing a mechanical bike pump to pressurize your bike tires while considering (a) the size of the pump (2) the number of "pumps" you have to make in order to pressurize your bike tires, (3) the amount of work per pump, (4) the amount of energy lost by heat transfer during the pumping process, and (5) the total amount of work you have to put in to pressurize your bike tires. The type of bike pump you are designing is shown in Figure 1(a)-(b). As you can imagine, the size of the pump cylinder will have an effect on the number of pumps you will have to do in order to fill your tire (i.e. how many times do you raise/push the piston).

(a) (b) (c)

Figure 1. Piston-cylinder bike tire pump types; 26"x2.125" tube[1]

The tire of your bike takes a 26"x2.125" tube as shown in Figure 1(c), which has the specifications given below:

Fig. 2. Bike Pump Design Project - ENES232 Summer 2021

In the Fall 2021 semester, I decided to improve the final design project for ENES232 and develop a new project that challenges students to tackle an alternative energy solution. The previous design project had been designing a traditional fossil-fuel power generation plant that utilized a Rankine cycle; while this project was technically challenging, I hoped to have the students work on a modern project that required them to think about the positive societal impacts of innovative thermodynamic solutions. To redesign this project, I seeked input from Elisabeth Smela, Natasha Andrade, David Bigio, and Sami Ainane, who are currently working on a Lemelson Foundation Grant focused on *Engineering for One Planet (EOP)*

Framework Integration, and Eric Waschman of the Maryland Energy Innovation Institute. By receiving feedback from both the practical angle and the societal angle, I was able to roll out a new design project that asked students to not only design a 3.5 ton Residential Geothermal Heat Pump, but also investigate the economic, societal, and environmental impact of their design, which is shown in Figure 3.

ENES232 Thermodynamics: Geothermal Heat Pump Cycle Design

Project Overview:

A geothermal heat pump or 'ground source heat pump,' is a highly efficient renewable energy technology that is becoming popularized for both residential and commercial buildings. Geothermal heat pumps are used for space heating, and can also be used for water heating. Because the earth's temperature 5-10 feet below ground level remains at a relatively constant temperature throughout the year, the benefit of geothermal systems is that they concentrate naturally-existing heat, rather than by producing heat through the combustion of fossil fuels.[1]

Source: https://www.climatemaster.com/news/energy-bills/2018-07-11-geothermal-heating-and-cooling-for-your-home

You are tasked with designing a geothermal heat pump system for a residential home that requires 3.5 tons (12.3 kW) of heating capacity. As part of the design, the geothermal heat pump system will also provide energy to the house's hot water heater. You are asked to design a system that provides at least 12.3 kW of heating capacity to the forced air heating system of the home on an average winters day, when the temperature of the buried water/antifreeze lines of the geothermal loop can be assumed to be 12°C and the temperature of the outside air can be assumed to be 0°C. The intent is to keep the house's forced air at or above a temperature of 21°C. The hot-water heater should be able to heat water to a temperature of 40°C.

For an explanation of geothermal heat pumps, you can watch this video provided from the US DOE. For an example of what components are needed in a residential geothermal heat pump system, reference this example that shows a geothermal system used to heat both forced air and hot water. (Note: the operating conditions shown in this example *do not* meet the specifications of this project, so do not attempt to copy/paste the example directly for your design!)

When designing the residential heat pump cycle, you can make the following assumptions:

- The cycle is operating at steady-state conditions
- The compressor operates adiabatically with an isentropic compressor efficiency of $\eta_{s,c} = 80\%$
- The refrigerant enters the compressor as a saturated vapor ($x = 1$)

Fig. 3. Geothermal Heat Pump Design Project - ENES232 Fall 2021

Innovative Practices in the Classroom

A primary teaching philosophy of mine is to make class fun and excite students about the content that I am teaching them. This helps students shift their mindset from one of intimidation to one of excitement for learning something new. Some innovative practices used in the classroom to achieve this are:

- Using an iPad with colorful text and graphics to illustrate concepts
- Writing alongside the students using an Apple Pencil on my iPad so that they stay at my pacing
- Showing memes or pop-culture references at the beginning of class that are both comical and informative include the reasoning here as to why you do this
- Walking around the classroom while discussing course material in order to engage students in the conversation, rather than a traditional lecture style

- Showing up 5-10 minutes before class to play music and talk to students same as above
- Making an effort to talk to students about their life outside of school, and follow up with them about the stories that they share

Once I have excited students to come to class and attentively learn, another teaching philosophy is to focus on the fundamental concepts that drive engineering solutions, and to actively connect these concepts to one another. Some innovative ways that I have achieved this are:

- Giving a non-graded 'prerequisite' quiz at the beginning of the semester with concepts from classes they've already taken, to remind them that classes build on each other and their knowledge is constantly growing (not a one-and-done type of education)
- On homework and exams, asking conceptual questions that do not require any computation and drive at the fundamental behavior
- Developing a Canvas quiz bank of conceptual questions about thermodynamic behavior that students can use for preparation on exams
- Asking quick, ungraded clicker-style conceptual questions at the beginning of class using MentiMeter.com to help solidify concepts learned in the previous lecture (See Figure 4)
- Developing worksheets that do not require any calculation, but ask questions like "What happens to the pressure when a fluid passes through a turbine?" or "What is the goal of adding a pump to a power generation facility?"

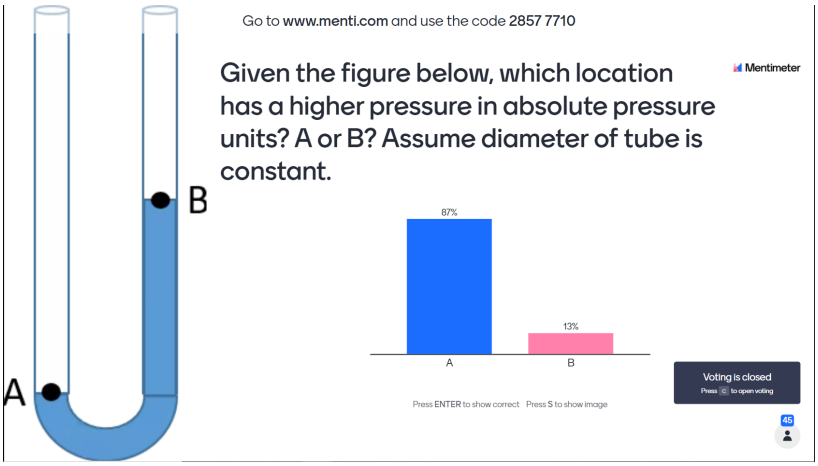

Fig. 4. Daily Conceptual Clicker Questions using MentiMeter.com

Once the fundamentals have been mastered by my students, I challenge them to connect these concepts to real-world applications, and to innovate solutions for complex societal problems. Some practices that I have utilized to achieve this include:

- Presenting an example of phase-change materials being used to keep premature babies warm
- Drawing from my industry experience to give a special-topics lecture where novel thermodynamic applications are used in the chemical and energy sectors (see this lecture here)
- Developing a new final project where students design a geothermal heat pump system for a residential home, considering social, financial, environmental, and engineering aspects of the design

Throughout the semester, students inevitably are met with challenges and failures, and a philosophy of mine is to instill confidence in them by first letting them fail, but then working with them to learn from their failures and develop a growth mindset. Ways that I've achieved this include:

- Allowing multiple attempts for assessments (ENES232 CFM)
- Personally coaching students about how to engage with the CFM regrade request process, letting them know that they have points waiting for them, and encouraging them to request these points
- Reaching out to students via email when they do not do well on an exam, letting them know that I am aware, asking them to find a time to consult with me on their learning techniques and come up with a plan for improvement
- Celebrating growth more than 'success' by sending personal emails to any student who has improved their scores from one midterm to the next, regardless of percentage score

Training and Supervision of Teaching Assistants

Since beginning in Fall 2018, I have trained and supervised 16 Graduate Teaching Assistants (GTA) and 19 undergraduate teaching fellows (UTF), and have supervised (but not trained) an additional one GTA and three UTFs (I did not train the GTA for ENES232 in Fall 2018, and have not directly trained the three UTFs for ENES100).

I have taken a particularly hands-on approach with training the GTAs and UTFs for ENES232 and ENFP405/621, since I am the course coordinator (ENES232) or sole instructor (ENFP405/621) for these courses. For ENES232, the training of the GTAs is intensive and very involved at the beginning of the semester, since I am responsible for training them on the grading system of the conceptual fluency methodology. This involves training them to be able to recognize between a conceptual error (like setting up a problem incorrectly) or a numeric error (like plugging something into a calculator incorrectly). Sometimes the distinction between these errors when grading can be very difficult, so I work hand-in-hand with the GTAs to ensure that their grading is consistent with one another, and most importantly consistent with the conceptual fluency methodology (CFM) overall. The overview of this training involves (1) explaining the CFM grading flow and partial credit rubric; (2) providing a training demonstration on how to set up assignments, scan and upload submissions, set up a grading rubric, and actually grade in Gradescope, which is utilized for grading in ENES232; (3) reviewing their grading on the first exam to ensure quality grading, and meeting with them weekly to discuss questions they may have about requests for partial credit on exams, which is a part of the grading flow for CFM exams; and (4) assisting them in their preparing of guided study sessions (GSS) for ENES232, including recommending particular technology like annotation tablets, reviewing and providing feedback on written solutions to their solutions, and encouraging them to develop new materials of their own.

Evidence of Additional Skills in Service

In addition to showcasing an exemplary teaching record, I hope to also highlight the service activities that I have been involved in since beginning as a Lecturer at Keystone. I care deeply about making an engineering education accessible to all, and believe that an integral part of achieving this is to inspire young people of all backgrounds to pursue engineering. As such, I have made it a priority to become involved with outreach activities run by the Women in Engineering program, mentorship of minority students in the Clark School, and serving on committees for Clark School departments and local high schools.

One of the first service activities that I became involved with was serving as the faculty member for the Women in Engineering Exploring Engineering summer program in Summer 2019. The Exploring Engineering summer program is a week-long stay-over program for high school women from all over the world. As the faculty advisor, my role was to design and implement a 3-hour nightly session that the women would use to work on a week-long engineering design project. I took it upon myself to also meet with the women throughout the day to teach them key skills like Arduino programming and basic circuitry. Additionally, the women had time to chat with me about questions they had about engineering, about my experiences working as a practicing engineer, and my experience as an engineering faculty member. The project that I ended up developing from scratch was "Designing a World without Cell Phones," where the students were challenged to first conduct interviews to determine what problems would exist if cell phones suddenly stopped working. They then brainstormed on solutions to these problems, and modeled their solutions using CAD. And lastly, they prototyped and iterated their solutions using the manufacturing methods available at Clark School facilities, and finally presented their products. I was extremely impressed with what the students were able to produce in just five days, including a wifi-enabled 'scheduler' that utilized a dual-servo system to coordinate a time and location to meet up with a friend. The students had a ton of fun, and were left extremely excited and curious about engineering design.

I continued my work with this program in Summer 2021, although we were forced to redesign the program to be online. For this transition, I took a much more hands-on role, redesigned the week to be more focused on each individual major at UMD, and designed mini-projects for the campers to complete at home that were relevant to each of the departments. For instance, the women designed a trussed tower (civil engineering) that held a wind turbine (mechanical engineering) that could be used to lift their phone when a hair-dryer was pointed at the turbine. I invited female peers of mine from industry to discuss their 'everyday life as an engineer' in a panel discussion where the students were able to ask questions about life as a woman engineer. And I gave the students an opportunity to summarize their interests and what they learned in the week by creating infographics and sharing with their fellow campers.

In addition to my service in the Women in Engineering summer programs, I served as a mentor for two students as they were preparing a research paper for induction to Salamander, the Fire Protection Engineering Program. I have served on the Curriculum Advisory Committee for the Fire Protection Engineering Department since 2018, and also served on the Strategic Planning Committee and LEAD Engineering Program Advisory Board for Elizabeth Seton High School, a local all-women high school in Bladensburg, MD.

UNIVERSITY OF MARYLAND

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January 21, 2022

Mr. Kevin Calabro
Director and Senior Lecturer
Keystone Program
University of Maryland, College Park
Via email

Re: Teaching observation of Ms. Catherine Hamel

Dear Kevin,

I had the opportunity to observe Ms. Catherine Hamel teach a class for the ENFP 405/621 shared course on September 26, 2019. The principal observation I had from that day is that Ms. Hamel is an excellent instructor. The lecture was well organized, her preparation level was very high, her delivery was highly professional and she welcomed interaction.

She began the lecture by relating the objectives for the day and reminded the students of how this topic related to topics covered in previous courses and how it related to topics to be discussed in future class meetings. She had a high level of familiarity with the topic and conveyed that sense of confidence to the students. She utilized the technology in the classroom (in Edward St. John Teaching and Learning Center) in a seamless fashion. She encouraged participation by the students by posing questions throughout the lecture. In some cases, she ended up answering the questions herself, and perhaps could've waited for an answer, but the flow of the class was smoother as a result of her style.

I routinely hear glowing reviews of Catherine teaching style from FPE students, whether associated with this course or ENES courses. As such, it's apparent that my observations are not atypical, but are in fact shared by a broad cross-section of the FPE community.

If you need any additional information about my observation from that day that I witnessed her teaching, please do not hesitate to contact me.

Sincerely,

James A. Milke, Ph.D., P.E.
Professor and Chair

E.

UNIVERSITY OF MARYLAND
Teaching and Learning Transformation Center
Classroom Observation Form

Respond to each statement candidly using the following scale:
A = *Accomplished/demonstrated* *A+ = indicates exemplary* **I** = *Improvement is needed* **N/A** = *Not -applicable, -available or -appropriate for the class subject*

1. Instructional Organization	**Circle One (+)**	**Comments**
Lesson was well-planned and organized	(A) I N/A	
Objectives for this lesson were made clear	(A) I N/A	
Appropriate sequence of activities	(A) I N/A	
Related today's lesson to course topic	(A) I N/A	
Lesson included check/reflection of learning goals	(A) I N/A	
Instructor's directions were clear and precise	(A) I N/A	

2. Teaching Skills and Delivery	**Circle One (+)**	
Maintained appropriate eye contact	(A) I N/A	made good use of open space in front of room.
Voice presentation was appropriate (e.g. tone, volume, rate of speech, clarity)	(A) I N/A	
Teacher's language was competent and appropriate	(A) I N/A	"flashover" – term used previously? Some student have not had FIRE D.
Had adequate wait time following questions	(A) I N/A	
Repeated student questions/answers for class to hear	(A) I N/A	
Limited distracting behaviors and mannerisms	(A) I N/A	
Varied explanations for complex or difficult material	(A) I N/A	
Active approach (e.g. collaborative, cooperative, problem-solving, task-based) was part of the pedagogy	(A) I N/A	
Relevant and meaningful examples were used to establish connections with students' prior learning	(A) I N/A	
Presented material at an appropriate level	(A) I N/A	

3. Interpersonal and Classroom Interaction	**Circle One (+)**	**Comments**
Respect for diverse opinions was communicated	A I (N/A)	
Receptive to/actively encouraged student participation	(A) I N/A	
Monitored student understanding	A I (N/A)	
Students appeared to be interested and engaged in what was happening in class	(A) I N/A	
Instructor responded to non-verbal clues	A I (N/A)	
Engaged different learning styles	(A) I N/A	
Instructor has good rapport and is approachable	A I (N/A)	
Encouraged all students to participate	(A) I N/A	

Respond to each statement candidly using the following scale:

A = *Accomplished/demonstrated skills,* ***A+ indicates exemplary*** **I = *Improvement is needed***

N/A = *Not applicable, available or appropriate for the class subject*

4. Promotion of Knowledge and Skill Transfer	Circle One (+)	Comments
Demonstrated knowledge of the subject	A I N/A	
Lesson objectives were met	A I N/A	
Demonstrated enthusiasm for teaching and learning	A I N/A	
Critical thinking and analysis were encouraged	A I N/A	
Made use of active learning techniques (group work, think-pair-share)	A I N/A	
Encouraged quality learning	A I N/A	

5. Use of Various Teaching Formats	Circle One (+)	Comments
Wrote key terms on board or visualizer	A I N/A	
Used presentation tools (PPT, Prezi, etc.) effectively	A I N/A	
Asked questions and had adequate wait time	A I ? N/A	– lots of questions posed, but ~~all~~ most rhetorical (see below)
Effectively incorporated and used technology (e.g. videos, computers, on-line activities, etc.)	A I N/A	
Used original materials effectively	A I N/A	
Provided useful and relevant handouts and materials	A I N/A	

6. Classroom Management	Circle One (+)	Comments
Managed student behaviors	A I N/A	
Good use of time management (e.g. adequate breaks/returned on time)	A I N/A	
Effective links and transition between activities	A I N/A	
Efficiently conducted activities within available time	A I N/A	
Instructor started class/ended class on time	A I N/A	
Overall, class time was used effectively	A I N/A	

Other Comments (Continue on next sheet if needed)

- Good use of technology to encourage note-taking.
- Intro to Fire D. concepts challenging (good thing).
- Pose questions for comment? — questions were posed but mostly were rhetorical. Could engage students more by having them answer.

Adapted from: (1) CTLE, University of Macau, http://www.umac.mo/ctle/resources/forms.html, (2) Hampton University (Hampton, Virginia, Office of the Provost), (3) The Classroom Observation Form (available on-line at): www.patrickosborne.com/.../Classroom%20Observation%20Form%20New%203-21-07.doc (4) The Classroom Observation Checklist www.unl.edu/gradstudies/current/dev/Class_Obs_Form.pdf,

Last Updated on 9/23/2019

16 SEPT 2019
Date of Observation

C. HAMLER ENTP 405/621
Instructor and Course

9:30
Start Time of Observation

10:30
End Time of Observation

EST
Location of Observation (BLDG)

Was this observation videoed _____Yes _X_ No

MILKE, PROF + CHR
Observer and Position

Signature of Observer

Signature of Instructor (optional)

Additional Comments:

Adapted from: (1) CTLE, University of Macau, http://www.umac.mo/ctle/resources/forms.html, (2) Hampton University (Hampton, Virginia, Office of the Provost), (3) The Classroom Observation Form (available on-line at): www.patrickosborne.com/.../*Classroom%20Observation%20Form%20New%203-21-07.doc* (4) The Classroom Observation Checklist *www.unl.edu/gradstudies/current/dev/Class_Obs_Form.pdf*,

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