Samuel Bechara - Curriculum Vitae

CV Section 1: Employment History / Awards

NAME
Samuel Bechara

ADDRESS
Department of Mechanical Engineering
Colorado State University
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Fort Collins, CO 80521

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EDUCATION

5/2012	Doctor of Philosophy (Ph.D.) School of Biomedical Engineering Colorado State University Fort Collins, Colorado
5/2008	Bachelor of Science (B.S.) Department of Bioengineering Washington State University Pullman, Washington

ACADEMIC POSTIONS

2017 – Present	Associate Professor of Practice Associate Department Head of Undergraduate Studies (2019-2022) Interim Director of Undergraduate Programs for the School of Biomedical Engineering (Oct 2023 – Present) Department of Mechanical Engineering School of Biomedical Engineering Colorado State University Fort Collins, Colorado
2015-2017	Assistant Chair and Lecturer Department of Biomedical Engineering Marquette University Milwaukee, Wisconsin
2013-2015	Science Faculty and Robotics Director Bellarmine Preparatory School Tacoma, Washington

2012-2013 Adjunct Professor
Department of Mathematics
Red Rocks Community College
Lakewood, Colorado

OTHER POSITIONS

2010-2012 Co-Founder and CEO
Hyperion Labs
Fort Collins, Colorado

2009-2013 Biomedical Engineering Specialist
Propel Labs
Fort Collins, Colorado

2008 Research and Development Biomedical Engineer
Beckman Coulter
Fort Collins, Colorado

2008 Flow Cytometry Research Scientist
University of Colorado Medical School
Denver, Colorado

CURRENT JOB DESCRIPTION

90% Teaching, 10% Service

HONORS AND AWARDS

2013 William Dahlgren Teaching Excellence Award
2014 Anthony Falcone Teaching Excellence Award
2016 Spirit of Marquette Award for work on DIY ECG After School Program
2019 Engineering College Council Smartest Professor Award
2019 ASEE RMS Best Presentation Award
2020 Voted Best Professor by CSU Engineering Undergraduates
2021 George T. Abell Award for Teaching and Mentoring
2022 Voted Best Dressed Professor by CSU Engineering Undergraduates
2023 Voted Funniest Professor by CSU Engineering Undergraduates

CV Section 2: Publications / Scholarly Record

PUBLISHED WORKS

Textbooks / Contributions:

1. **SL Bechara,** "Introduction to Mechanical Engineering" 2019 *Free Online Educational Resource E-Text* Accessible at http://intro2eng.com
2. **SL Bechara,** "Ethics and Thought-Provoking Discussions Prompts" Chapter in book "Teaching the Entrepreneurial Mindset to Engineers" 2017 *Springer* ISBN:976-3-319-61411-3

Journal Articles:

1. **S. Bechara**, A. Judson, K. Popat. 2010. Template Synthesized poly(epsilon-caprolactone) nanowire surfaces for neural tissue engineering applications. *Biomaterials*
2. **S. Bechara**, L. Wadman, K. Popat. 2011. Electroconductive polymeric nanowire templates facilitates in vitro C17.2 neural stem cell adhesion, proliferation, and differentiation. *Acta Biomaterialia*
3. N. Riedel, **S. Bechara**, K. Popat, J. Williams. 2012. Ion etching for sharp tip features on titanium and the response of cells to these surfaces. *Materials Letters*
4. N. Riedel, T. Cote, **S. Bechara**, K. Popat, J. Williams. 2012. Low energy helium ion texturization of titanium and relevance to biomedical applications. *Surface and Coatings Technology*
5. **S. Bechara**, K. Popat. 2013. Micro-patterned nanowire surfaces encourage directional neural progenitor cell adhesion and proliferation. *Biomedical Nanotechnology*
6. **S. Bechara**. 2019. Evidence that Adaptive Online Textbook Utilization May Lead to Higher Grade Performance. *American Society for Engineering Education.*

Papers Presented/Invited Lectures/Poser Presentations:

1. **S. Bechara**, J. Goldberg, M. Sotelo, S. Beardsley. October 2016. Utilizing Cell Phones, *Plasma, and Imaging Software to Introduce Surface Engineering to Freshman. Biomedical Engineering Society Annual Conference*
2. **S. Bechara**, D. Ricapor. October 2018. The Muscle Car: Creation and Implementation of an Open-Source STEM Summer Camp. *Biomedical Engineering Society Annual Conference*
3. **S. Bechara.** February 2019. Industry or Graduate School? An introspective analysis. *National Association of Engineering Student Councils Annual Conference*
4. **S. Bechara**. October 2019. A Free, Open Source, Student Calling Application Increases Student Attendance And Motivation *Biomedical Engineering Society Annual Conference*
5. **S. Bechara**, D. Baker. January 2022. Amplify learning by infusing courses with learning science *43rd Annual Colorado State University Professional Development Institute*
6. **S. Bechara,** C. Giles, I. Lorisch, October 2023 Utilizing a Prosthetic Design Project as an Extra-curricular Experiential Learning Activity. *Biomedical Engineering Society Annual Conference*

Editorial Work:

1. **Edited book (2021):** "Engineering Design, Planning, and Management" by Hugh Jack
2. **Edited book and created problems (2021):** "Applied Numerical Methods for Engineers with Python" by Steven Chapra

CV Section 3: Evidence of Teaching and Advising Effectiveness

TEACHING:

Courses Taught Outside CSU

Year	Semester	Course No./Title	Cr. Hrs.
2012	*Summer*	*MAT 121 / College Algebra*	*4*
2012	*Fall*	*MAT 121 / College Algebra*	*4*
2013	*Spring*	*MAT 121 / College Algebra*	*4*
2013	*Spring*	*MAT 202 / Calculus II*	*5*
2013	*Fall*	*AP Physics C (Calculus Based)*	*3*
2013	*Fall*	*College Prep Physics*	*3*
2014	*Spring*	*AP Physics C (Calculus Based)*	*3*
2014	*Spring*	*College Prep Physics*	*3*
2014	*Fall*	*AP Physics C (Calculus Based)*	*3*
2014	*Fall*	*College Prep Physics*	*3*
2015	*Spring*	*AP Physics C (Calculus Based)*	*3*
2015	*Spring*	*College Prep Physics*	*3*
2015	*Fall*	*BIEN 1100 / Introduction to Biomedical Engineering*	*4*
2015	*Fall*	*BIEN 4320 / Biomedical Engineering Instrumentation*	*3*
2016	*Spring*	*BIEN 1110 / Introduction to Biomedical Engineering II*	*4*
2016	*Fall*	*BIEN 1100 / Introduction to Biomedical Engineering*	*4*
2016	*Fall*	*BIEN 1120 / Computing for Biomedical Engineers*	*3*
2017	*Spring*	*BIEN 1110 / Introduction to Biomedical Engineering II*	*4*
2017	*Spring*	*BIEN 4290 / Biomedical Engineering Design Laboratory II*	*4*

Courses Taught at CSU

Year	Semester	Course No./Title	Cr. Hrs.	Enrollment
2017	*Fall*	*MECH 105 / Problem Solving*	*3*	*51*
2017	*Fall*	*MECH 486A / Mechanical Engineering Senior Design I*	*3*	*174*
2018	*Spring*	*MECH 103 / Introduction to Mechanical Engineering*	*3*	*29*
2018	*Spring*	*MECH 105 / Problem Solving*	*3*	*172*
2018	*Spring*	*MECH 486B / Mechanical Engineering Senior Design II*	*3*	*173*
2018	*Fall*	*MECH 103 / Introduction to Mechanical Engineering*	*3*	*255*
2018	*Fall*	*MECH 105 / Problem Solving*	*3*	*30*
2018	*Fall*	*BIOM 441 / Biomechanics, Biomaterials, and Biofluids*	*3*	*45*
2019	*Spring*	*MECH 105 / Problem Solving*	*3*	*175*
2019	*Spring*	*BIOM 300 / Problem Based Learning Biomedical Engineering Laboratory*	*3*	*78*
2019	*Fall*	*MECH 103 / Introduction to Mechanical Engineering*	*3*	*143*
2019	*Fall*	*MECH 105 / Problem Solving*	*3*	*53*
2020	*Spring*	*MECH 105 / Problem Solving*	*3*	*104*
2020	*Spring*	*BIOM 300 / Problem Based Learning Biomedical Engineering Laboratory*	*3*	*73*
2020	*Fall*	*MECH 103 / Introduction to Mechanical Engineering (Two Sections)*	*6*	*126*
2021	*Spring*	*BIOM 300 / Problem Based Learning Biomedical Engineering Laboratory*	*3*	*60*

2021	*Spring*	*MECH 105 / Problem Solving*	*3*	*76*
2021	*Fall*	*MECH 103 / Introduction to Mechanical Engineering (Two Sections)*	*6*	*140*
2021	*Fall*	*MECH 105 / Problem Solving*	*3*	*37*
2022	*Spring*	*MECH 105 / Problem Solving*	*3*	*68*
2022	*Summer*	*MECH 182* Berlin Bridge Study Abroad*	*3*	*18*
2022	*Fall*	*MECH 103 / Introduction to Mechanical Engineering (Three Sections)*	*9*	*192*
2023	*Spring*	*MECH 103 / Introduction to Mechanical Engineering*	*3*	*52*
		MECH 105 / Problem Solving	*3*	*65*
2023	*Fall*	*MECH 103 / Introduction to Mechanical Engineering (Two Sections)*	*6*	*131*
		MECH 202 / Engineering Design I	*3*	*87*
		ENGR 180A2 / First Year Seminar	*1*	*30*
		ENGR 496 / Group Study CASE Prosthetic Project	*1*	*4*

Course Syllabi, Assignments, and Other Materials:

- MECH 202 Fall 2023 Course Syllabus (**Appendix I**)
  The updated syllabus for Engineering Design II (MECH 202) for Fall 2023, crafted by Dr. Samuel Bechara, emphasizes a holistic and student-centric approach to learning and grading. It outlines a clear grading philosophy, prioritizing understanding the students' learning journey and success over mere numerical assessment. The syllabus underscores Dr. Bechara's commitment to open communication, consistency, fairness, and the use of feedback as a learning tool, fostering a growth mindset. The course, blending in-person and online components, covers the engineering design process with a focus on teamwork, ideation, project planning, and ethical responsibilities in design. It includes comprehensive guidelines on course administration, office hours, inclusion policies, course materials, and use of AI tools like ChatGPT. With a no-late work policy mirroring industrial standards and a detailed academic honesty section, the syllabus reflects Dr. Bechara's dedication to preparing students for professional success. A special emphasis is placed on accommodating diverse learning needs, underscoring the inclusive and supportive educational environment fostered in his classroom.

- MECH 105 Discussion Post (**Appendix II**)
  Dr. Samuel Bechara introduces an engaging assignment in MECH 105, focusing on the critical concept of correlation versus causation in data analytics. Students are tasked with analyzing absurd correlations, such as the link between fishing boat accidents and marriage rates in Kentucky, to understand why correlation does not imply causation. This discussion post requires students to creatively justify a causation for a chosen spurious correlation, despite its obvious inaccuracy, fostering critical thinking and ethical considerations in data interpretation. The assignment culminates in a peer-to-peer discussion, where students critique, build upon, or offer alternative explanations for these correlations, promoting civil discourse and collaborative learning. This innovative approach highlights Dr. Bechara's dedication to integrating ethics and critical analysis into the engineering curriculum.

- MECH 103 Ethics Discussion Post (**Appendix III**)
  Ethics is hard, and most engineering programs do students a disservice by not

challenging students to think about the ethical implications of engineering. Dr. Bechara has created a series of ethics discussion prompts to get the students to think about the consequences of engineering and their ethical obligation as engineering professionals. The example included is representative of the set in that it is entertaining and engaging for students but not lacking in substance or the ability to help the students be more introspective.

- MECH 103 - ChatGPT and AI Lecture Notes (**Appendix IV**)
  The updated lecture notes for MECH 103 on ChatGPT and AI, as seen in Appendix IV, effectively showcase Dr. Bechara's engaging and structured teaching style. The notes are well-organized, beginning with a relevant real-world example to capture students' interest, and are annotated with key takeaways for clarity and emphasis on important concepts. Prepared questions within the notes demonstrate a proactive approach to student engagement and understanding. These notes exemplify Dr. Bechara's skill in incorporating current topics like AI into the curriculum, enhancing both the relevance and the depth of the learning experience.

Peer Evaluations of Teaching

- BIOM 300 evaluation by Dr. John Petro, Professor of Practice (**Appendix V**)
  Dr. John Petro agreed to evaluate Dr. Bechara's teaching as part of Dr. Bechara's professional development. Dr. Petro's evaluation highlights Dr. Bechara's ability to prompt the students with thoughtful, open-ended questions and commented on Dr. Bechara's general abilities as a classroom leader (poise, energy, tempo, etc).

- MECH 105 evaluation by Dr. Susan James, Professor (**Appendix VI**)
  Dr. Susan James agreed to evaluate Dr. Bechara's teaching as an assigned mentor. Dr. James highlights Dr. Bechara's strengths in classroom management and active learning. Furthermore, although Dr. James does have constructive criticism she mentions that Dr. Bechara is actively working to address some of the problems Dr. James noticed. This highlights Dr. Bechara's ability to continually improve.

Student Course Surveys

The course surveys for Dr. Samuel Bechara's classes consistently highlight his exceptional teaching prowess. The unabridged evaluations included in the appendices represent just a snapshot of student feedback, demonstrate his dynamic teaching style, dedication to student success, and ability to create an inclusive and supportive learning atmosphere. Students repeatedly laud the engaging, challenging, yet rewarding nature of his courses. For a more comprehensive understanding of Dr. Bechara's impact in the classroom, additional unabridged evaluations are available for review upon request.

- MECH 202 Fall 2023 Course Evaluations (**Appendix VII**)
  In Fall 2023, Dr. Samuel Bechara's MECH 202 course received high acclaim for its engaging and dynamic teaching style, marked by his enthusiasm and dedication to student success. The highlight, the Battle Boat competition, was celebrated for its creative and challenging nature, effectively enhancing students' engineering skills and fostering a fun learning environment. Dr. Bechara's commitment to fostering a supportive and inclusive class atmosphere was consistently noted. Overall, the course was regarded as transformative and memorable, with Dr. Bechara's passion and student-centered approach significantly enhancing the learning experience.

- MECH 103 Spring 2023 Course Evaluations (**Appendix VIII**)
  The course evaluations for MECH 103 in Spring 2023 reflect Dr. Bechara's profound impact as an instructor. Students overwhelmingly appreciated the engaging and insightful lectures, highlighting Dr. Bechara's ability to make complex topics accessible and enjoyable. They commended the inclusive and supportive learning environment, emphasizing his genuine care for student success and well-being. The course's challenging yet rewarding nature was noted, with many students expressing that it significantly influenced their perspective on engineering and learning. These evaluations underscore Dr. Bechara's exceptional teaching skills and his positive influence on students' academic journeys.

- BIOM 300 Spring 2021 Course Evaluations (**Appendix IX**)
  The BIOM 300 course evaluations from Spring 2021 exhibit Dr. Samuel Bechara's effective and engaging teaching style. Students praised the course's challenging projects and appreciated Dr. Bechara's clear expectations and supportive approach. His dedication to creating an inclusive and interactive learning environment was evident, with students noting significant growth in their scientific research and engineering skills. This feedback underscores Dr. Bechara's ability to foster a positive and impactful educational experience, even in an online setting.

Development of New Courses

- BIEN 1120 – Fall 2016
  This was a new course taught at Marquette University that introduced freshman students to foundational concepts in computing and enabled them to use computers to solve problems. The course emphasized both MATLAB and C programming languages and concentrated on thinking algorithmically and how to use computers to solve complex engineering problems.

- MECH 105 – Fall 2017
  This course previously existed at CSU when I joined however it was very inadequately defined and managed. The course was redesigned to include an adaptive textbook which quizzes the students as they are reading. Furthermore, the course was redesigned with an emphasis in active classroom learning and was “flipped” to provide students time in class to work on assignments.

- BIOM 441 – Fall 2018
  This course also previously existed at CSU but due to a professor leaving for another institution, Dr. Bechara was given no material and had to redesign the course from scratch. The course is titled “Biomechanics, Biomaterials, and Biofluids” and was designed as a survey course to get students to understand and generate interest in the three fields covered. Dr. Bechara also implemented a final project paper and presentation to give students practice writing and presenting in a scientific format.

- MECH 103 – Fall 2019
  This course was redesigned to include more active learning and use a new textbook. Furthermore, a series of labs were developed that include Arduino microcontrollers. These new labs, designed by Dr. Bechara, are intended to replace the previous way of

teaching MATLAB and include more hands on and physical programming concepts.

- MATLAB Catch-up Course (0 credit) – Fall 2021
  This course was created to help transfer students and currently has no credit attached to it. The course targets transfer students who have taken courses similar to MECH 103 / MECH 105 but learned a programming language other than MATLAB. The course is designed to help transfer students be successful in MECH, without having to retake introductory courses.

- ENGR 180A2 – Fall 2023
  As a part of the First Year Engineering Education Task Force, Dr. Bechara participated in the development of a new course, ENGR 180A2. With help from Dr. Bechara, the course was designed to help improve the retention of engineering students from their first to second years of study.

- MECH 202 – Fall 2023
  While the course that Dr. Bechara was taught had previously existed at CSU, the effort undertaken in the Fall of 2023 transformed the class. The course was redesigned to be more engaging, fun, and impactful for the students. A CSU source article outlines some of the efforts and can be found here: https://engr.source.colostate.edu/mech-202-students-in-nautical-knockdown-make-their-professor-proud/

Development of New Teaching Techniques

- WSCOE – MATH Student Success Initiative (**Appendix X**)
  Dr. Samuel Bechara led the creation of two innovative math courses, MATH 160: Calculus I and MATH 161: Calculus II, addressing the critical challenge of math as a major hurdle in engineering education. These courses integrate engineering-relevant examples and weekly numerical methods labs to underscore the significance of math in scientific applications. Preliminary results, as of January 2024, indicate a significant decrease in DFW rates, enhanced overall class performance, and improved GPAs. Additionally, students have shown higher grades in related courses like Physics. This initiative not only improved academic outcomes but also positively influenced students' perception of math's role in engineering. Plans are underway to further refine these courses and extend their impact on student success in the engineering curriculum. ***Appendix X*** *includes a summary of program performance and an example laboratory.*

- Random Student CLI
  Although CSU has access to iClickers, there are many problems associated with this type of assessment (students can have friends bring iClicker, etc). To counter these issues and to increase student engagement with learning, Dr. Bechara has developed a MATLAB program to call on students randomly in class. For example, Dr. Bechara will ask students to perform active learning and work on a problem in class. He walks around the room and tries to do assessments with the students on the fly, however in large classes it is difficult to get to every student to ensure they are working. The program calls on a random student, tracks their performance, and makes notes about date and time they are called on. This information is then used as the participation portion of students grades.

Written Comments from Students

- Letter of Support from Carissa Vos (**Appendix XI**)
  A sophomore CSU undergraduate student agreed to write a letter of support for Dr. Bechara. Her comments (shown in full in Appendix XIV) highlight Dr. Bechara's emphasis on an inclusive learning environment, ability to handle a large classroom, and the individual attention and support he gives to his students.

- Letter of Support from Kelsey Bilsback (**Appendix XII**)
  Dr. Bilsback was a former Graduate Teaching Fellow whom Dr. Bechara mentored. She writes that Dr. Bechara is an exceptional instructor, a dedicated mentor, and she highlights his passion for classroom engagement. Finally, Dr. Bilsback includes an anecdote about a particular student that Dr. Bechara mentored and helped improve his communication skills.

- Selected Comments from Student Evaluations (**Appendix XIII**)
  The selected comments from Dr. Bechara's MECH 202 and MECH 103 courses in Fall 2023 reflect his profound impact as an educator. Students expressed deep appreciation for his engaging teaching style, impactful mentorship, and the dynamic learning environment he creates. His influence extends beyond the classroom, inspiring students in their academic and personal growth. These testimonials are a testament to Dr. Bechara's exceptional teaching and mentorship. For a more comprehensive view of student feedback, additional evaluations are available upon request, showcasing the widespread positive impact Dr. Bechara has on his students.

Participation in Professional Development Activities Related to Teaching

- Marquette University Community of Practice (2016-2017)
  While an instructor at Marquette University, Dr. Bechara joined a Community of Practice (CoP). The CoP met monthly, consisted of both junior and senior faculty, and discussed best teaching practices. Workshops were conducted by senior faculty that were designed to help enhance the ability for junior faculty to design compelling lectures and assessments.

- TILT Teaching Squares (2017)
  At CSU, Dr. Bechara was part of a pilot program called "Teaching Squares" implemented by The Institute for Teaching and Learning (TILT). The teaching squares program paired participants up into groups of four. The four faculty members agreed to be observed at least once by the other members of the group and be evaluated by them. The faculty also agree to observe the other three faculty in the group once and evaluate their teaching. The program helps professors share best practices and improve their teaching.

- CSU Faculty Collaboration Group (2017-Present)
  The CSU faculty collaboration group is another program run by TILT designed to create an environment where professors can discuss best practices, specifically towards the use of adaptive online textbooks. Dr. Bechara joined this group after adopting an adaptive textbook for MECH 103 and MECH 105 and has participated in monthly meetings to enhance delivery of the aforementioned courses.

- Walter Scott College of Engineering Master Teacher Initiative Workshops (2017-Present)
  When possible, Dr. Bechara attends all the Walter Scott College of Engineering (WSCOE) Master Teaching Initiative (MTI) workshops. These workshops vary and cover topics such as how to create engaging lectures to how to gauge your teaching effectiveness.

- 2019 TILT Summer Conference Attendee (Summer 2019)
  In addition to academic year activities, Dr. Bechara has shown his dedication to teaching by attending voluntary summer programs as well. An example being the 2019 TILT Summer Conference. The 2019 conference emphasized the new CSU teaching effectiveness framework and how best to implement it as a faculty member at CSU.

- Master Teacher Initiative Coordinator for the College of Engineering (2019-Present)
  As the co-coordinator of the College of Engineering Master Teacher Initiative, Dr. Bechara collaborates with co-coordinator Dan Baker to enhance teaching quality of the college. They organize bi-semester seminars to disseminate teaching best practices, recently covering the use of generative AI in teaching and research. Additionally, they contribute to faculty development by circulating weekly teaching tips. This role underscores Dr. Bechara's commitment to fostering educational excellence and innovative teaching methods within the engineering community.

Professional Consultation Related to Teaching

- McGraw-Hill Chapra Numerical Methods Book (2018-Present)
  For his superior instruction using the book, Dr. Bechara was selected to edit the Numerical Methods for Engineers book published by Mc-Graw Hill and written by Dr. Chapra. Currently, Dr. Bechara is helping enhance the online textbook offering by; creating new learning objectives that are linked to Bloom's taxonomy, writing questions that are asked to students as they read the book, and editing the text as necessary to enhance clarity.

- Numerical Methods Teaching Webinars (2019)
  In addition to editing the textbook, McGraw-Hill has also contracted with Dr. Bechara to lead a series of webinars on best practices when teaching Numerical Methods courses to large numbers of students. These webinars are intended to help junior faculty enhance their teaching effectiveness by utilizing the McGraw-Hill learning tools to their fullest potential.

ADVISING:

Undergraduate Honors Thesis Advising

Honors thesis advisors mentor undergraduate students in Honors programs. The mentoring includes meetings, advice, and grading thesis papers and presentations. Dr. Bechara has served as the Undergraduate Honors Thesis Advisor for the following students:

- Jason Ruetten (2016-2017)
- Annemarie Kibbie (2017-2018)
- Tessa Brockwell (2017-2018)
- Joanna Dunne (2018-2019)

- Amy Keisling (2020-2021)
- Abril Ocampo (2021-2022)
- Melanie Blake (2021-2022)

Senior Design Team Advising
Senior design team advising usually entails meeting with teams on a weekly basis, dispensing advice, helping set goals, and evaluating progress and performance of the teams. Dr. Bechara has served as an advisor for the following senior design teams (total 42 students) :

- Hydration Monitor (2015-2016)
- Patient Specific 3D Printed Scaffolds for Bone Tissue Repairs (2016-2017)
- Robocup Competition Team (2017-2018)
- Hi-altitude Chamber-Poultry (2017-2018)
- Terraforma Biobox (2017-2018)
- Boeing Basalt Based Composite (2017-2018)
- Otterbox Slip Cover (2017-2018)
- Medtronic Mechanical System to aid Sphincter Compression (2017-2018)
- Terraforma Biobox v2.0 (2018-2019)
- Wheelchair Monitoring System (2020-2021)
- H20 Go – Pool Capable Wheelchair (2020-2021)
- H20 Go V2 – Pool Capable Wheelchair (2021-2022)
- Prosthetic Limb Project (2022-2023)
- Prosthetic Limb Project V2 (2023-2024)

Graduate Teaching Fellow Mentoring
The WSCOE has created the GTF program to give graduate students the opportunity to engage with teaching. As a mentor, Dr. Bechara has mentored the following graduate students to help them design and give lectures, design, and grade assessments, and to improve their teaching practices:

- Nate Overton (2016-2017)
- Kelsey Bilsback (2016-2017)
- Aryeh Drager (2017-2018)
- Tijun Wang (2018-2019)
- Joshua Christopher (2019-2020)
- Alexander Preston (2020-2021)
- Siddhesh Bhoite (2020-2021)
- Akash Shah (2021-2022)

Independent Study
The Mechanical Engineering department offers independent study credits to students working on problems that can be applied as technical credit to their education. Independent study students require a faculty mentor. Dr. Bechara has helped mentor the following students:

- Carissa Vos (Spring 2022)
  The objective of this independent study is to design, construct, and program an automation cell to increase manufacturing process throughput. The system will be designed in Solidworks, manufactured, and programmed with Epson RC+ PLC software.
- Sherry Parker (Fall 2023)
  The objective of this independent study was to design a MATLAB library that could

program a multiplex LCD display. Parker created the MATLAB library and was able to control the display with software. The goal was to create a MECH 103 lab from this project but it was decided to be too time consuming.

CV Section 4: Evidence of Leadership, Outreach, and Service

COMMITTEES

- Mechanical Engineering Advisory Board Committee
  Department Level Committee (2017-2020)
- Information Science and Technology Center Committee
  University Level Committee (2018-2019)
- Biomedical Engineering Undergraduate Curriculum Committee
  Department Level Committee (2016-2018)
- Biomedical Engineering Advisory Board Committee
  Department Level Committee (2016-2018)
- Contract, Continuing, and Adjunct Faculty (CCAF) Task Force
  University Level Task Force (2020-2021)
- President's Commission on Diversity and Inclusion
  University Level Committee (2021-Present)
- Mechanical Engineering Diversity and Inclusion Committee
  Department Level Committee (2020-2022)
- Student Success Working Group
  University Level Committee (2021-Present)
  Student Technology Sub-Group Chair (2022)
- Disaggregated Identity Data Working Group
  University Level Committee (2020-2022)
- Engineering Education Initiative
  College Level Committee (2022-Present)
- Mechanical Engineering Awards Committee (2019-Present)

PROFESSIONAL AFFILIATIONS AND ACTIVITIES

Membership in Professional Societies

- American Society for Engineering Education (member)
- Biomedical Engineering Society (member)

Manuscript Refereeing

- Biomedical Engineering Society – Undergraduate Research Division
- Biomedical Engineering Society – Engineering Education Division

ENGAGEMENT

DIY Electrocardiogram (EKG) After-School Project (2016)
The DIY EKG project was a program setup with collaboration with the Milwaukee Academy of Science High School. This particular high school is predominately African American and students are typically economically disadvantaged. Dr. Bechara designed and created this program in which students built, programmed, and designed working electrocardiograms from an Arduino microcontroller. The program was run 4 separate times with different students ranging in grade from 9th to 12th.

Bioengineering Bootcamp (2017)
This was a weeklong summer camp intended for students (from 8th to 10th grade) interested in

learning about engineering principles and how they apply to human physiology in a fun, hands-on environment. Students learned by creating a medical device. Specifically, students made an electrocardiogram (ECG). Throughout the week, students learned about human physiology, how to program a touchscreen raspberry pi computer, and how to read and interpret the electrical activity of the heart. By design, the course was moderately rigorous but emphasizes fun and learning at the same time. At the completion of the course, students got to keep all their materials and were instructed on other Raspberry Pi projects that they could try on their own.

CSU Mechanical Engineering Summer Camps (2018)
This was a 4 summer camp series including summer camps such as Bioengineering Bootcamp, MATLAB Bridge Camp, GALS Camp, and the Muscle Car camp. Dr. Bechara designed, planned, and administered all the camps and personally ran the Bioengineering Bootcamp and Muscle Car camps. The camps were designed to get middle and high school students engaged and interested in science, engineering, and programming. The eventual goal is to create a sustainable and repeatable summer camp series that brings in at-risk and underrepresented students to CSU.

Berlin H.S. Bridge Program (2021)
The Berlin H.S. Bridge Program was developed by Dr. Bechara and co-led with Toni-Lee Viney (ME Undergraduate Program Director). The bridge program is designed to give under-represented minorities in engineering an opportunity to participate in a faculty-led study abroad program in Berlin. The program was designed to help build a sense of community among disadvantaged students and to help them connected to the University. The program was delayed until 2022 due to COVID restrictions.

PROGRAM DEVELOPMENT

Marquette University and Medical College of Wisconsin Joint-Department (2017)
Dr. Bechara provided support and leadership on the creation of the joint-department of Biomedical Engineering between Marquette University and the Medical College of Wisconsin. During the process Dr. Bechara was instrumental in merging the two tenure systems (the medical college system was significantly different), gathering and implementing feedback from faculty in both departments, and developing a new department code.

Engineering-Math Strategic Courageous Transformation Initiative (2022)
With help from colleagues in Math and Engineering, Dr. Bechara wrote a proposal to overhaul the mathematics instruction at Colorado State University to improve student retention and make math instruction more equitable. Currently, the largest hurdle to being retained in engineering is mathematics (almost 15% fail part of the calculus sequence). An investigation showed significant deficiencies in how math instruction is delivered to engineering students. Currently, Dr. Bechara is leading the team that is working on redeveloping the math sequence for engineering students to focus more on numerical techniques and real-world examples.
See Appendix X for more information.

Appendix I

MECH 202 Fall 2023 Course Syllabus

Engineering Design II
MECH 202 - Fall 2023

Course Contract (This Syllabus)

It is your responsibility to read this syllabus in its entirety. The syllabus has a lot of details about the course and my expectations for your learning and participation. **There will be no exceptions to the policies detailed in this syllabus.** I will not entertain any pleas for exceptions to the policies outlined in this syllabus.

Grading Philosophy and Your Success

I want to take a moment to address an essential aspect of this course: grading. At first glance of this syllabus, you may notice that many of the grades in this course will be assigned based on instructor discretion. I understand that this might raise some concerns, so I want to provide some context and assurance.

- Holistic Approach: My goal is not merely to assign numbers to your work but to understand your learning journey. Grading is not just about the final product but also about the process, effort, and improvement.
- Your Success is My Priority: Please remember that I am in this profession, and particularly in this classroom because I deeply care about your growth and success. I am not looking for reasons to reduce points but for opportunities to recognize your hard work and understanding.
- Open Dialogue: I encourage open communication. If you ever feel unsure or concerned about a grade or feedback, please come to me. I welcome discussions that can provide further clarity and understanding for both of us.
- Consistency and Fairness: While grading might seem subjective, I strive for consistency and fairness. I constantly reflect on my decisions and often seek peer reviews from my colleagues to ensure I'm upholding the highest standards.
- Feedback is a Tool: Grades are one form of feedback, but not the only form. Engage with feedback as a tool for learning, not just as a measure of performance. I will provide comments, suggestions, and insights to guide you toward excellence.

- Growth Mindset: We're all here to learn, myself included. I hope we can all adopt a growth mindset. Mistakes are not failures but opportunities to learn and grow. I'm here to support you in that journey, every step of the way.

In conclusion, trust in the process and in our shared commitment to your education. Let's work together to make this course an enlightening and rewarding experience for all.

Course Administration

Instructor: Dr. Samuel Bechara

For whatever reason students started calling me Dr.B a few years ago and it stuck. So you can just say Dr.B if you don't want to call me Dr. Bechara (or don't know how to pronounce it). Just don't call me "Sam" or "Bro".

Email: samuel.bechara@colostate.edu

- Please **do not message me through Canvas!** If you need to get a hold of me, please email me.

My Office: Engineering A105

Course Delivery: In person with some online components (Canvas). In-person participation is strongly encouraged.

Course Details:

Meeting Location	Times
Scott 101	TuTh 14:00–14:50

Note: Online students, if you are local to the area and you would like to attend class, please contact me via email.

Graduate Teaching Assistants (GTA):

The graduate teaching fellows are graduate students that are receiving specific training to be instructors. They are an excellent option to meet with as they have the skills necessary to help you succeed. They should be one of your first options when you need

help.

- Aniruddha Savargaonkar, aniruddha.savargaonkar@colostate.edu
- Abbie Maben, abbie.maben@colostate.edu

Office Hours

Office hours are a fantastic opportunity for you to get help and reinforce concepts you are taught in lectures. Please understand that office hours are not to be a replacement for lectures. If you show up to office hours and ask us to help you get information from a lecture that you missed we will turn you away. Instead, think of office hours as a place to go when you are stuck on a problem. The key here is that being stuck implies that you tried something! If you show up to office hours with something already done, it gives us a place to start.

Note: As of the writing of this syllabus, we have not located times or locations for all the TA's / LA's office hours yet. I will post the locations of the office hours on the Canvas homepage as soon as we get that sorted! Bechara's office hours are held in his office. Duh.

A Note on Inclusion

Everyone is welcome in my classroom. I understand that each of you has an individual history that is unique. I just want to let you know I am here for you *whoever* you are. If you ever feel like you are being discriminated against for any reason at CSU, I want you to know that you can always reach out to me and I will do everything in my power to make it right. That includes but is not limited to the following:

- I say something that makes you feel uncomfortable. I assure you it is never my intent, but I will not retaliate if you feel that you need to correct something I say in class as long as you are respectful and understanding.
- Your fellow classmates are making you feel uncomfortable because of race, gender, or any other reason that you feel is inappropriate. Even if you just overhear something, I need to know.
- You feel hostility in any environment related (or even not related) to the course.
- Someone at CSU has harassed you for any reason and you need someone to talk to.

Please know that you are not alone. Even if I can't relate to your situation exactly, I can empathize. My goal is that *everyone* feels safe, welcomed, and ready to learn.

Course Description

This course is designed to emphasize the engineering design process (EDP) with an emphasis on teamwork, ideation, decision-making, and project planning applied to a group design project.

This course is an introduction to the engineering design process and is part of the mechanical engineering design curriculum. It will prepare you for Engineering Design III (MECH 301) and the Senior Design Practicum (MECH 486) by allowing you to practice necessary engineering skills, such as working in teams, problem-solving, designing, and manufacturing. Course topics include:
• The planning process, organizing design teams, and product discovery
• Development of engineering specifications
• Concept generation and evaluation in the age of AI
• Understanding mechanical design features
• Product design, generation, and evaluation (e.g., variation effects, cost, production, assembly, performance)

Course Objectives

Upon successful completion of this course, students should be able to:

1. Apply engineering design methods to effectively solve open-ended design problems.
2. Manage multiple long-term projects using established planning, time management, and evaluation methods.
3. Manage project team dynamics with team health assessments and effective communication to establish expectations,
   tasks, and goals.
4. Develop customer requirements, performance specifications, and competitive benchmarking to specify a design.
5. Understand that ethical and professional responsibilities, patents, and reverse engineering guide design.
6. Evaluate design alternatives, performance, tradeoffs, and risk.
7. Design, fabricate, and build parts and assemblies using CAD and manufacturing skills.
8. Compose effective oral and visual technical communications.

Course Materials

Required Textbook: Introduction to Engineering Design by Ann Saterbak and Matthew Wettergreen. The textbook is free and readily accessible via: https://link.springer.com/book/10.1007/978–3–031–02093–3

Canvas

Canvas is going to be the main hub for the course.

I am going to contact the class using Canvas announcements exclusively. I will periodically send out announcements using Canvas and it is *your responsibility* to check for announcements. I recommend allowing Canvas to send you notifications.

You will also complete and submit all of your assignments and deliverables through Canvas. It is a good idea to spend a few minutes to learn how to use this learning management system. It is fairly intuitive and easy. The canvas grade book will be the *unofficial* grade book for the course.

Finally, **DO NOT MESSAGE ME THROUGH CANVAS MESSAGING SYSTEM** I do not have time to check the Canvas messages. If you need to get a hold of me, please use email.

Recommended Software

SolidWorks is available for use on the campus computers in the designated laboratory spaces. Students may access SolidWorks 24/7 from several campus computer labs: https://www.engr.colostate.edu/ets/lab-and-classroom-overview/.

SolidWorks may also be accessed remotely via the Virtual Classroom. Go to https://www.engr.colostate.edu/ets/virtual-classroom/ to set up your personal computer with Virtual Classroom.

Finally, if you would like to purchase a student edition of SolidWorks for your personal computer, go to: https://www.solidworks.com/sw/education/buy-student-edition-software.htm. Purchasing a license is NOT required for this class.

Recommended 3D Printing

For 3D printing, the Idea2Product laboratory (located in the basement of the Engineering building, room B–7) is available to all students for about $20 per semester + material cost. Students who choose to use the I2P 3D printing lab must first complete a mandatory training session. Although utilizing the I2P lab is not required, it is highly recommended that students go through the training ASAP to ensure lab access when needed. See https://idea2product.net/ for more information.

Students may also access 3D printing at the Morgan Library. The printers are located across from the Morgan Library Event Hall and may be used on a first come, first serve basis. See https://lib.colostate.edu/technology/printing-copying/3d-printing/ for more information.

Grading

Grading will be assigned according to a fixed grade scale and use the +/- grade system per the CSU catalog. You will be given the grade that you **earn** based on the scale below.

Percentage	Grade
Competition Winners	A+
100–94	A
93–90	A-
89–87	B+
86–84	B
83–80	B-
79–75	C+
74–70	C
69–66	D
<66	F

Assignments will be weighted as follows (for more information, see the corresponding section below):

Category	Percentage
Reverse Engineering Project	25%
Design Competition Project	50%
Log Checks	5%
Peer Evaluations	10%
Final Exam	10%

Details about each of the grade categories follow:

Reverse Engineering Project

Each student will be given a product to disassemble and analyze the mechanics of the system. The project will culminate in a clear and complete reverse engineering technical report of the system, including the selection and analysis of an improvement concept. Your grade will be based on the completeness and correctness of the report. More details will be provided to students in class.

Design Competition

Each group will be given clearly defined tasks to achieve using an autonomous or controlled device of their own design and will participate in a tournament-style class competition. Your grade will be based on the completeness and quality of the group device, a report, and peer evaluations. Additionally, winning teams will receive prizes related to grading. See the competition description document for more details.

Log Checks

Please note that both the reverse engineering and design competition projects will require significant time investment outside of class. Students will be required to keep a project work log of their individual contributions listing hours and a description of the work performed. Consistently low working hours indicate a lack of commitment and will result in a lower individual final course grade at the instructor's discretion.

Peer Evaluations

In general, the team members of a team will receive the same grade on all assignments. However, as a requirement for the class, each student will submit weekly peer evaluations of their teammates. Students will consistently poor student evaluations will receive a lower overall grade than their teammates or may even fail the course at the instructor's discretion.

You will receive full points in the peer evaluation section if you meet the following:

- The overwhelming majority of the peer evaluations of the student in question are positive.
- The student submitted all of their required peer evaluations.

If a student does not meet the above bullet points, their peer evaluation grade will be reduced at the instructor's discretion.

Final Exam

As this is a design course, traditional engineering exams are not applicable. Instead, in lieu of a written exam, each student will be required to give an oral exam to the instructor in a one-on-one format. The oral examination can cover any topic that was included in the book, any topic that the instructor covered in the lecture, or maybe about clarifications on the written report. I'll be honest, I am worried that a lot of you are going to use ChatGPT to write your final reports. As such, consider the final exam to be your opportunity to prove that you have written and understand your final report. The exam will most likely be graded as Pass (100%) or Fail (0%) with intermediate grades assigned at the instructor's discretion.

As the final exam due date approaches, the instructor will post more specific details about what students can expect during the final examination. In general, if you made a good effort on your final report and the project, attended class, and engaged with the course, you are going to be fine.

Course Policies

Attendance

In this project-based course, consistent attendance is pivotal not just for individual success, but also for the collective progress of the team. While attendance for lectures isn't mandatory, missing sessions can lead to gaps in understanding critical course content. Consequently, this may influence your teammates to rate you lower in peer evaluations (and frankly, it should). It's in your best interest, and in the interest of your team, to actively participate and attend class regularly. The instructor and TAs will not repeat information that was relayed in class for students that missed lecture.

Late Work Policy

This course is designed to mirror the fast-paced and high-stakes world of industrial research and development. As such, to prepare students for the professional workplace, no late work will be accepted for any reason. Please note that technical issues are not an excuse for late work, so plan on turning things in early just to be safe. The only exception to this rule will be if a student can provide documentation of an emergency or medical issue. Even then, late work will be awarded at the instructor's discretion only.

Grade Dispute Policy

Before disputing an assignment or exam grade, students must review the syllabus in its entirety. If, after reviewing these policies, you believe there is a grading error, you may dispute the grade by attending the grader's office hours within 2 week of receiving your grade. Grade disputes submitted after 2 weeks will not be considered for regrading. The entire assignment will be regraded, not just the points in contention. Re-grading after your final letter grade has been assigned will only be allowed in extreme circumstances. Mistakes in the grade book entries should be rectified as soon as possible to avoid any change in grade issues. You will need a copy of all your graded assignments for verification. Keep all your graded work until you confirm your final letter grade! Graded material not picked up by the start of the following term will be discarded.

Extra Credit

No extra credit will be awarded under any circumstance. Please don't ask, I hate saying no.

Academic Dishonesty and Class Conduct

It is your responsibility to make sure you are familiar with the CSU Academic Dishonesty Policy. You can find it by clicking here. I take cheating in any form *very seriously* and will punish offenders.

Any breach of the academic integrity policy will result in an automatic F grade for the course. Exceptions to this policy are at the discretion of the instructor.

Artificial Intelligence

In this course, we will explore the utilization of artificial intelligence tools, including platforms like ChatGPT, to aid in ideation and writing processes. While these tools can be valuable for enhancing your understanding and workflow, they should not replace your own efforts or insights. Relying solely on AI to produce or complete your assignments will be deemed a breach of our academic integrity policy. Ensure that you comprehend and can justify every line in the documents you submit, as you remain accountable for all content presented.

Special Needs

CSU Strives for an inclusive learning environment. If you anticipate or experience any barriers related to the format or requirements of this course please contact Resources for Disabled Students.

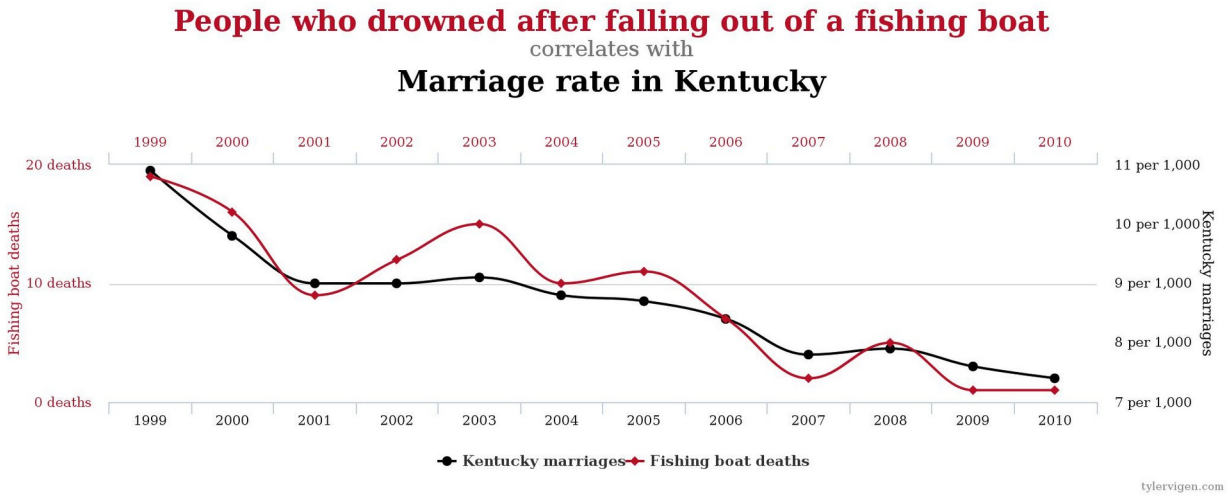
Appendix II

MECH 105 Discussion Post

A set of online discussion post prompts were developed to encourage students in computing classes to think of the field of computing as an engineer in a more holistic way. Students were given one week to "have a discussion" that was graded and proctored by myself and teaching assistants. A set of 8 discussion prompts were created. Only one is presented here.

EXAMPLE) Discussion I – Correlation Does Not Imply Causation

Look at the following chart…



There is a very strong correlation between people who drowned after falling out of a fishing boat and the marriage rate in Kentucky. And if we are forced after the fact, we might even be able to come up with a reason that one causes the other. Maybe with less marriages, less women are pushing their husbands out of boats?

Ok, that is ridiculous, but what this is getting at is that correlation does not imply causation. This is a danger in data analytics, as we get better and better at analyzing data, we are going to find several correlations that are not this ridiculous but are equally as dubious.

Your job is to find an instance or correlation does not imply causation. Try to justify the causation in one paragraph (even though you know it is wrong).

You can use the following website. It has several of these ridiculous correlations: http://www.tylervigen.com/spurious-correlations

Respond to at least one classmate, and either help build up their theory, offer an alternative to explain the causation, or offer an explanation as to how they cannot be related. Remember to be civil, the idea is to start a discussion.

Appendix III

MECH 103 Ethics Discussion Post

This post is not anonymous. The professor and participants can see the responses and the author.

Most people recognize the name Nobel and associate it with the Nobel Prize. The Nobel Prizes are arguably the most prestigious and famous scientific, literary, and social achievement awards in human history. What most people do not realize is that it was named after Alfred Nobel, a Swedish engineer credited with inventing dynamite. Nobel had an interesting opportunity to read his own obituary (it was published on accident) which was scathing and condemned him for profiting off of the sale of weapons. Realizing that his legacy was one of death and destruction, Alfred bequeathed his fortune to create the Nobel Prizes.

In the future you may have the opportunity to design and create something that will be used in a way you didn't intend. Let's pretend that you create a software algorithm that eliminates the jobs of 100,000 people. Your company is pleased and you get a raise! After all, you have increased profits by a huge margin.

For this weeks online discussion post, write your own obituary. What do you think it will say? Will the world look kindly on the innovator that gave them the algorithm that increased productivity and profits? Will it lament the loss of jobs and curse you as a job killer? Read some NY Times obituaries (*insert link here*) to get a feel for how they are written before you write your own.

Respond to at least one other person's obituary. Do you agree or disagree with the author's assessment of our pro/antagonist? Remember to be civil and have a discussion.

Appendix IV

MECH 103 - ChatGPT and AI Lecture Notes

? Start w/ question "How do you envision AI will change engineering in your lifetime?"

OVERVIEW OF CHATGPT (Google Bard, Bing chat, etc)

→ a language model designed to understand and generate human-like text

→ it is relevant to engineering because:

- ▫ Help research and design. Provides info, generates hypothesis, suggests design parameters
- ▫ Coding development. Can debug, optimize, accelerate development
- ▫ Data analysis and interpretation
- ▫ Report writing and documentation

? "What do you see as the ethical issues that might arise when considering ChatGPT in an engineering context?"

→ Data privacy

→ reliance on training data

→ bias in AI models

→ Responsibility for accuracy

DEMO ☆ Lets see how it works: "What are suitable materials for building a lightweight, but strong bridge, and what are their key properties?" ☆

RESPONSIBLE AI USE ?☆ Ask students what they think this means ☆

→ AI is a tool to ASSIST NOT REPLACE human judgement and expertise

→ Critical thinking is CRUCIAL when considering AI generated text. You must <u>ALWAYS</u> verify the information provided to you by AI

→ Use AI as a starting point and helper, not the final answer

→ Disclose the use of AI in academic and project work

REAL WORLD SCENARIOS

Responsible	Irresponsible
A team uses AI to analyze various building materials and designs to optimize energy efficiency	Under time crunch, team uses AI to quickly generate a product design. They skip rigorous testing.
The team critically evaluates suggestions, verifies data, and uses AI as only one of the research tools they use.	AI design are used w/out testing or validation, bypassing standard engineering protocols.

CUSTOM INSTRUCTIONS

< See chatgpt_customInstructions.md file >

MATLAB EXAMPLES TO SHOW STUDENTS

"find the minimum of the function $f(x) = x^2 + 3x + 4$"

< calculate_velocity.m > Show how chatGPT can debug

" Write a function to generate the first 'n' numbers of the Fibonacci sequence"

Appendix V

BIOM 300 evaluation by
Dr. John Petro, Professor of Practice

Colorado State University

John Petro, Ph.D., AWS CWI
Professor of Practice
Mechanical Engineering Department
1374 Campus Delivery
Fort Collins, CO 80523
John.Petro@colostate.edu

March 7, 2019

Peer Classroom Teaching Evaluation

Samuel Bechara

BIOM-300 Topic: Experimental Research Questions

Scott, room 101, 8AM

Observations:

- Sam was talking and interacting with students before the class began.
- Class started on time.
- Majority of students in attendance and engaged (not on phones).
- Energetic and good tempo, good control of class.
- Sam showed a real passion for the subject, Experimental Research.
- Students were asking questions, good class participation for 8AM.
- Used a MATLAB script that he developed to randomly call on students – good.
- Student's questions were answered clearly and to their understanding.
- Board work was clear, large enough, and readable.
- Speaking – clear and loud enough.
- Posed thoughtful, open ended research questions to the class.
- Sam walked around the room, speaking with, engaging, and helping the student groups.

Overall Impression:

- Sam had a well thought out and organized lecture. Efficient use of the class period.
- Outstanding job for the first time teaching this class.
- Sam is a natural teacher and his prior years of experience showed this.

Sincerely;

John Petro, Ph.D., AWS CWI

Professor of Practice

Department of Mechanical Engineering

Colorado State University

Appendix VI

MECH 105 evaluation by Dr. Susan James, Professor

Colorado State University

Department of Mechanical ENGINEERING

Susan P. James, Ph.D.
Professor and Head
Department of Mechanical Engineering
1374 Campus Delivery
Fort Collins, CO 80523
(970) 491-0924
Susan.James@colostate.edu

March 29, 2019

Peer Classroom Teaching Evaluation
MECH 105: Mechanical Engineering Problem Solving, enrollment = 176
Prof. Sam Bechara

Dr. Bechara is a very engaging instructor who works hard to build a good rapport with all his students and to create an inclusive classroom. The following are my overwhelmingly positive observations of Dr. Bechara's teaching, as well as few suggestions for improvement.

Using the random number generator to randomly call on students is very effective.

Sam introduced each concept with the context of why it was important – incentivizing the students to want to learn what often appear to be esoteric techniques. He explained each concept clearly and effectively and used hand and pens on the document camera to work out example problems. This was very effective and I could see students all around me engaged, taking notes and asking good questions. However, after class Sam and I discussed perhaps using fewer pen colors as it was a bit distracting.

His pace was very good for the level of information he was trying to convey.

Before moving into active learning at the end of the lecture, Sam made sure to revisit the take-home messages of that lecture, reminding them of their original goal and wrapping the lecture up nicely with a big picture perspective,

He used active learning (without learning assistants!) quite effectively in the last portion of the class. While I did recommend he use learning assistants in the future (and he is), I was amazed at how well this worked with just him cruising around the classroom answering questions and providing help to the small groups as they worked on the problems. My observation is that this was due to the fact that he had established a classroom climate where everyone felt included and confident and ready to meet or exceed his expectations. Furthermore, the students had clearly figured out that working on the problems at the end of lecture was very helpful to them – if not, they would have left class early and only one student did that.

Not only were the students asking great questions, but one even caught a minor mistake Sam had made in the problem he was working out on the document camera – just what you want as an instructor!

There were a couple of times that a student in this large lecture hall with over 175 students asked Prof. Bechara a question and he responded, but other students in the course didn't actually hear the original question, resulting in lack of context for Sam's answer. Sam seemed to quickly pick up on this and began repeating each question before answering it.

There were a few times Sam used the term "guys" to refer to the entire class, and afterwards we talked about how that might be alienating to some students who don't identify as male. "Folks" or other gender-neutral terms.

Also, during lecture and the active learning portion of class, there were a few times that Sam assumed the first-year students knew too much or told them to "figure it out on their own". With first year students in particular this is a delicate balance of stimulating and challenging them without making them feel like they've been thrown in deep water before learning to swim. This is particularly true of shyer students or minoritized students who might not speak of in class and ask for clarification or help. I happened to meet three of the students (2 male and 1female) from the lecture in the bookstore immediately after class. All three confirmed they found

Appendix VII

MECH 202 Fall 2023 Course Evaluations

Colorado State University

Fall 2023, Mechanical Engineering 69020 MECH202-Lecture Section 1
Instructor: Bechara, Sam (Primary)

There were: 87 possible respondents.

	Question Text	N	Agree	Not Agree	IDK			
1	Abide by the CSU Principles of Community	57	98% (56)	2% (1)	0% (0)			
			None	1-20%	21-40%	41-60%	61-80%	81-100 %
2	Time allocated to discussion	58	3% (2)	29% (17)	31% (18)	14% (8)	12% (7)	10% (6)
3	Time allocated to online	58	31% (18)	43% (25)	17% (10)	3% (2)	3% (2)	2% (1)
4	Time allocated to projects	58	0% (0)	0% (0)	5% (3)	7% (4)	29% (17)	59% (34)
5	Time allocated to homework	58	10% (6)	62% (36)	16% (9)	5% (3)	5% (3)	2% (1)
6	Time allocated to activities/labs	58	47% (27)	21% (12)	12% (7)	3% (2)	7% (4)	10% (6)
7	Time allocated to lectures	58	0% (0)	28% (16)	31% (18)	28% (16)	7% (4)	7% (4)
			Impact	No Impact				
8	Lectures	57	96% (55)	4% (2)				
9	Discussions	57	93% (53)	7% (4)				
10	Assignments	57	84% (48)	16% (9)				
11	Activities	57	93% (53)	7% (4)				
12	Labs	57	49% (28)	51% (29)				
13	Instructor	57	100% (57)	0% (0)				
14	Classmates	57	100% (57)	0% (0)				
			Not Stated	Low	Reason-able	High	V High	
15	Classmates/peer expectations for student to contribute	57	0% (0)	2% (1)	65% (37)	28% (16)	5% (3)	
			Not Enough	Reason-able	Chall-enging	Over-whelming		
17	Course workload	57	0% (0)	35% (20)	65% (37)	0% (0)		
			Strength	Not Strength				
19	Inclusive environment	56	96% (54)	4% (2)				
20	Clarity of expectations and grading	56	88% (49)	13% (7)				
21	Timing of Feedback	56	86% (48)	14% (8)				
22	Challenge of the course	56	98% (55)	2% (1)				
23	Accessibility and usefulness of materials	56	93% (52)	7% (4)				
24	Instructor Communication	56	98% (55)	2% (1)				
25	Support from Instructor	56	100% (56)	0% (0)				
			Enhance	Do not Enhance				
26	Inclusive environment	56	5% (3)	95% (53)				
27	Clarity of expectations and grading	56	25% (14)	75% (42)				
28	Timing of Feedback	56	16% (9)	84% (47)				

29	Challenge of the course	56	9% (5)	91% (51)				
30	Accessibility and usefulness of materials	56	14% (8)	86% (48)				
31	Instructor Communication	56	5% (3)	95% (53)				
32	Support from Instructor	56	0% (0)	100% (56)				
			No	**Yes**				
34	Student wishes to sign name to comments	55	67% (37)	33% (18)				
			Not Stated	**Low**	**Reason-able**	**High**	**V High**	
36	Instructor's expectations	57	2% (1)	0% (0)	56% (32)	40% (23)	2% (1)	
			None	**Incon-sistent**	**Not Enough**	**Enough**	**Too Much**	
38	Instructor feedback	55	0% (0)	5% (3)	9% (5)	85% (47)	0% (0)	
			Too Late	**Timely**	**Incon-sistent**			
40	Instructor feedback timely	55	2% (1)	91% (50)	7% (4)			

Instructor	Text Responses
	Question: Describe your classmates/peers expectations for you to contribute. Please include specifics. TEF domains - Student Motivation
	Same as Lab
	We were expected to contribute in class when needed but also to help our teammates work on the projects for the class so everyone is participating and putting in effort.
	We all expected each other to pull their own weight, and everyone did.
	The whole class is group-project based, so it is imperative that each student is contributing their fair share to the projects outcome.
	my teammates expected me to do what I said I would, which made sure I was held accountable and did what I was supposed to. Even though the project was a competition other teams also wanted us to do our best.
	Participate in the project. Be a group! It is completely reasonable to expectations the groups had for each individual.
	Since this class was team based everyone was expected to contribute.
	The expectations are high, but that is becuase the expectations of the class are higher. My group worked well together, becuase we fufilled each others expectations as well as having high expectations for each other
	As it was group based project everyone was responsible
	I think that my classmates really helped to push me through the class. The expectations of my peers boats really pushed me throughout the semester and kept me going.
	I was expected to show up to every group meeting and participate with my full attention. I was also expected to attend the lectures every day that I was able to.
	Being that the call was mostly project-based, there was an expectation we all held each other to to get the project done.
	My classmates expect me to participate and contribute to the project
	Up to group selection process.
	This class was heavily project based, so of course my peers expectations were high. I think this is a more dependent course on classmates than most, but it is nice to have this diversity of coursework and hands-on experience.
	As the work in this class was mostly done in groups, my classmates expected me to help and participate in the work.
	To contribute to the group project, and work as a team.

	you have to contribute or you will fail
	In our team we were expected to allocate time to help out with the project
	Come for team
	My team honestly did a really good job of working together. We held each other accountable. Initially I was worried about working on a team and them not pulling their weight. There were some issues with me doing more work then my partners but for the most part it was good. Part of this came from dr. B assuring us that our grades would be based on our effort, not silly assignments.
	I had one project group that expected me do the semester-long project mostly by myself and I felt most of the work of the project ended up falling on me
	Working on a group project, it was expected to be part and contributed to the major project of the boat compition.
	The project based course required full participation from all its students as well as after-hours time dedicated to the project.
	A majority of the class was group projects, had to contribute.
	My classmates depended on me (specifically my group) to contribute to our group project and contribute a reasonable amount.
	As this class had us working on a group project for most of the year, we had to make sure we met the expectations of our other group members.
	Kinda did everything.
	The design process for the entire competition in the boat design process required us to meet with our classmate group in order to get the main idea done for building a competition-ready boat. The main contribution I was set out to have was to provide ideas for the boat design, help construct the hull of the boat, construct the firing mechanism of the boat, and all rudder and steering for the boat. Mainly it was to work with the group and make a functional barbie battle boat.
	This is a very group based, collaborative class. Therefore, the expectations for your group mates were high to complete the necessary tasks.
	except one, none of my group mates asked me directly to contribute to anything.
	Question: Describe the workload. Please give specific examples. TEF domains - Student Motivation, Feedback and Assessment
	Same as Lab
	reasonable so long as you delegate tasks and time properly
	The workload may seem like a lot because of the projects and working with a group but we were given enough time to make a project that was functional for the competition.
	The trick to this course is its as challenging as you make it.
	Shorter mid-term project and also a big semester-long project
	we werent incredibly ambitious with our boat so we were able to do everything we needed to and still had time to check everything we did to make sure it worked.
	Reverse Engineering project was difficult to do at the same time of ship project.
	It was very exciting to actually do engineering. We needed to solve a problem, work in a group, and learn new things. It was all trial and error. Bechara was very helpful in responding to emails and questions and making the class successful for each student.
	We worked on programming and building a boat all semester.
	Lots of work is meant to go into this class, but its not so much that it is unreasonable.
	A lot of work but a lot of fun
	I think that the workload really boiled down to individuals. If you wanted to work a lot and hard on the class you did but if you wanted a shittier product then you could have done that as well.

	The workload was entirely designing and building the boat. That included brainstorming, initial designs, testing, and design altercation/adjustment.
	The workload was dependent on ones self, I spent more time than I ever have consistently on a class to get this project done nearing the last couple months of the semester.
	It is a lot of work, but it is worth it in the end when you can be proud of the final product of your project.
	This project was a lot but also very rewarding. I would love if there was a lot more instruction with how to code the transmitters.
	Fairly difficult on project but doable.
	The hype of this battle boat competition made the stakes great. This also meant that everyone was held to a higher standard than years prior. I think this was a really challenging, but also fun and rewarding class. It is easily ranked in the top tier of all the classes I have taken at CSU so far. I think Dr. B did a great job motivating students to want to do well, and he showed that he was just as invested in this project as all of us were, which I think is rare to find in the college of engineering. I never mind large workload as long as the benefit is large as well.
	Mostly made up of two projects. The boat project is the coolest project that I have ever done. If I could I would do this course again without having to take any other courses and have a 100 % of my effort and mental being focused on this project.
	making a boat for a design challenge. Reverse engineering a bilge pump
	The only reason I say challenging was because of the programming component of the project, some of us havent had much ece experience or a lot of coding.
	you have to build a boat and make electronics for it. it was a fairly difficult task
	Outside of class work needed to be done to advance the project
	Work load is not bad if you had a good team
	Because this project was so hands on, it was definitely a lot. I spent wayyyyyy more time on this course then I have spent on any other course in the past and part of that was becasue it was competition based. Part of it was also becasue the project was definitely challenging for me, working with flotation and water as a first design project was maybe a little too hard. But also challenge is part of engineering, so in a way it was good about preparing me for the real world.
	This class definitely had a lot of work to do but I feel that if it was better spread out over the semester and I didnt have to do other groupmates work it would be mostly doable.
	As designing and building is a lot to do, the workload with a group was do able.
	Fully design a boat over the course of the semester.
	A majority of the class was group projects.
	While the actual day-to-day assignments werent too demanding, the overall assignment for this class was quite stressful. There were tons of different aspects that needed to be covered but I feel like that was to be expected from this.
	Would have been easier with more support from classmates, definitely learned a lot.
	The work was meant to be spread out across the semester with iterative design, it wasnt too bad.
	Workload was mainly out of class on designing and working on the boat during class days and on the weekends at times. It definitly got overwhelming near the competition day on Dec 2nd with having near sleepless nights of work for everything. Otherwise, lectures were do-able and fine on time.
	It was a lot. This class brought me a lot of stress throughout this semester (a lot of things bring me stress). However, at the end of the competition I felt very rewarded. My work had paid off.
	The workload for this class, although at times felt like a lot, was reasonable and doable especially with the context of the learning outcomes that were gained by this class.
	I think the workload is reasonable if all group members put in equal effort, otherwise trying to pick up the slack made it difficult.

	Question: If you have any other comments about the learning environment or course, please provide them here
	N/A
	Instructor made it very clear that he was here to help us, it felt very easy to bring up issues and felt like proper discussions
	We had a very good and inclusive environment that was enjoyable to be apart of. Had a friendly but competitive competition.
	I think it would be good for the course as a whole to occasionally split the 4 person groups by their role in the project (programming/CAD/electronics/whatever the four types we were separated by day one) and have them discuss their breakthroughs and roadblocks. I think it would foster a greater sense of community and sportsmanship, while encouraging those stuck or in need of help.
	This was one of the best classes that I have had at CSU, Dr B was very helpful and seemed as excited as we were about the work that we did.
	I had an amazing time in this class, it is one of the most reasonable on class expectations and workload while also being probably my most fun class. Everyone wanted to participate in my group and give their all to such an awesome project.
	N/A
	Very fun and worth the time
	N/A
	The course could be a little more structured in terms of progression of the final project (i.e. steps of prototypes, weapons, motors, etc). It would also be nice to learn specific skills to the engineering for application, such as electronic wiring.
	The only I put could improve for clarity of expectations and grading was because the project criteria were changed around significantly during the semester. This was simply due to the fact the it was the professors first year teaching the course and first time designing the project.
	The only thing that was a little challenging was how the rules would change throughout the semester. With this being said, I do felt it taught us as engineers that we need to be able to adapt. I think sometimes its easier to have something predictable, but it is more rewarding to have something you have to adapt to. I will also say that all rule changes felt in the best interest of the students, which should always be the goal for any professor. I never once felt that decisions were being made without thinking of putting the students first.
	The learning environment is exciting, fun, motivating, and engaging. Dr. B is the heart and soul of this course. He comes in everyday radiating enthusiasm and wants nothing more than to work together with his students to create an exceptional experience.
	none
	good
	Dr Bechara did an amazing job with this course. It was stressful because it was competitive, but not becasue he intentionally made it so. The text book was easy to access, but honestly really really dull. Dr. Bechara definitely could have just lectured in class instead of having us read the book. PLEASE LET DR. B TEACH THIS COURSE AS LONG AS HE WANTS, IT WAS AN AMAZING EXPERIENCE AND I HOPE HE KEEPS GOING WITH IT.
	Just wish I had a better group
	With the new curriculum for this class I feel like that a little more teaching on certain aspect of the class such as 3d printing, coding and how certain component may help.
	N/A
	Canvas didnt seem the most organized at times.
	collaborative and welcoming.
	I feel like the bilge pump was more of a hinderance to the class than a help, it made it so that we couldnt work on our boat as much and that sort of didnt allow our group to work on the boat for a few days.
	N/A

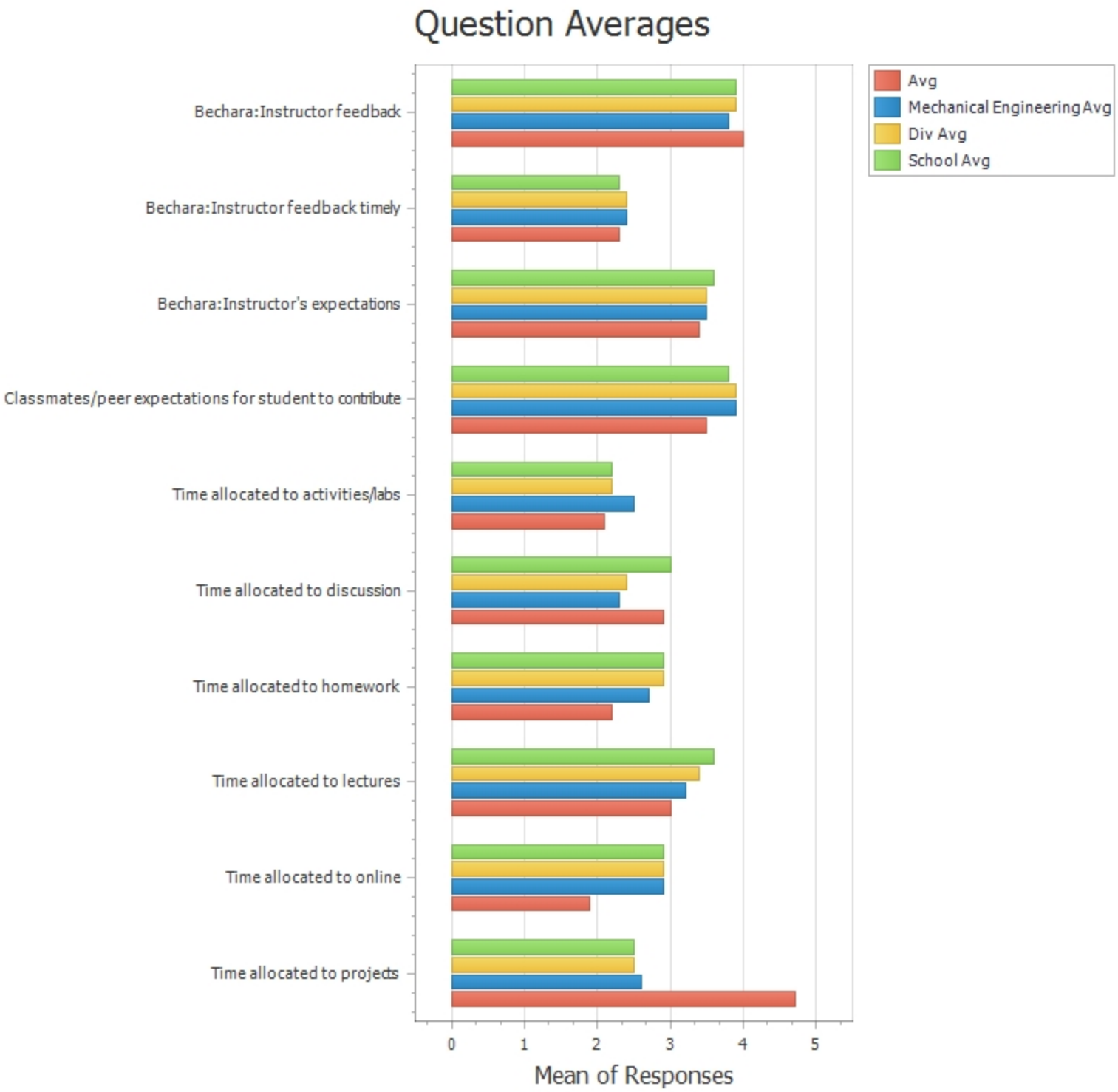
	Give Dr. Bechara a high five
	I loved how the learning environment of this class was fun. to me personally it made it better for a better learning environment because I was more engage because I wanted to learn the material. I already have a side project plan for my winter break to use the things that I learned in this course.
	I think forming groups should be delayed by a week and some time should have been spent with people honestly reflecting about what their strengths are or otherwise have people take a survey before grouping people based on their rated strengths. Also better consideration of the budget based on the project challenge. Most of my stress from this course was due to the fact that we couldnt have backups without significantly compromising performance.
	I loved this class even though I didnt do as good as I liked
	This course is a masterclass in engineering design. From top to bottom it was the full experience. I can not speak highly enough of the curriculum that was taught this semester. 10/10. Of all the classes I have taken thus far, this one has had the closest resemblance to industry.
	Question: How could the timing of the feedback be improved? What might that look like? Please be specific in your comments. TEF Domains - Feedback and Assessment
	N/A
	feedback was always timely and detailed
	Only thing would just be getting the feedback from the design logs back sooner so we know how to improve on it for next time. But overall, everything was handed back in a good amount of time.
	Get more TASs
	The feedback of this course was excellent as far as being able to reach out and get feedback on our boat, however the feedback and grading of the design journals felt lackluster. I would have liked to have recieved faster and more feedback on those.
	You all killed it on grading and responding to any emails or comments.
	N/A
	the timing of feedback was good, and couldnt improve much
	The grading of the weekly design logs were not descriptive in how we lost points. Same with the peer evaluations.
	i think feedback from Dr Bechara and the tas was reasonable
	The timing was actually a strength of this course. The prototype meetings forced us as groups to meet a deadline and also hear what the TAs thought about our ideas. Dr. Bs open door policy and office hours also allowed us to get immediate feedback on out ideas for the design competition.
	Sooner and more clear about the problems where we went wrong.
	There were some online discussion boards that could improve in reaction time, this goes for instruction guidelines as well.
	It would be helpful to respond to emails within 24 hours or 36 hours
	I think that the timing of the feedback was pretty good. I didnt go to office hours that much for help but if I did then the timing wouldve been even better
	N/A
	Feedback was well timed
	Feedback was always timely and on time so there were no ways I could say to improve it. Overall really well done in my stance.
	-
	I feel like it is less about the timing and more about the frequency. Having more progress meetings and such throughout the year will help us and the teams stay on course.
	N/A
	none

	Question: Describe the instructors expectations. Please include specifics. TEF Domains - Curriculum/Curricular Alignment
Bechara	N/A
Bechara	Expected to show up to class and complete the work given to us before it is due. Also expected to create a boat for the competition.
Bechara	he expected us to put in effort and more importantly, have fun
Bechara	Dr B expected me to make a bitchin boat
Bechara	I think the instructors expectations were high but never too high, he knew what we were capable of and wanted us to go to that level
Bechara	You are expected to learn something. Do the work and pay attention to the class and youll be fine. But you are meant to succeed in this class and I think thats a great thing. Bechara provides support for each student to succeed and meet his expectations.
Bechara	Dr. B wanted everyone to do well so he wanted to make sure everyone was engaged and working throughout the semester.
Bechara	Dr. Bechara has incredibly high expectations for us due to his passion for the class itself and the beleif that he has in our abilities to achieve these expectations. This is NOT a bad thing whatsoever. I personally really took to this level of expectation, and it pushed me to be a better student for a class that was genuinly fun.
Bechara	I think that the expectations were well regarding that it was his first time running the class. I like the change up from previous years and made the class wayyyyy more fun for all the students.
Bechara	Bechara expected every student to participate with their group and follow the guidelines provided for designing and building the project. He expects effort as a minimum.
Bechara	He wanted us to come to the competition with the boats that worked. He did amazing at changing how the course worked. There are lots of kinks that he has already been talking about fixing which is great.
Bechara	Dr. B pushed everyone out of their comfort zone and made us work really hard. He held us to a very high, but achievable standard. He also expected us to ask for help when we needed it. He was very hands on and made every student got what they needed to be successful.
Bechara	He expected us to participate, and learn from what he presented us in class, and to come to his competition with a completed boat.
Bechara	Dr. B expects his students to put in effort, ask questions and participate in class discussion. He wants the same level of enthusiasm from his students as he gives off.
Bechara	Expected to provide a working boat, expected to be a helpful member of group
Bechara	he expects you to have a boat that wont just sink to the bottom of the pool
Bechara	Wanted use to do the most that we could
Bechara	Dr. B expects us to try, and that helps me not get anxious but still preform well.
Bechara	The instructor expected that even through the failure of other classmates the project was still complete which put a very high expectation on my but was not unreasonable
Bechara	He encouraged fun and learning above all. Obviously there is an expectation for quality in our work that isnt unknown to students at this point in their academic careers. Those requirements were clearly outlined in the project statements. Overall, we were expected to critically think and work with others to combine our engineering skills and create a finished product. A culmination of what we have learned so far.
Bechara	A majority of the class was group projects.
Bechara	While Dr. Becharas expectations were quite high for all of us, I feel like they are valid and still reasonable.
Bechara	Pushes me to be the best I can, Love it and definitely causes me to work harder
Bechara	The expectations were to work with our assigned team and provide an actual learning experience for the group on both working together and also pushing the boundaries to make the class challenging.
Bechara	it was always clear that as long as you put in an honest effort into the project you would do just fine in the class.
Bechara	To be able to design and implement creative ideas and learn lessons from what failed and what succeeded.

	Question: How could the amount of feedback be improved? What might that look like? Please provide details. tip: it may help to put the amount of feedback in context with how much work you submitted to get that feedback. TEF Domains - Feedback and Assessment
Bechara	N/A
Bechara	it cant, its great as is
Bechara	The feedback was good when it came to the timing and the quality of responses were good enough to help you improve in the future.
Bechara	What makes a good design journal entry?
Bechara	Been waiting on the final report grade for some time this finals week.
Bechara	my one complaint was that it was not always obvious what we did wrong when we lost points, I wish that was more clear in canvas. But if we asked what we did wrong the graders were able to tell us pretty easily.
Bechara	Any of the big assignments we submitted would have comments on how to improve on that work and what could be done better. It was very helpful because these assignments built off eachother so out next work was improved.
Bechara	N/A
Bechara	With a weekly submission of the design journal, I would have appreciated some more personalized feedback on the journals, as well as timely feedback.
Bechara	Given that Bechara and the TAs knew the majority of the groups designs, feedback on the boats themselves doesnt really make sense. On some of the design journal submissions and other assignments, a talk with the TA just after grading would have helped us greatly.
Bechara	The feedback was reliant on students to go look for feedback from the instructor
Bechara	On the design note books and the written reports., some points were taken off that did not explain why they were taken off.
Bechara	I think there were already built in feedback mechanisms (like mentioned before). I thought it was a great idea to not put too many, because then that forces us to learn to advocate for ourselves and ask for help. Never once were we turned away by Abbie, Ani, Dr. B, Steve, James, Justin, etc if we asked for help.
Bechara	Some of the feedback we got for the reverse engineering project was that what we turned in was not relevant to the assignment. We obviously thought it was but we didnt know why or what it should have been
Bechara	I think the feedback was okay but I would have appreciated feedback more often that 2 times
Bechara	Personally, I did not love having the TAs grading the bulk of the reports/work. In terms of feedback, I felt that my groups work followed the rubric well, yet the grades did not reflect that despite us clarifying the expectations with Dr. B beforehand.
Bechara	Again, I would say, more feedback would just be better overall. Another thing my team considered was providing us with almost a chacklist of things to do , of which at least one must be completed each week.That or have individual meetings for each category rather than just a general meeting.
Bechara	more office hours?
Bechara	N/A
Bechara	I dont know if it could. It was very clear to me that the instructor really cared about what he was teaching.
	Question: If you have any other comments about the Instructor, please provide them here
Bechara	N/A
Bechara	This class was by far my favorite and Dr. B made it very enjoyable and made me want to learn and participate in the class.
Bechara	Thank you for a memorable class and enjoyable project
Bechara	Barbie battle blimps when?

Bechara	It was a challenging course compared to other semesters of MECH-202. A lot of the boat project relied on knowing Mechatronics, although that class is not a prerequisite for this class. This put a bunch of teams at a disadvantage when they didnt have the same knowledge level to bring something to compete. Compared to the spring semester of 2023, their project was all mechanical/physical based which made it more level. I also think that the teams should have been more randomly generated. I dont know if the creation of teams based on pairs and how they evaluate their strengths was very organized or efficient. It could really have just been done through an online generator, where pairs of students input their strengths, and the program assigns teams as evenly as possible based on their strengths (manufacturing, coding, etc.) Also, the design competition voting screwed a lot of teams over, especially those that worked really hard. It shouldnt have been based on flashy advertisements at all but based entirely on the boat itself. It should have required us to take a high-quality image in different views of our boat. I also dont think the due date of the advertisement was helpful since some teams boats werent fully finished. The voting should have been later in the week, like the Thursday, or honestly the day before the competition (just an online vote).
Bechara	I was very excited when I learned that Dr B was teaching this section this semester, I dont think another professor could have done a better job. many of my friends that did the course last year were jealous that I got to be a part of it this semester and it was by far my favorite class that I have taken because of the work and care that he put into this class.
Bechara	The class was great, I had a lot of fun this semester, and it was largely due to the professor that was in charge. Thank you Dr. B. two notes that I will make though. Having the competition so soon after thanksgiving break was very challenging. Could be a good idea to have another prototyping meeting or something right before break. Also, I dont think the style competition should be a poster making contest.
Bechara	This class was amazing. It was fun and engaging. I learned more about engineering and making new things and the design process than I ever have. I love the engaging environment and the success of the final project. The competition was so fun and pushed every student to try hard to produce a good product.
Bechara	Great Professor and one of the most down to earth and reasonable ones Ive had.
Bechara	Dr. Bechara is one of the best professors I have had
Bechara	Thank you for a great semester and learning experience.
Bechara	Dr. B operates his class in an encouraging and exciting manner, that integrates learning goals for the class as a whole. I really appreciated having him and the TAs as resources during this class. This class overall was fun and challenging!
Bechara	Dr. Bechara is great! I know this was his first time teaching the class, and I love his ability to truly support students and troubleshoot any problems that we discovered along the way.
Bechara	Dr. B made this class so fun. He pumped up the battle boat competition and made it a really fun experience for me. He took risks with this project, and I appreciate all he has done to support and provide for us.
Bechara	I think that Dr. B has really brought MECH 202 back to life. This class is meant to be a pivotal part of engineering students education, and it was exactly that. Not only did he push us intellectually, but he also pushed us to be better versions of ourselves. He made us advocate for ourselves, but also never abandoned us. He led through example to show us how cool and important this class was. He risked his reputation to make the Battle Boat Competition huge to show us he had faith in us as engineers to make him proud. Dr. B is truly a gem in the college of engineering. He is always motivated by students best interest and gives us his best. In exchange, he expects the best from us and will not give up until we but our best foot forward. I also found it really thoughtful that he made sure out textbook was free and accessible to all.
Bechara	He was awesome and funny.
Bechara	Dr. B is an incredible professor. His pass passion is contagious as well as his enthusiasm. His vision for this class is incredible. The Battle Boat competition was a highlight of my CSU experience. I cant wait to see what he does for the upcoming years; I just know that the design projects are going to become more spectacular and streamlined in the years to come, under Dr. Bs influence.
Bechara	Genuinely one of my favorite classes I have ever taken at CSU. I will forever think about how cool this assignment was. You are one of my favorite professors and I love that your excitement for this type of stuff makes other people get excited! I do think maybe for the project in the future making groups have more meetings with the TAs for check -ins or something because some people cannot get it together without certain deadlines and fear of a bad grade.
Bechara	Easily the most fun class Ive had at CSU, Dr. Bechara did a great job

Bechara	I thought this class was super fun and I like Dr Bechara as a professor
Bechara	Definitely a supportive professor when the group went sideways but the profanity was a little much in class
Bechara	It was one of the greatest classes that I took so far. A lot of the classes should be like this.
Bechara	I absolutely adored this course because of Dr. Becharas enthusiasm towards the content - or lack thereof. The semester had its challenges but he encouraged us and taught us important skills regarding team dynamics, etc. Not to sound like a brownnoser but Sam Bechara is one of the best professors, and not just at CSU.
Bechara	I enjoyed this class and I appreciated the passion and time Dr. Bechara put into this course. His passion for this class and the design competition was infectious and made me want to put my best foot forward in this competition. I hope I get to take classes with him in the future!
Bechara	Bechara deserves the world, he makes so many sacrifices for us. If I had the choice to just be taught by him for all my classes I would pay an immeasurable sum of money for that
Bechara	Dr. Bechara is always really well mannered and overall a great professor. He definitly made a mech 202 design class into a true design challenge and overall was fun to be of help. Dr.B made the best boat competition for CSU overall, give this man a raise!
Bechara	give Dr. Bechara a fist bump.
Bechara	I believe these majority of these issues stem from this being the first semester this class was taught. However, I think more prototype meetings to evaluate progress throughout the semester would decrease stress by having a more set path to follow
Bechara	N/A
Bechara	No comments about Bechara, I really appreciated his charismatic attitude about my ideas for the project. Did not appreciate the attitude and passive aggression from TA. Showed little enthusiasm when ideas were brought to her, almost felt demeaning in her communication at times. Not ideal when looking for idea validation.
Bechara	No comments about Bechara, I really appreciated his charismatic attitude about my ideas for the project. Did not appreciate the attitude and passive aggression from TA. Showed little enthusiasm when ideas were brought to her, almost felt demeaning in her communication at times. Not ideal when looking for idea validation.
Bechara	An amazing professor. Seriously engaging and brings interest to an otherwise boring topic. Knows when to be serious and when to have fun. I am sad I didnt do that well because of factors completely in my control but, I would recommend this class and this professor to any mechanical engineering student going forward. A seriously cool guy
Bechara	Dr. Bechara is an enthusiastic, passionate professor who truly cares about his students. Every lecture was a joy to sit through and I received useful knowledge that allowed me to succeed in the course. Future students would be very lucky for the opportunity to take engineering design 202 with Dr. B.


Question Averages
Avg
Mechanical Engineering Avg
Div Avg
School Avg
Bechara:Instructor feedback
Bechara:Instructor feedback timely
Bechara:Instructor's expectations
Classmates/peer expectations for student to contribute
Time allocated to activities/labs
Time allocated to discussion
Time allocated to homework
Time allocated to lectures
Time allocated to online
Time allocated to projects
0
1
2
3
4
5
Mean of Responses

Appendix VIII

MECH 103 Spring 2023 Course Evaluations

Colorado State University

Spring 2023, Mechanical Engineering 14060 MECH103-Lecture Section 1
Instructor: Bechara, Sam (Primary)

There were: 52 possible respondents.

	Question Text	N	Agree	Not Agree	IDK			
1	Abide by the CSU Principles of Community	26	100% (26)	0% (0)	0% (0)			
			None	1-20%	21-40%	41-60%	61-80%	81-100 %
2	Time allocated to discussion	26	0% (0)	27% (7)	27% (7)	23% (6)	15% (4)	8% (2)
3	Time allocated to online	26	15% (4)	50% (13)	23% (6)	4% (1)	0% (0)	8% (2)
4	Time allocated to projects	26	4% (1)	15% (4)	35% (9)	35% (9)	8% (2)	4% (1)
5	Time allocated to homework	26	4% (1)	23% (6)	42% (11)	27% (7)	0% (0)	4% (1)
6	Time allocated to activities/labs	26	0% (0)	4% (1)	38% (10)	19% (5)	27% (7)	12% (3)
7	Time allocated to lectures	26	0% (0)	4% (1)	23% (6)	54% (14)	8% (2)	12% (3)
			Impact	No Impact				
8	Lectures	25	100% (25)	0% (0)				
9	Discussions	25	80% (20)	20% (5)				
10	Assignments	25	100% (25)	0% (0)				
11	Activities	25	96% (24)	4% (1)				
12	Labs	25	100% (25)	0% (0)				
13	Instructor	25	100% (25)	0% (0)				
14	Classmates	25	84% (21)	16% (4)				
			Not Stated	Low	Reason-able	High	V High	
15	Classmates/peer expectations for student to contribute	25	4% (1)	20% (5)	72% (18)	4% (1)	0% (0)	
			Not Enough	Reason-able	Chall-enging	Over-whelming		
17	Course workload	25	0% (0)	64% (16)	32% (8)	4% (1)		
			Strength	Not Strength				
19	Inclusive environment	25	92% (23)	8% (2)				
20	Clarity of expectations and grading	25	92% (23)	8% (2)				
21	Timing of Feedback	25	76% (19)	24% (6)				
22	Challenge of the course	25	96% (24)	4% (1)				
23	Accessibility and usefulness of materials	25	96% (24)	4% (1)				
24	Instructor Communication	25	96% (24)	4% (1)				
25	Support from Instructor	25	96% (24)	4% (1)				
			Enhance	Do not Enhance				
26	Inclusive environment	25	8% (2)	92% (23)				
27	Clarity of expectations and grading	25	20% (5)	80% (20)				
28	Timing of Feedback	25	40% (10)	60% (15)				

29	Challenge of the course	25	8% (2)	92% (23)				
30	Accessibility and usefulness of materials	25	12% (3)	88% (22)				
31	Instructor Communication	25	4% (1)	96% (24)				
32	Support from Instructor	25	8% (2)	92% (23)				
			No	**Yes**				
34	Student wishes to sign name to comments	25	60% (15)	40% (10)				
			Not Stated	**Low**	**Reason-able**	**High**	**V High**	
36	Instructor's expectations	26	0% (0)	0% (0)	58% (15)	38% (10)	4% (1)	
			None	**Incon-sistent**	**Not Enough**	**Enough**	**Too Much**	
38	Instructor feedback	26	0% (0)	0% (0)	12% (3)	88% (23)	0% (0)	
			Too Late	**Timely**	**Incon-sistent**			
40	Instructor feedback timely	26	8% (2)	69% (18)	23% (6)			

Instructor	Text Responses
	Question: Describe your classmates/peers expectations for you to contribute. Please include specifics. TEF domains - Student Motivation
	In smaller groups and during lab, my peers and I talked but during lecture we mostly kept to ourselves.
	We had a final project meant designed for group work.
	We were encouraged to help each other work through problems that were presented in class, as well as problems presented in projects.
	i think my class mates just expect me to put time in on group projects
	Discussing answers to questions, how we approach a problem.
	Sometimes there is no group work and other times its the entire class length.
	My peers and I helped each other to understand concepts and work through challenging problems. engaging with classmates was important.
	Discuss problems presented in class, help each other in labs, work well together for final project
	The peers in my class expected me to complete my part of the labs.
	As students we all share the responsibility of contributing in class. If you have something to say, you just have to speak up. Unfortunately, many young adults nowadays are afraid to speak, at least in engineering school.
	Regular/there were no group projects
	Through lab work, there is an expectation to do a reasonable amount of group work. I also helped and was helped by classmates on assignments.
	Needed to help contribute for projects and labs
	The expectations of my classmates/peers was reasonable.
	Yeah I felt that as long as you work together you would do good.
	Class was mostly lecture with some small amount of discussion so classmate contributions were mostly restricted to labs. My lab group mostly worked on an individual basis.
	n/a
	I was expected to do my fair share of of work of the final project. I was also expected to help troubleshoot issues that came up along the way. I was expected to find time to meet up outside of the normal class time to work on things as well.

	to work on specific projects together
	They wanted me to contribute.
	Question: Describe the workload. Please give specific examples. TEF domains - Student Motivation, Feedback and Assessment
	This class doesnt have a lot of homework but the labs are challenging and take a lot of time. Matlab is definitely hard to understand and that is all this course goes over.
	The labs were difficult but you do learn a lot from them. It did not feel pointless to do the assignments. I constantly felt like I was learning compared to "waisting my time."
	The labs were doable, but a little challenging outside of class time. We are encouraged to participate in office-hours when needed.
	i think the workload was more than doable and the labs took me the most time to complete
	Reading chapters from textbook and completing quizzes. Sometimes homework assigned in class which we discuss, but mainly lab work that is due every week. Big final project in the last few weeks where we needed to spend a lot of hours outside of class.
	There arent many super huge assignments, but there are lots of small ones every week
	Workload was not too much but helped me to better understand class concepts.
	About 2 homework assignments weekly, lab weekly, 3 total exams and final project. All doable
	Workload was reasonable for an intro class.
	Semester started with weekly readings and homework questions. These werent too hard at first. The material became more challenging, and labs began taking much longer. The workload was surprisingly heavy for a 100-level class. I learned a lot by cursing at Matlab for hours every week.
	The work for this class is challenging but it is also very doable. It was difficult but also very engaging.
	Workload is moderate and necessary. He gave us proper homework that is applicable to the tests and content while giving us challenging labs. In my opinion, the difference in difficulty between the labs and the content taught is tremendous, requiring the use of outside knowledge to complete them.
	Not very excessive, Matlab labs and projects were outlined well and expected work for how to solve problems was reasonable. Final project had plenty of time to get it done.
	The workload was very reasonable. The labs were a little more overwhelming along with the final project but it was very doable. The work overall was easy to understand if you attended lecture.
	A lot of labs but if you work together you should get it done.
	Reading and related questions were very doable as the textbook is very easy to process for the most part. The labs were relatively simple but some of the lab guides were a little misleading or hard to understand. That may be a feature though, considering Dr. B likes to promote critical thinking.
	n/a
	The workload consisted of reading one or two chapters in the book and answering questions regarding those chapters for homework. Which I thought was really reasonable. We also had a weekly lab that, in some cases, required a bit more searching to find how to properly complete the lab.
	not heavy but pretty good amount yet nothing that I couldnt keep up with
	Some of the homework seemed a little hard for no reason other than the fact to be hard so we can learn to solve problems. It also seemed like the TA graded unnecessarily hard and took points of for things that didnt need to be taken points of off.
	Question: If you have any other comments about the learning environment or course, please provide them here
	I found the lectures very captivating and insightful. This is my fourth semester at CSU and I have not had any other course come close to his in terms of quality.
	I felt that the learning environment was inclusive, I never felt that I didnt belong there. Dr. B made sure that we knew to talk to him if we felt otherwise.

	I took this class as an Exploratory Studies student and really enjoyed how Dr B focused on what engineering is like and compared it with other similar fields like being a scientist. He brought in a lot of experienced people to speak with us including Steve, alumni, and senior students from diverse backgrounds which was a really insightful experience. The second half of the course was harder as the labs were more MATLAB focused and would take me much longer to do as I could not attend most of the office hours due to my schedule. A wider variety of office hours would have been a lot more helpful to me as there were overlapping office hours for some of the LAs, but I understand that this is not always possible. The final project was a really engaging experience overall but it took me a while to complete the first two levels and so I felt like my last part was rushed through– an additional week or two would have made this a much more enjoyable experience.
	I feel that more students would participate and be more successful in the labs if we did them more as a class. Showing up to a lab with 6 people total with most of them being confused is not very motivating.
	Dr. B was probably the best teacher/professor I have ever had and was very valuable to my learning and enjoyment of school.
	This class was awesome. Very challenging but rewarding. Great learning environment.
	My only complaint is that the 2 exams and final werent posted on Canvas. I know is a small nitpick but it threw me off a little.
	The free textbook really nice and I like the combo of labs and lecture.
	Dr. B was incredible as a teacher. He not only improved my knowledge as an engineer, but gave me real world experience in making my life better and happier. He goes on my list as one of my favorite teachers I have ever had. Dr. B changed the course of my life for the better.
	The environment was amazing and although it seemed as if I was not engaged, I very much was. The best part was having an instructor that actually cared and showed it. This made the environment very enjoyable.
	I thought the learning environment was great.
	This was one of the most fun classes Ive taken so far. I think Dr. B is an excellent instructor. 10/10 would take another class where he was the professor.
	n/a
	N/A
	none
	Question: How could the timing of the feedback be improved? What might that look like? Please be specific in your comments. TEF Domains - Feedback and Assessment
	Some times it took a while to get my labs and homework assignments graded . A huge part of being able to complete future assignments was based on the success of past assignments. So sometimes this was difficult if feedback was delayed.
	Several labs took a long time to get graded, which was a bit unfortunate.
Bechara	It would have been more helpful for the labs to be graded faster so I could have a better understanding of where my academic standing is.
	grade assignments sooner and give SPECIFIC feedback
	I felt that the feedback was given to us in a timely manner.
	The labs took a long time to get graded along with some miscellaneous assignments.
	Timing of feedback was great.
	The grades to come in bursts. It would be a little nicer to have a more consistent view of my grade
	The timing on the feedback was good
	If tests were returned more quickly. It took over a month to get a lab grade correction.
	N/A
	none
	I dont remember saying the timing of feedback needs to be improved. I think every bit of feedback I received was timely and incredibly helpful.

	n/a
	The timing of the feedback was great.
	I think it could be improved I felt like I wish a lot of things were graded pretty late and I wish I got them graded a little quicker.
	This is a relatively small criticism, but grading has been slow and sometimes the parameters for the answer were a bit of a grey zone. For example if we were expected to upload a plot and it was unclear from the assignment what the plot should look like, Id like to know sooner or later if I did it wrong so I correct my mistake and not continue to make it.
	Question: Describe the instructors expectations. Please include specifics. TEF Domains - Curriculum/Curricular Alignment
Bechara	He just wants us to care about what were doing and want to learn not just care about a letter grade which is a really refreshing way for a teacher to act (good thing!)
Bechara	Dr.B wants nothing but the best for each student. He wants everyone to succeed. However, you have to work hard to do so. Dr.B held us accountable. He challenged us. He encouraged us.
Bechara	Dr. B cares about his students and really wants them to succeed and learn the material.
Bechara	We were expected to be able to reproduce the information given to us in class and in the textbook on the exams, which was reasonable.
Bechara	I feel that if a student has a hard time understanding something, due to the professors disapproval of stupid questions, they will stay behind and feel like they are drowning in the amount of confusing assignments.
Bechara	Show up to class and learn, our class is bad and doesnt do that a lot, epically during lab days (Fridays).
Bechara	Expectations for the class were fair and ensured that we stayed engaged.
Bechara	Do homework and other assignments on time, dont be distracting to classmates in lectures, participate and talk to others in group activities/labs
Bechara	Dr. B was very clear with his expectations and it is not his fault for the lack of motivation in the class.
Bechara	Learning is no joke to Dr. Bechara. He expects you to take your education seriously, or figure out something else to do with your life. Self-guided learning is required but Dr. B and the TAs were there to help at all steps (only if you had already exhausted all of your options).
Bechara	Dr.B has high expectations for learning but it is expected and it makes sense.
Bechara	He expects people to show up and learn, because our jobs in the future have a lot of responsibility.
Bechara	Wants you to make time for reading through the text and working through projects in a timely manner. Wants you to be prepared to answer questions on tests from the covered course material. Gives you the tools to succeed if you come to class.
Bechara	The instructor had reasonable expectations and made it clear.
Bechara	As long as you show up to class you should be good to go.
Bechara	Dr. B expected us to show up to lecture, do the reading and the homework, and put in a reasonable amount of effort.
Bechara	Come to class, make a genuine attempt to learn the material, and ask questions if you need help.
Bechara	n/a
Bechara	He was very encouraging.
Bechara	to get work done and be able to learn the material and it isnt so much about the grade
	Question: How could the amount of feedback be improved? What might that look like? Please provide details. tip: it may help to put the amount of feedback in context with how much work you submitted to get that feedback. TEF Domains - Feedback and Assessment
Bechara	Possibly a small amount of feedback on the tests like going over some problems in class that people struggled with or just feedback on the test itself.
Bechara	Matlab grader is awesome, but it lacks personal feedback.

Bechara	The regular course assignment feedback is fine, but for exams I felt when I made a good argument for a regrade or felt as though I deserved more credit, it was not considered very highly.
Bechara	I think that the feedback provided was enough.
Bechara	Its mostly fine. His office hours have been helpful for people that took that class with me.
Bechara	Id say its really good as is.
Bechara	Feedback was good.
Bechara	No way.
Bechara	Feedback was good
Bechara	The feedback was good and needed no improvement. Unless someone asked about a topic then he would go over the material but if nothing was asked then he would assume we knew everything. This feedback is good as it allows people to ask questions they need to ask.
Bechara	I just feel that if stuff could be graded quicker it would be good.
Bechara	The only note I have on this front is that when I make a mistake, Id like some specifics as to what that mistake was. For example, if I used the incorrect conversion factor, instead of saying: "the conversion factor is wrong", it would be helpful to get feedback like "the conversion factor for inches to cm is 1:2.54."
Bechara	I dont know how the amount of feedback could be improved. Honestly Im not a person who requires a ton of feedback in the first place. My grade on exams is feedback enough.
Bechara	n/a
Bechara	N/A
Bechara	none
	Question: If you have any other comments about the Instructor, please provide them here
Bechara	Dr.B is by far (I have a whole other degree so Ive been through A LOT of professors) the best professor Ive ever had and I dont mean that lightly. He inspired me to live me life a certain way and work hard and believe in myself to get what I want to achieve. I dont think Ive ever had a professor I feel personally believes in me, let alone cares if I learn not just pass or fail. I never missed a lecture because I LOVED being there and hearing his passion and hilarious rants about silly things and I always learned something new whether it was MATLAB code or just a little life lesson from him. Lets just say Dr. B doesnt have a good "poker face" so when attendance was low this semester it bummed him out pretty bad and I cant actually come up with a single explanation why you as a student wouldnt want to show up every day to watch Dr. B lecture and care and encourage you no matter what bad day he has. It sounds sappy and ridiculous but Dr.B is what I aspire to be later on, hes passionate about his students and engineering and that is so inspiring that I will never ever forget my mech 103 class with the "infamous" Dr. B. And Dr. B, I will be visiting because I already miss class and office hours!!! Thank you for truly making me believe I can do this and that teachers actually do care after all, youve changed my trajectory in my career/life for the better so if I have to give critical feedback there is NONE because never stop being you, as I said I was inspired and had a wonderful semester every MTW at 9am... thanks so much Dr. B, have an awesome summer with your wonderful family (and of course dont get too carried away at those raging engineer parties, I know they get crazy!)
Bechara	Dr.B changed my perspective on learning and life. He is truly one of the best.
Bechara	One of the best courses I have taken, but if I were to suggest one change it would be for the exams. I struggle with some of the specific coding based exam questions. I feel as though I have a strong understanding of Matlab and Excel, but some problems I use a bit of trial by error to figure out the solution and I feel that is consistent with many coding languages, but a test does not give you that ability.
Bechara	Dr. B was very professional in providing the course materials. He was also willing to work with students when they needed it. I always felt that my time spent in the classroom was worth it, because I learned something new every day. Having someone as a professor who had already been working in the field of engineering was very important to my learning experience, I felt.
Bechara	Dr B is a great professor who clearly cares a lot about his students. He has always been really helpful each time I've approached him– whether that is for a small MATLAB doubt or for helping me decide if engineering is the right fit for me. His classes are really engaging and I always look forward to them, even if they're at 9 am :)

Bechara	Do a little more with the in class participation. I feel that the main reason students didnt show up is most of the material learned is through the homework and there was very little penalty for not showing up.
Bechara	I am taking this class a second time this semester with the same professor. I learned the second go around that he reuses jokes, hes still great here, I heard rumors from other students that he is harder compared to other professors who teach similar class, hes still great. Ive been through one school year of college and despite that, he is still head and shoulders above the next best professor here. We had a day of just how to do college properly and I loved it, it changed the way I go throughout my days probably until the day I graduate or even longer. The one thing I do want to say about him in a way though is that when students get lower grades in his class, he thinks that he failed the students but for me thats not the case. Dr.B, if youre reading this, I was the reason why Im getting fairly bad grades in your class, the first time around it was because I didnt take the labs seriously as I should have and the second semester it was because I didnt show up to the in person labs, or heck in person classes even, enough. Im not beating myself up here as I tend to do, I legit think that there were things I could have done better with this in this class to get a better grade and Im pretty sure on what they are. So Dr. B, if my grade is sub par this semester, just know that it wasnt your fault thats the way it is. So yeah, Dr. B, thanks again for being such and amazing professor this semester and stay true to yourself.
Bechara	Dr. Bechara is the best teacher Ive had so far, he is very clear in his teaching, very supportive and non-judgemental of students when helping them with things, and easy to talk to and ask for help
Bechara	Some things would get graded immediately and some would be two months late.
Bechara	Dr. B is a straight-shooter, comedian, and genius. His lectures were always as entertaining as they were enriching. We were encouraged to confront deep philosophical questions while learning about more worldly things like Excel plots. This teaching style, interlaced with humor, kept me engaged and entertained all semester.
Bechara	Personally, I really enjoyed this class. I learned a lot about MATLAB and Arduino, but I wish we wouldve spent just a little more time on that. I think that we spent a little too much time learning excel and unit conversions. I was learning unit conversions at the same time in CHEM and I think most people will take both classes. Also, there are many other classes that teach excel. In my opinion it would be better to spend less time on Excel and Units. I feel like I learned the most from the Industry panel and Senior Panel days. My favorite class day was definitely the last day when you answered questions, I think you should do more of that maybe. By far my favorite course this semester; cant wait for MECH 105. Thank You Dr.B!!!!
Bechara	I liked Dr. Becharas class because he genuinely tries to make it engaging and interesting and has a passion for teaching and engineering. Ive taken a 5 credit matlab class at another school and I still learned a lot of tricks I didnt know beforehand, too.
Bechara	Thank you for being an amazing introduction into engineering.
Bechara	It was a fun class.
Bechara	I think Dr. B is the kind of teacher that most people deserve to have earlier in their lives. He is passionate about the material, he knows how to relate to his students, and he cares whether or not they are actually learning what he is teaching. It is really rare to find a person who can explain high level concepts well and who is personable enough to make them stick in your memory.
Bechara	I think Dr. Bechara is an excellent professor. His class was definitely my favorite class I was in this semester.
Bechara	n/a
Bechara	N/A
Bechara	none
	Question: You chose to sign this evaluation, Please type your name in the box below.
	Sarah Woznick
	Alex Ronning-Arnesen
	Stefania
	Alex Tutino
	JOhn Luera
	Colin Christensen
	Mason Smith

	Michael Brown
	Mateo Osorio

Appendix IX

BIOM 300 Spring 2021 Course Evaluations

Colorado State University

Spring 2021, Engineering Intra-College 13806 BIOM300-Lecture Section 1
Instructor: Bechara, Sam (Primary)
There were: 60 possible respondents.

	Question Text	N	Agree	Do Not	Don't Know			
1	Abide by the CSU Principles of Community	33	100% (33)	0% (0)	0% (0)			
			None	1-20%	21-40%	41-60%	61-80%	81-100 %
2	Time allocated to discussion	33	0% (0)	18% (6)	33% (11)	36% (12)	9% (3)	3% (1)
3	Time allocated to online	33	3% (1)	9% (3)	9% (3)	24% (8)	6% (2)	48% (16)
4	Time allocated to projects	33	6% (2)	6% (2)	3% (1)	12% (4)	27% (9)	45% (15)
5	Time allocated to homework	33	27% (9)	45% (15)	3% (1)	15% (5)	9% (3)	0% (0)
6	Time allocated to activities/labs	33	9% (3)	18% (6)	12% (4)	21% (7)	27% (9)	12% (4)
7	Time allocated to lectures	33	0% (0)	15% (5)	48% (16)	24% (8)	9% (3)	3% (1)
			Impact	No Impact				
8	Lectures	33	85% (28)	15% (5)				
9	Discussions	33	94% (31)	6% (2)				
10	Assignments	32	81% (26)	19% (6)				
11	Activities	33	79% (26)	21% (7)				
12	Labs	33	97% (32)	3% (1)				
13	Instructor	33	100% (33)	0% (0)				
14	Classmates	33	85% (28)	15% (5)				
			Not Stated	Low	Reasonable	High	Very High	
15	Classmates/peer expectations	33	0% (0)	3% (1)	70% (23)	27% (9)	0% (0)	
			Not Enough	Reasonable	Challenging	Overwhelming		
17	Course workload	33	0% (0)	36% (12)	61% (20)	3% (1)		
			Strength	Not Strength				
19	Inclusive environment	33	91% (30)	9% (3)				
20	Clarity of expectations and grading	33	55% (18)	45% (15)				
21	Timing of Feedback	32	84% (27)	16% (5)				
22	Challenge of the course	33	97% (32)	3% (1)				
23	Accessibility and usefulness of materials	33	82% (27)	18% (6)				
24	Instructor Communication	32	88% (28)	13% (4)				
25	Support from Instructor	33	100% (33)	0% (0)				
			Enhance	Do Not Enhance				
26	Inclusive environment	33	9% (3)	91% (30)				
27	Clarity of expectations and grading	33	58% (19)	42% (14)				

28	Timing of Feedback	32	13% (4)	88% (28)				
29	Challenge of the course	33	9% (3)	91% (30)				
30	Accessibility and usefulness of materials	33	15% (5)	85% (28)				
31	Instructor Communication	33	18% (6)	82% (27)				
32	Support from Instructor	33	0% (0)	100% (33)				
			No	**Yes**				
34	Student wishes to sign name to comments	33	79% (26)	21% (7)				
			Not Stated	**Low**	**Reasonable**	**High**	**Very High**	
36	Instructor's expectations	32	0% (0)	0% (0)	44% (14)	56% (18)	0% (0)	
			None	**Inconsistent**	**Not Enough**	**Enough**	**Too Much**	
38	Instructor feedback	33	0% (0)	0% (0)	3% (1)	97% (32)	0% (0)	
			Too Late	**Timely**	**Inconsistent**			
40	Instructor feedback timely	32	0% (0)	91% (29)	9% (3)			

Instructor	Text Responses
	Question: Describe your classmates/peers expectations for you to contribute. Please include specifics. TEF domains - Student Motivation
	You had to contribute or your group would likely not do well and/or have to do twice as much to make up for you
	Since we work in groups for projects, peers hold each other at high standards to pull their weight and get their work done on the project. We do peer evaluations at the end of projects so that we know if everyone contributed equally.
	Projects
	All of the projects are group projects with a peer review component so you are expected to pull your weight.
	Most of this class is group project based so the expectations from my peers is reasonable as our grades depend on one another
	In lecture, I feel that classmates reasonably expect me to contribute to class discussions. I definitely think that my classmates reasonably expect me to contribute to completing each of the problem statements in lab throughout the year.
	With this class being project based and relying so heavily on the group projects, my group relied on me to complete my portion of the project and be active in discussions. I had to be prepared and aware of what my group was doing to be able to help out when needed.
	We all want to do well on the projects, and we all expect the other members of our projects to do well
	There are 60 kids in the class and mostly the same 3 lead the way but everyone contributes here and there
	To perform my portion of work to succeed.
	My classmates expectations of me to contribute coincides with the amount of work each group project requires to be well completed. The expectation is to do enough work on each group project that no one person is doing the majority of the project on their own. This is incredibly reasonable, given the complexity of the problems that we are solving. My classmates expectations are basically comprised of doing your fair share of work, so that there is an equal load on each group member.
	The class has group discussion about research articles in which we are supposed to participate. Additionally the lab periods are all group projects which require participation from each student.
	Each student is expected to contribute equally to discussions and lab problems.
	They rely on me to complete my part of a project so that they can do their part.
	We are all motivated to do well and learn in this course.
	When having discussions it is important to voice my thoughts and be respectful when others are speaking.
	As this is primarily group project based, the expectation from me was high so that we would produce quality work as a team. Although the standards were high, I believe the expectation from my peers is reasonable as this is 300 level project learning based class.
	My classmates expected me to do the research that I was assigned and my part of the papers and presentations. I needed to be prepared as everything was group based and if one person didnt do their part, then the project wouldnt get finished on time
	-participate in the projects -complete my portions of the project on time and to a high standard -gain an understanding of the entirety of the project -be able to present and be knowledgeable about the problem/solution we are presenting
	There is a lot of work associated with each project so each person in a group is expected to do their part, which is significant. I have also been in two groups so far where one of my group members did not do their fair share so they had higher expectations
	Question: Describe the workload. Please give specific examples. TEF domains - Student Motivation, Feedback and Assessment
	The workload was challenging but doable, which wasnt an option for some reason. It took time to complete the projects, and a lot of hard work and communication with group members, but it was also engaging and there were good resources to ensure we were doing it well.

	We have to work outside of class time on the projects, but it is doable if we are productive in lab. I never felt that the work load was too much.
	Projects
	The only time the workload was stressful was when other group members didnt do their parts.
	The works is challenging, but i feel as though it forces me to learn more. It never feels like the work is not impossible if you put effort in.
	The only "workload" in this class is the journal discussions (which is not very time consuming or difficult) and the problem statements (which make up our grade for the class and are more challenging.) While the problems are more difficult and require quite a bit of time, I dont feel that the workload to complete them is overwhelming or too demanding, especially given that they are group-based.
	This class was a lot of work in getting the projects done. It was reasonable especially because there was not much homework outside of the big projects but future students should know that it will be time consuming.
	A project report, and presentation was due roughly every 3 weeks. This was very doable and able to be done if students stay on top of it and work well with their groups. This class challenged time management and working with different people to complete a common goal.
	This is a challenging class, the projects are not easy, but it will prepare us for our future careers
	For the lecture, there are periodic scientific papers and discussions due outside of the lab work.
	the workload was enough to be challenging, but not overwhelming where I felt I had too much to do.
	We do problems and at times I spend a lot of time on it and other times less.
	The workload is reasonable given the content that the class is working to teach us. Since this is a course that works on building the skills necessary to be successful engineers, the workload involves doing the things that we need to build skills in, since the only actual way to build a skill is to practice a lot. For example, the only way to learn how to give a scientific presentation is to give a presentation that you feel is scientific, obtain feedback on that presentation, and use that feedback to create a better scientific presentation. The workload is a little high in this class, but it is reasonable given the fact that it takes a lot of work to build skills that you havent known you needed to build.
	The assignments sometimes felt boring. You would get a very broad topic and it was exciting, you could do anything with it! Well ,actually you could not. We would start on the project and think of great ideas, oh wait what was that? Oh we cant do that because he actually wants something super specific and narrow that everybody has to do the same thing. Wow time to start over the project again and listen to the same presentation 4 times.
	The work load is primarily project based with 4 major projects. The research, report, presentation and lab notebook are all challenging but doable. Additionally there are journal discussions that look at research articles and students examine them through group discussion.
	The projects helped me think outside the box which was challenging at times but this also made the projects more engaging.
	The workload is mainly a lot of time spent on research and doing the lab assignments.
	There is lots of time and effort put into the projects where I spent way more hours working on it than lab and lecture.
	There are a variety of work types in this course which keeps things interesting and they are not overly time consuming.
	While the projects are somewhat time consuming, they are interesting and fun to do.
	Like I mentioned in the previously said, this class requires a lot of work and time management skills to complete the projects. However, I think the level of work required from this course is manageable and prepares students well for industry.
	The workload was not overwhelming. There were a couple article discussions that took some time and then doing the project with our groups. Overall, the projects took the most time but were the main focus of the course, but they were not so overwhelming that they couldnt get done.
	-4 projects throughout the entire semester -lab time to complete projects -presentations and reports due at the end of every project

	The workload verges on overwhelming because the scope of each project is very large and we are expected to become experts in the field of each problem. It is helpful and Ive learned a lot but there is so much work associated with this class
	Workload is doable, but if the prompt is changed then the workload becomes dramatically more difficult
	Professor assumes that only his class matters. For example, he was very upset that many students complained about us all having to do the same image analysis for hundreds of images on top of normal work because he wanted it to be a lesson on how real lab work and research works. However, most of us are already working or volunteering in actual labs and have to do this stuff anyway, but the results are real and we get paid or have agreed to do it. This was especially frustrating because the data was already highly inaccurate due to everyone collecting it in different ways. This is a really valuable course, but I wish more time was spent considering how we could use our time to get the most out of the class, especially for a class that requires so much outside work by nature.
	Question: If you have any other comments about the learning environment or course, please provide them here
	I personally felt as if you get as much out of the course as you put in. The students that seemed to be enjoying it the most were the students asking the most questions and engaging with Dr. B. Sometimes things were confusing but asking Dr. B for clarification would often lead to an open dialogue, allowing the class to agree on a solution.
	Both my peers and Professor Bechara did a great job at creating an environment where we were pushed to learn and grow. The online adaptation of the class did not seem to hinder our experience because of how much work Professor Bechara put in to making it a productive and prosperous learning environment.
	This class was well done and interesting. The projects were challenging and I did find it a good class to take. My biggest criticism is that the main projects (what the class is based around) could be presented in a way that is more clear. Almost every time, my group had to email the teacher about clarifications on what he wants us to do. He responded and was helpful but that explanation would be better if it was put in the project description to begin with.
	The grading expectations and course materials for this course were always available and made clear, and Dr Bechara was always available to help during office hours or during outside appointments if there were questions. I do think that many of us struggled during the beginning of the class to understand fully what was expected of us within the problem statements. While I understand that part of this was a learning exercise for us to improve in future assignments, I think that the ambiguity and uncertainty that surrounded a couple of the problem statements made the projects more challenging and difficult to understand than what was necessary. I think the expectations for the problem statement could have been more well-defined and understood from the start, so that students could jump right in rather than taking the first couple weeks to adjust the problem statement and fully understand what was expected.
	Dr. B cares about all of us and makes that clear in the environment of his class. Hes funny and a little goofy but refreshingly real.
	Dr B did a great job of organizing the class and making it a fun class to be in. I really enjoyed all of the project and liked learning different life skills that will be used throughout the rest of my career. At first I wasnt sure the importance of this class, but as I have done things outside of class (presentations for work, writing concise and getting key points across) I can see how important this class is and why it is offered for students.
	The clarity and expectations of the course are usually not clear and all the students are confused about what they are doing, but I am pretty sure that is the intention of the course to make us work harder and better engineers
	Dr. Bechara was always super supportive and always open to meet outside of his office hours for help.
	N/A
	This professor has done a really good job teaching the skills required by this course. In using a discussion based classroom, he opens the floor to any questions that students may have and creates a welcoming and inclusive environment. The classroom environment minimizes stress, as the professor plans the class activities well enough that there is no rush to follow the content plan for the day.
	We kept being told that the projects were not being graded off the rubric, glad I ignored that because they were. It felt like the expectations for the projects kept changing and o did the grading, so we could never figure out what we are being graded on. We kept being told that to not worry about the grade and just worry about doing the best we could. Well it is hard to do that when he actually has a set expectation for the project, but then guides you to thinking the rubric does not matter. When your whole grade depends on these projects and they all can mess up your grade harshly, then it would have been nice to understand exactly what the expectations and grading of the project are.

	This is a wonderful learning environments that wants students to think outside the box for potential solutions through problem solving.
	I enjoyed the class but a little more structure would have helped me get more out of it, other than that the class was great.
	Could be more straightforward with assignments and what his expectations are fro the assignment. Was good at working with the students to explain the assignments.
	Dr. B has effectively created an inclusive and open classroom environment where I feel the majority of students feel comfortable. He "keeps it real" and is honest with us which I appreciate.
	I feel like this class allows for discussion and Dr. B really tries to foster communication during lecture which is especially hard over Zoom.
	I think Dr. B did a great job given the circumstances with COVID. He was lenient with some of the course material and did everything he could to make the course run smoothly. He was very communicative and told us what to expect from the beginning
	I know the professor cares a lot about his students and wants to make an inclusive environment, which I truly appreciate. However, his energy often gives off another vibe, which is that he doesn't care how anyone and that he is too set in his ways to change his actions. I really do think that's not true, but the energy he gives off often seems that way which may make some students more hesitant to speak up and actually see that the professor does care. I think something that may help is if discussions emphasized asking students' opinions before the professor expressed his very strong opinions that he won't change his mind about.
	Question: How could the timing of the feedback be improved? What might that look like? Please be specific in your comments. TEF Domains - Feedback and Assessment
	Timing was great on feedback. We usually got all feedback on our projects within a week of the due date.
	I felt like the timing of feedback was appropriate. Everything was graded well before the next report was due so necessary improvements could be made.
	The timing of the feedback was fine, I dont think there were any issues with the feedback or the time it took to got back. One thing that may have been helpful would have been to spend some time after each presentation to talk about improvements and areas where growth can continue to be achieved. This also may have been better to meet with each group and talk about initial reactions after the presentation. I would have liked to know what went well after the presentation instead of reading it in the comments.
	Timing of feedback was quick and effective.
	I think that the timing of feedback was usually excellent. Our project grades were usually returned pretty quickly after our presentations, allowing us to make changes and adjust accordingly for future projects. It may have been nice to see more constructive written comments from both our TAs and the professor from our presentations. During the presentation days, we received some feedback, but it was usually pretty general. I think more specific feedback for each group after the presentations could be beneficial.
	Some GTAs just took a little too long to grade stuff which would cause our papers to come back a little too close to the due date of the next project making it hard to implement the corrections.
	I think that the timing of feedback is really good in this class. We obtain feedback on our reports and presentations pretty quickly after they are submitted.
	At times you said you would do something but days later you would do it. This semester was hard to get information later than usual. I understand other issues arose that you had to take care of first.
	It id fine as is.
	I felt the timing of feedback was more than enough to be helpful.
	He was good as he would talk about the good and bad the lecture after presentations were done.
	Just have the projects graded more efficiently especially on the pilot and final study projects.
	Feedback on reports was provided in time to apply comments to present assignments.
	The timing of feedback is good, we have previously gotten it in time to use it to improve our next projects

	Question: Describe the instructors expectations. Please include specifics. TEF Domains - Curriculum/Curricular Alignment
Bechara	That seemed like the whole point of this course. Other courses just teach material and test on it and dont care if you do well, but here the instructors time would be wasted if he didnt push us to learn. The class is about learning to solve problems and be scientific in the way we present our findings, so if we didnt learn anything, theres no point in taking the course.
Bechara	As this is a problem-based learning class, Professor Bechara really pushed us. From the beginning, he said he would be grading harsher on the first project because of these high expectations. He made clear that we would fail in some aspects and that that was okay. From failure comes learning and growth. He set the bar high, and when we reached it he praised us but pushed us to reach the next bar up. I appreciated the challenge level of this class because things were not just handed to us and we gained lots from that.
Bechara	Reasonable high. He wants to be prepared for the future when investors or other peers are critical of our research.
Bechara	His expectations are to be able to work in groups to solve a problem, we are supposed to learn from these projects and his lectures are to help us through them, not to give boring lectures. I actually really enjoy this set up and think the expectations are extremely reasonable for this setup.
Bechara	The instructor expects us to take an active role in our learning. He wants us to ask questions, do our research, and really dive into the topics we cover in our problem statements. While he does not expect a lot from us in terms of homework or assignments, I do feel that he expects dedication to the problem statements and a general interest and enthusiasm in learning all that we can from the projects as well as from the journal discussions and general class lectures.
Bechara	The only complaint was that the expectations are not clear in the beginning and more that you learn the expectations by doing. I like to see things in order to learn from it, so I was initially frustrated. However, Ive learned so much regarding presentations, that I appreciate the different format. I have improved so much. I am grateful for that.
Bechara	Dr B wants the students to grow throughout the class. This class focuses on professional growth and being prepared in the real world. Dr B made me understand the work that goes into a lot of the research and what it takes to succeed in the real world. I also think that because of this course, it makes me want to go into grad school and do some research on my own. I really liked this course and the expectations that Dr B had for this course made me want to succeed and put forth a lot of effort into everything that I do in this class.
Bechara	Dr. B does have high expectations for, but I think he is preparing us for our future careers so I appreciate the high expectations and not being treated like we are idiots
Bechara	Its a different kind of class as opposed to any other class Ive taken so far so he expects us to take our knowledge from all classes and apply them at a graduate level.
Bechara	Dr. Becharas expectations were very reasonable, and I felt he was doing his very best to prepare us for what the work force is going to expect from us.
Bechara	You want us to succeed so you make us aim high to showcase our best.
Bechara	The instructor expects us to put in the required amount of effort to build the skills that he is trying to teach us in this course. This includes putting in the work to learn how to critically analyze academic articles, write scientific reports, and perform a scientific presentation about the topic that we have researched. I believe all of this to be incredibly reasonable.
Bechara	He wants students to have a passion for learning and to put out work that they would be proud of. He strives to make all students excel and pushes them to problem solve.
Bechara	Dr Bs expectations were high but in a good way he wanted us to get the most out of his lecture.
Bechara	High expectations that pushed us to be better scientific writers and presentations which is good and helped us grow.
Bechara	Dr. B has reasonably high expectations for us and wants to see growth in our work throughout the semester. He provides support and reviews on how to do this.
Bechara	He wishes for us to give our best efforts and learn rather than memorize.
Bechara	I feel like Dr. Bs expectations are high but they are achievable. He told us early on that his standards are high, but that his goal is to get us up to his expectations. I feel like we have been getting enough feedback to understand what is required of this class especially on the last project presentations. My lab section all made significant strides in terms of our presentation and scientific writing.

Bechara	He expects us to do our own research for the projects and to read the journal articles when they are given to us for discussion.
Bechara	Dr. Bechara maintained very high expectations for us throughout the semester. He expected us to completely understand the problems that he presented to us, and to invest time and hard work into finding and proposing solutions.
Bechara	He expects us to create projects that are on the caliber of professional scientists who are real experts in their field, which is a really high bar.
	Question: How could the amount of feedback be improved? What might that look like? Please provide details. tip: it may help to put the amount of feedback in context with how much work you submitted to get that feedback. TEF Domains - Feedback and Assessment
Bechara	We only have 5 reports paired with 5 reports. As of writing this all of my reports and presentations have been graded well before the due date of the next. We also got immediate feedback on each presentation that quickly let us judge if we did well or not. Im not a huge fan of one of the presentations being pre-recorded so we dont get that instant feedback.
Bechara	Professor Bechara did a great job of giving us important feedback, but not all of it. He expected us to figure some things out on our own and improve ourselves without just being told everything. I appreciated this because it forced us to evaluate our own knowledge and learning to improve for the future projects.
Bechara	No need to improve.
Bechara	As discussed above, I think that the timing and amount of feedback has been consistently helpful in this class. My only suggestion would be that presentation feedback may be more detailed.
Bechara	The feedback is helpful and timely enough that I could apply it to each subsequent project.
Bechara	I dont think the amount of feedback could be improved. I felt like I always got enough information and feedback to know where I can improve in the future and what I did well.
Bechara	It is fine.
Bechara	All of our assignments were graded in a timely manor and feedback was always helpful
Bechara	IDK if Ive heard a lot of feedback for presentations and reports.
Bechara	I feel like one way the amount of feedback could be improved relates to the critical analysis of academic articles that we have to do. I think it would be easier to build this skill if a module was posted in canvas showing how the professor goes through a critical analysis of academic articles. I think that having something we can refer back to while analyzing articles would tremendously assist in building this skill, as we would be able to see if there is something were missing when we try to do that. Other than that, there really isnt any way that I believe the feedback could be improved. We obtain a lot of feedback for our reports and projects, and that definitely helps.
Bechara	Its fine.
Bechara	The feedback was good enough where we were able to improve.
Bechara	I think the feedback being given is adequate.
Bechara	Feedback given is sufficient.
Bechara	I think the feedback we are given is enough. They make it clear what needs to be improved and what we did well. Then tell us to look at other groups for other tips they might have missed
Bechara	I dont think this needs to be improve, weve received really specific feedback and comments on all of our reports and presentations.
Bechara	The professor talks about assignments like he's the one grading them when in reality it's the TAs. Because of that, it sometimes feels like there's a slight disconnect between the professors expectations and the TAs feedback. The professor says he doesn't really grade based on the rubric, but the TAs do. I know the professor says he hates rubrics, but I think he just hasn't been able to write one he likes. If he could create a more open-ended rubric with more applicable expectations that are actually used for grading that may help so that feedback is consistent.
	Question: If you have any other comments about the Instructor, please provide them here

Bechara	I have had Dr. B for 3 courses now and I really enjoy learning from him. He seems to understand what its like to be a student and doesnt want to overload us with unnecessary information and assignments. In this course, he took into account the fact that COVID has made going to school a lot more difficult than normal, and has done well to accommodate and appreciate the hard work we have put in despite COVID. His grading intentions are clear and if they arent he is open to any questions or concerns and often really pushes students to engage and interact. The course doesnt feel robotic and full of unnecessary info and overly difficult exams, the point is to learn and that goal is clearly achieved. I wish more professors understood that.
Bechara	Professor Bechara is an amazing instructor. You can tell that he genuinely cares about his students and their success. The online environment is not easy for students, but it isnt any easier for the professors. He consistently went out of his way to communicate with us and ensure that we were in the best positions possible to continue to fail (sometimes), learn, grow, and succeed in his class. He adapted when necessary even when it wasnt the most convenient for him. It was evident that he really worked hard to make this class a beneficial one throughout the entirety of the semester. This class ended up being my favorite class this semester because I felt valued as a student and person. I felt that I was becoming a better learner, scientific thinker, and researcher. I hope to have the privilege of being in one of Professor Becharas classes in the future.
Bechara	Dr. Bs non-traditional teaching style really works for this course. I cant imagine anyone else teaching it, or at least teaching it as well as he does.
Bechara	There is nothing to be commented on with the timeliness.
Bechara	Ive really enjoyed this class. While I was frustrated at the beginning with the ambiguity surrounding the first few problem statements, I think that the experience of approaching these open-ended problems and defining the problem was really beneficial for my development as an engineer. I can tell that Dr. Bechara is incredibly dedicated to his students. Despite the challenges that Covid and online learning brought to this class, he did everything he could to make sure we were getting the most out of the experience as possible. He was dedicated to our learning and growth in this class, while still being flexible, understanding, and available at all times to help us when we needed it.
Bechara	Thank you Dr. B. My presentations and ability to convey them were trash before this class. This class is hard and I was frustrated in the beginning, and with getting quarantined twice (no ones fault of course), but my growth is huge. This class was uncomfortable and extremely rewarding. I appreciate all you put into this class to help better us and prepare us for the real world. This is the first class I felt was training me for the real world, and you did that well. I appreciate the high standards and challenge, Ive grown a lot for it. Thanks again Dr. B.
Bechara	Dr B did a great job this semester with making the course and the projects fun despite the challenges that have come with COVID. This is my third course with Dr B and he has been my favorite professor so far at CSU. I really like interacting with them and appreciate the passion that they have for seeing students succeed. I have been really lucky to have them as a professor.
Bechara	There are several terrible engineering professors I have had at CSU (most of the CBE department professors are mean, miserable, assholes who hate students)- however Dr. B is the best professor I have had by far. He is so caring and kind and wants to help his students succeed and grow in their knowledge. This is my favorite professor and I am so happy to have had him teach this class
Bechara	I loved having Dr. Bechara as a professor, definitely one of my favorite professors at CSU. He was always super engaging, and made sure to bring in real world context so we can see how everything applies. I also had him for MECH 103 and 105, and I wish I could have him for more classes. He was one of the few professors that was able to keep me engages for the whole class period, even when being online.
Bechara	This course has enabled a different opinion of Dr. Bechara. While I am still finding some of his methodology unorthodox, it is needed when comparing to other faculty. I am thankful to have had him as a teacher and CSU is better for having him teach.
Bechara	I believe that this instructor does a very good job of creating a classroom environment that is conducive to learning and skill-building. I really enjoy his teaching style and have learned a lot this semester as a result. It takes a specific kind of person to create a good environment for building the softer skills that a career in engineering requires. This instructor matches all of those requirements, and is very effective in his role. His care for his students is expressed very clearly, helping create both a healthy learning environment and a link of respectful trust between himself and his students. He makes it clear that he is willing to go above-and-beyond to help his students, and reaching out to him is welcomed and encouraged. Its nice to have a professor who explicitly states that he cares about who you are as a person, not just as a student, as it removes a bit of the stress that can come from talking to a professor. He is probably one of the best professors that Ive had during my time at CSU.

Bechara	I think Dr. Bechara is an excellent instructor, just has run out of ideas for the course. I think he struggled to come up with projects and needs a break from this course for a year or so. Sometimes it felt like he could not communicate what he actually wanted from these projects until we had done tons of work that we would have to restart. Overall I think the students felt bored with the projects and not pushed to the limits. Dr. B did connect well with students and is a good instructor. I enjoyed lectures and such, but some fresh ideas need to be pumped into the course.
Bechara	This was the first time Ive has Dr B as my professor and he was wonderful. He always had great positive energy and you can tell that he really cared about students and learning. He did a wonderful job.
Bechara	The instructor is interesting and eccentric, but it makes the class interesting.
Bechara	Dr. B wants to see each of us succeed and will put the effort in to see this happen.
Bechara	Dr. B has been one of my favorite professors I have had at CSU. I have had him in Mech 103, 105, and now Biom 300. Hes the reason that I got involved with on campus projects as early as I did by having us go to E-days freshman year. Likewise this year, I feel like this class had helped prepare me the most for industry out of any class I have taken. Project based learning has helped me develop my researching, writing, and presenting skills. It has also allowed me to pull content from other classes and help bridge the gap from classes like solids, stats, and fluids to their functions in biomedical engineering.
Bechara	Throughout my time in the college of engineering at CSU, I have never felt like a professor cared more about his students than Dr. Bechara. He challenged us in a way that forced us to find a new way of thinking and approaching problems. He demonstrated the importance and value in teamwork when it comes to solving problems. He taught us how to properly give presentations and challenged us to be better with each one. This was a class that I wanted to do well in, not because of the grade, but because I actually enjoyed everything that we did and I wanted to keep improving upon my scientific research and engineering skills. Out of all of the courses that have been transitioned to an entirely online or hybrid platform due to the pandemic, this one has felt the most interactive and valuable due to Dr. Bs instruction. In most of my online courses, I spend my time watching pre-recorded lectures for three hours and then spend an hour a week doing a worksheet over a Zoom call. Dr. B made his classes interactive and engaging by making them live online lectures for which we had to attend, and that made it so much easier to motivate myself to participate and do well in this course.
	Question: You chose to sign this evaluation, Please type your name in the box below.
	Garret Snyder
	Alexa Morgen
	Ali Rochette
	Justyn Knapp
	Stephanie Mooty
	Jared Schymanski
	Ryan Mahoney

Appendix X

WSCOE – MATH Student Success Initiative

Calculus Engineering Enrollment and DFW Rates

Term	Total Enrollment at End of Term				Engineering Student Enrollment at End of Term				% Engineering Enrollment			
	MATH 160	MATH 161	MATH 261	MATH 340	MATH 160	MATH 161	MATH 261	MATH 340	MATH 160	MATH 161	MATH 261	MATH 340
Fall 2021*	402	258	291	234	241	159	257	202	59.95%	61.63%	88.32%	86.32%
Spring 2021	163	320	293	306	69	215	171	252	42.33%	67.19%	58.36%	82.35%
Fall 2020	346	354	321	247	202	201	246	210	58.38%	56.78%	76.64%	85.02%
Spring 2020	281	394	256	323	123	232	173	276	43.77%	58.88%	67.58%	85.45%
Fall 2019	446	404	412	274	233	186	315	220	52.24%	46.04%	76.46%	80.29%
Spring 2019	289	403	280	343	94	219	201	264	32.53%	54.34%	71.79%	76.97%
*Enrollment number for FA21 are as of 11.15.21, not end of term				Overall Averages	160	202	227	237	**48.20%**	**57.48%**	**73.19%**	**82.73%**
				Fall averages	**225**	182	**273**	**211**				
				Spring averages	95	**222**	**182**	**264**				

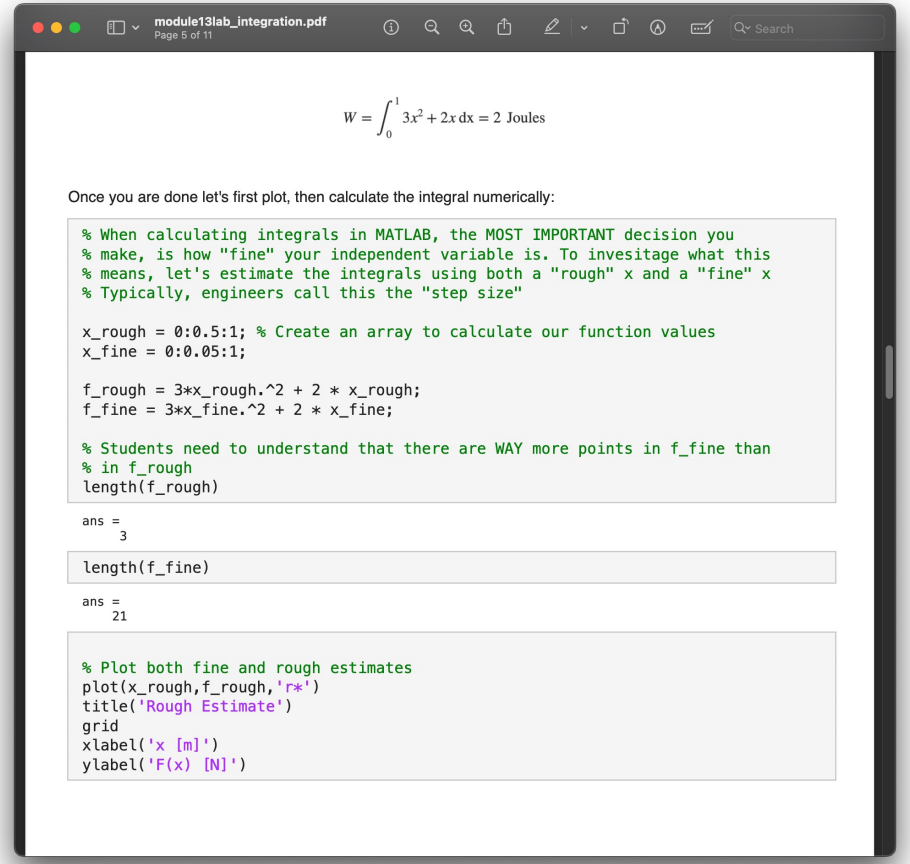
WSCOE students represent about half of the Calculus I (MATH 160) enrollment and increase to ~83% for Differential Equations (MATH 340).

DFW rates (%)	MATH 160	MATH 161	MATH 261	MATH 340
Fall 2020	34	33	13	21
Fall 2019	29	32	8	25
Fall 2018	30	32	13	36
Fall 2017	28	36	16	35
Averages	30.3	33.3	12.5	29.3

Approximately 1/3 of students DFW in Calculus I and II, with similar rates in Differential Equations.

WSCOE-MATH SSI Calc Initiative

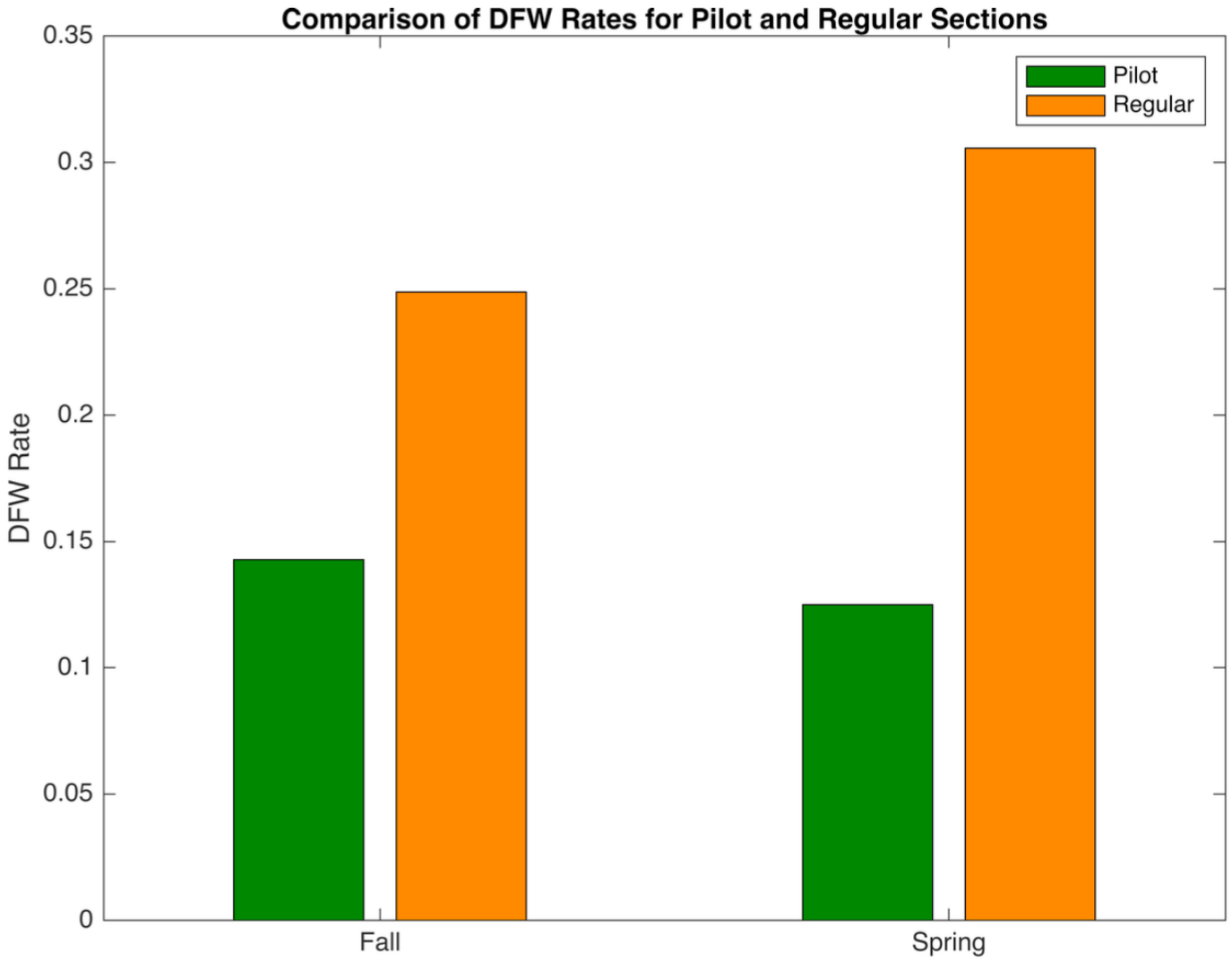
- The WSCOE-MATH SSI initiative introduced 30 new laboratories, uniquely designed to blend engineering concepts with the mathematics principles being taught to students.
- The aim was to ascertain whether this hands-on, applied learning could enhance comprehension, improve grade outcomes, and promote retention among students.
- The following data are from the pilot test, comparing results from students who underwent this integrated learning experience (~60 in 2 sections) with those who were in the traditional recitation section. (~190 in 8 sections)



Example of a MATLAB Based Calc I Lab

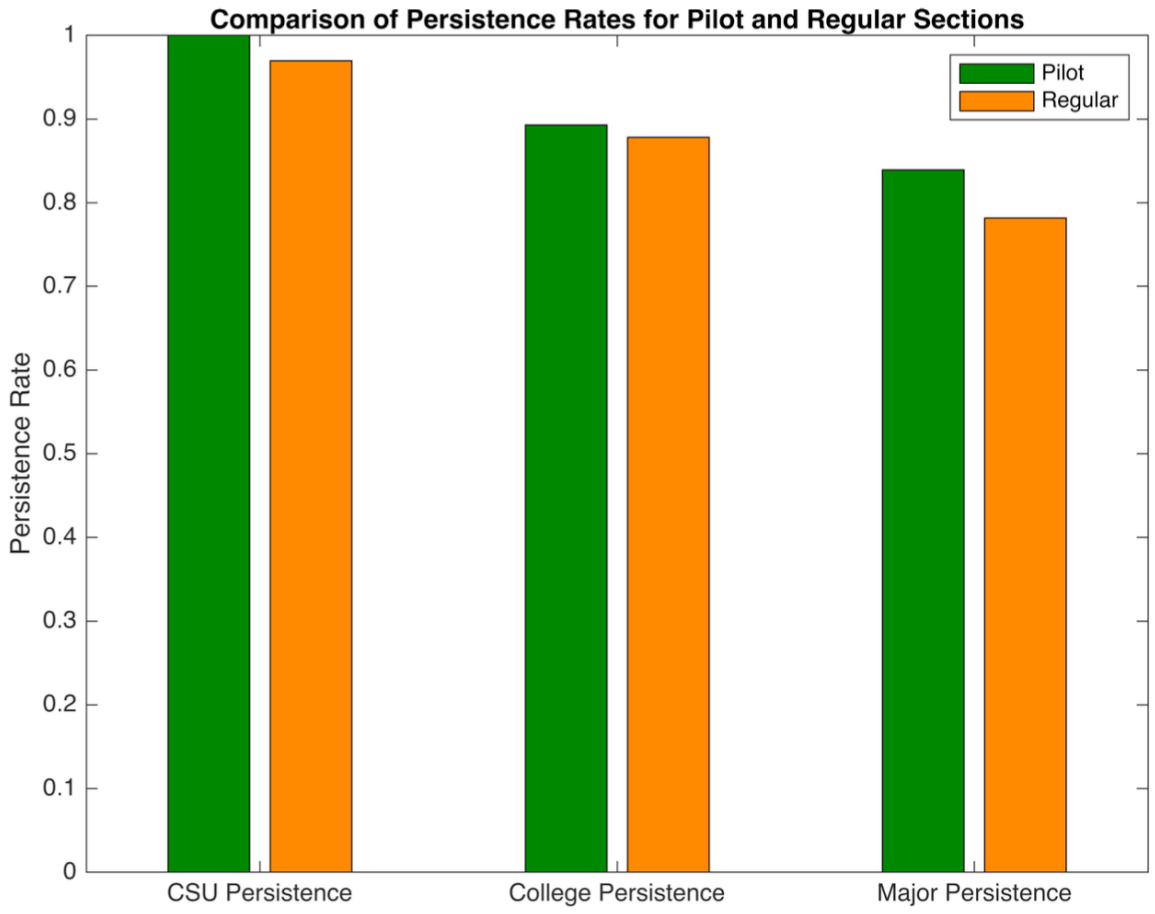
Better DFW

Students in the pilot displayed a significant reduction in DFW rates (grades of D, F, or withdrawal) in MATH 160 during the Fall, indicating better grasp and performance.



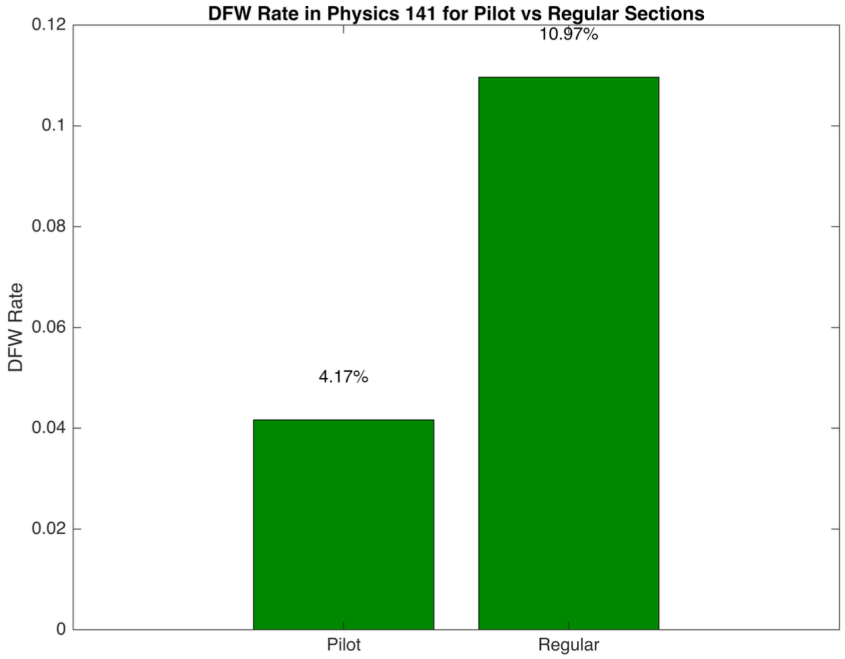
Encouraging Persistence

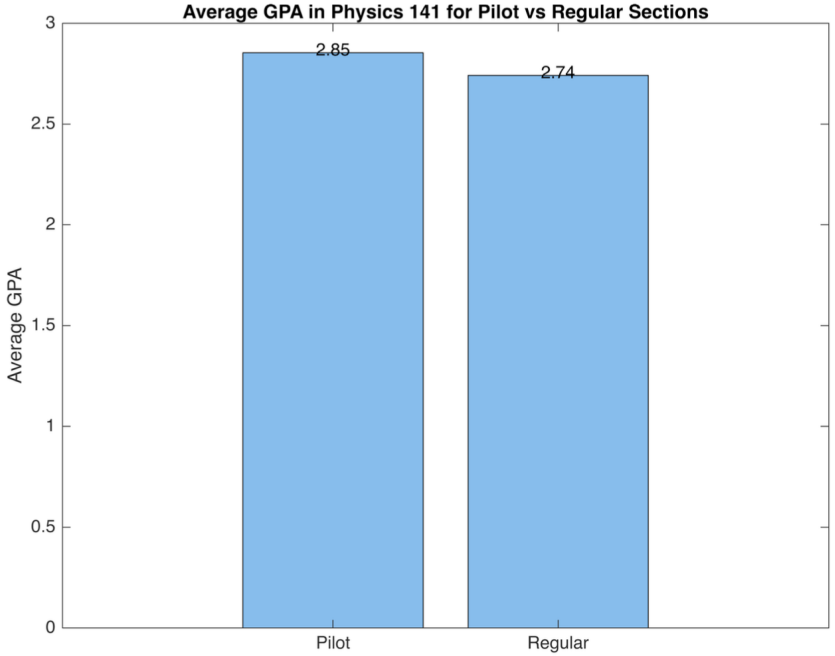
Persistence rates, which denote the likelihood of students continuing their studies, were excellent across the board. Especially notable was the pilot class's slight edge in persisting within the same college and major, hinting at the potential of the integrated approach to bolster commitment to their chosen fields of study.



Phys 141 Performance

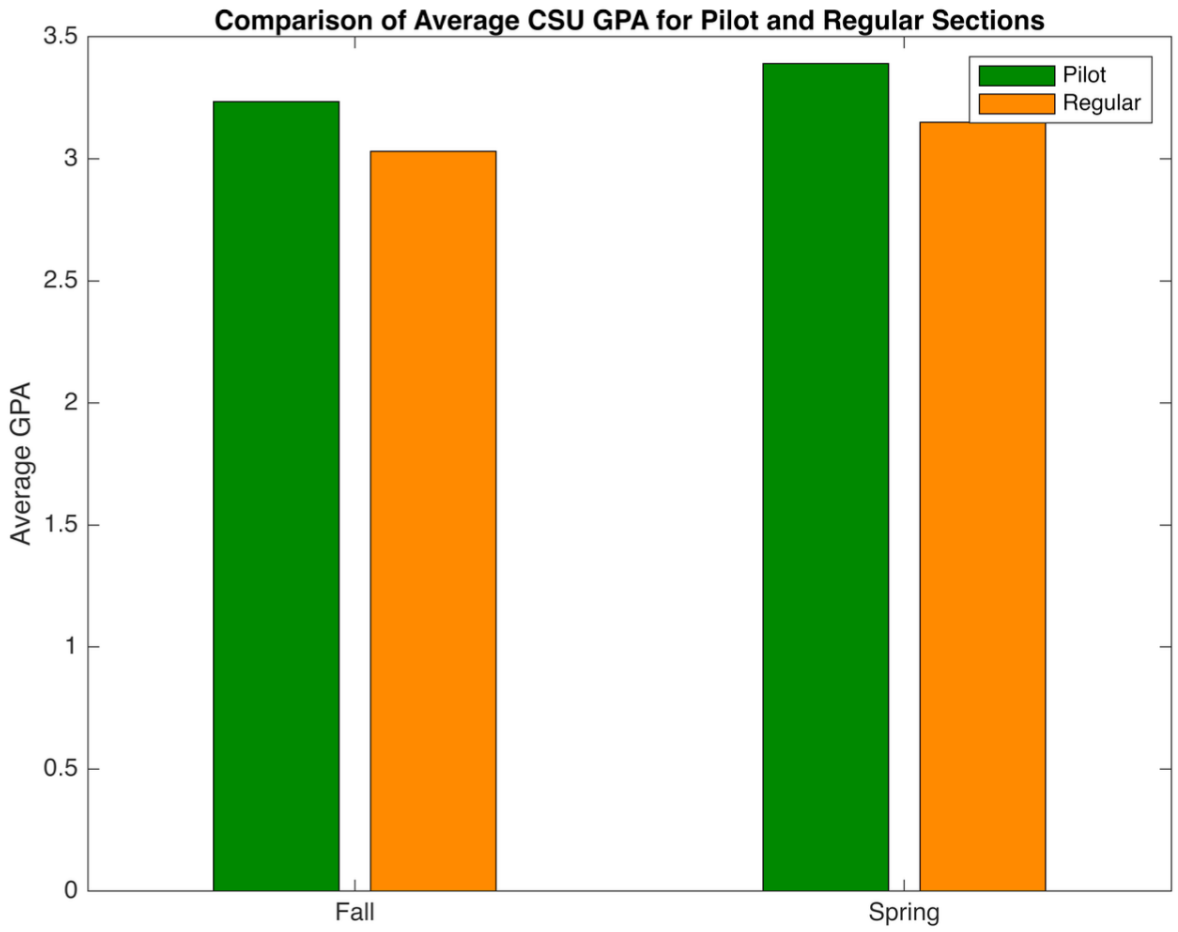
There's an upward trend in the performance of students from the pilot group in Physics 141. While statistical significance hasn't been reached, the trajectory is worth noting for its potential implications.





Overall GPA Increase

One of the most striking revelations was the notable uplift in the average CSU GPA for students in the pilot courses, approximately +0.2 GPA points higher than their peers in the regular sections.



MATH 160* Module 13 Lab - Integration

Created by: Samuel Bechara, PhD

Written on: November 2022

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Table of Contents

EXPLORATION

1. Get to work (Physics work that is)!

Recall that work is done when a force is applied to an object to move it a certain distance (if you haven't learned this yet, you will when you take Physics I). **If the force is constant**, the work done is just the force times the distance:

$$W = F \times d$$

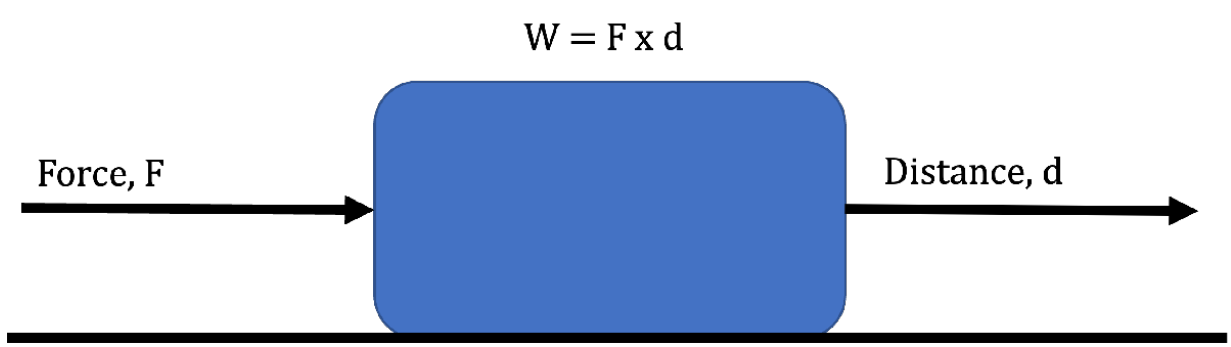


Figure 1.1: Diagram showing an object, moving with applied force F

If the object is moved by a constant force as shown in figure 1.1, the work done is the "area" under the force-displacement curve:

$$W = F \times d = F \cdot (x_2 - x_1)$$

If you are operating in the SI system, the units for W are Joules, the units for F are Newtons, and the units for x are meters.

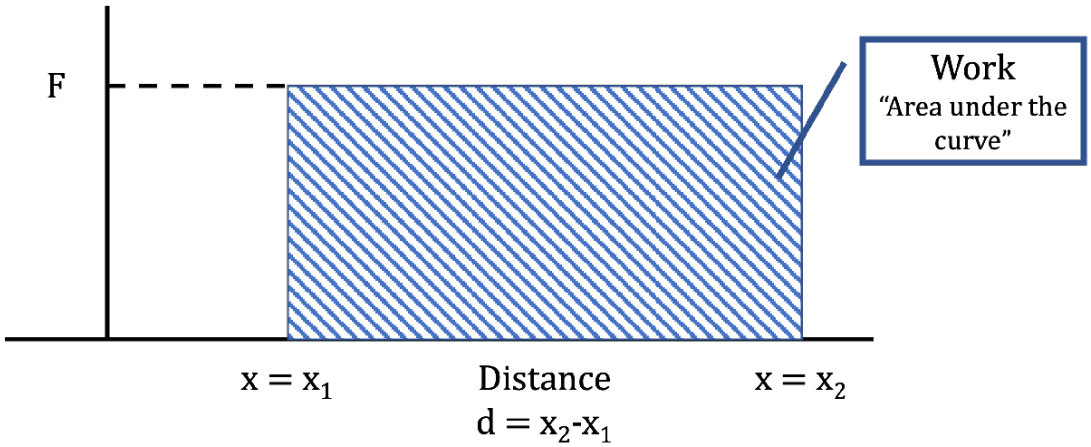


Figure 1.2: Work as area under a constant force curve

Things get more interesting when the force is not constant but instead can be described with a function of x. In the case that x varies, you can no longer count the force as a constant so the work becomes:

$$W = \int_{x_1}^{x_2} F(x)\,\mathrm{dx}$$

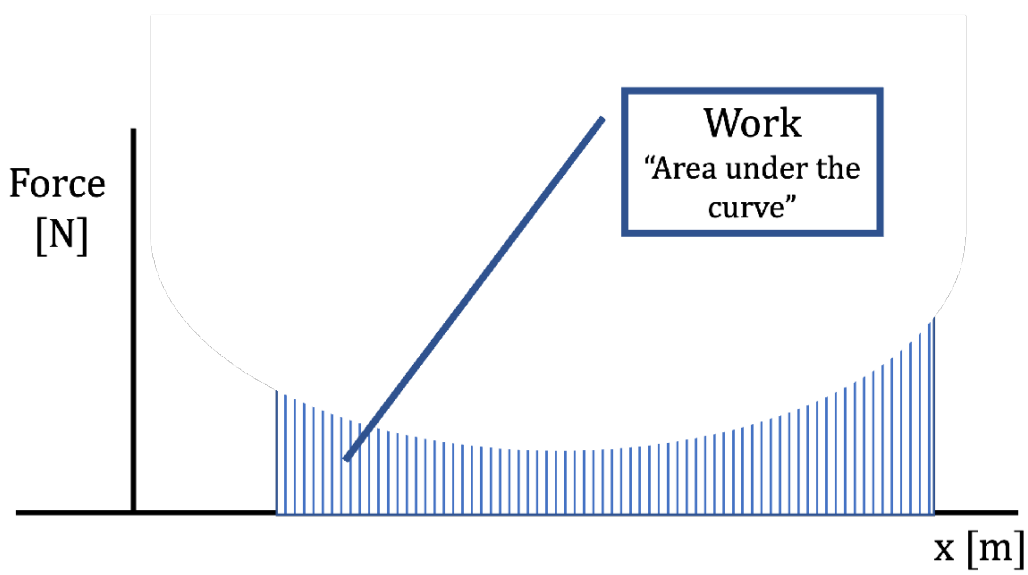


Figure 1.3: Work as area under a variable force curve.

As a future engineer, it is more important to *think and understand* what integrals are used for than to learn all of the different techniques to solve them. I am not saying that what you are learning in class is unimportant! But the truth is that engineers have some pretty neat tricks they can use to calculate integrals without calculus (we will investigate some of these tools shortly).

For this example, I encourage you to take a moment to notice that the equation: $W = F \times d$ is the exact same thing as $W = \int_{x_1}^{x_2} F(x)\,\mathrm{dx}$ in the case where F is constant!

Spend a moment to "prove" this equality by hand.

The reality is that Engineers use integrals because in the real world, things are constantly changing. We need integrals to be able to characterize how one changing variable can impact the summation of different properties over either spatial or temporal variables.

1.2 The engineer's "trick". What if instead of dx we just used Δx?

Let's take another look at the equation: $W = \int_{x_1}^{x_2} F(x)\,\mathrm{dx}$. You should have learned in class that the $\int$ symbol is signifying a "summation" operation. You should have also learned that the $F(x)\,\mathrm{dx}$ in the preceeding equation you can think of as multiplying *all* of the function values $F(x)$ by an infinitely small width, dx. Each time you do this, you calculate a dAor incremental area.

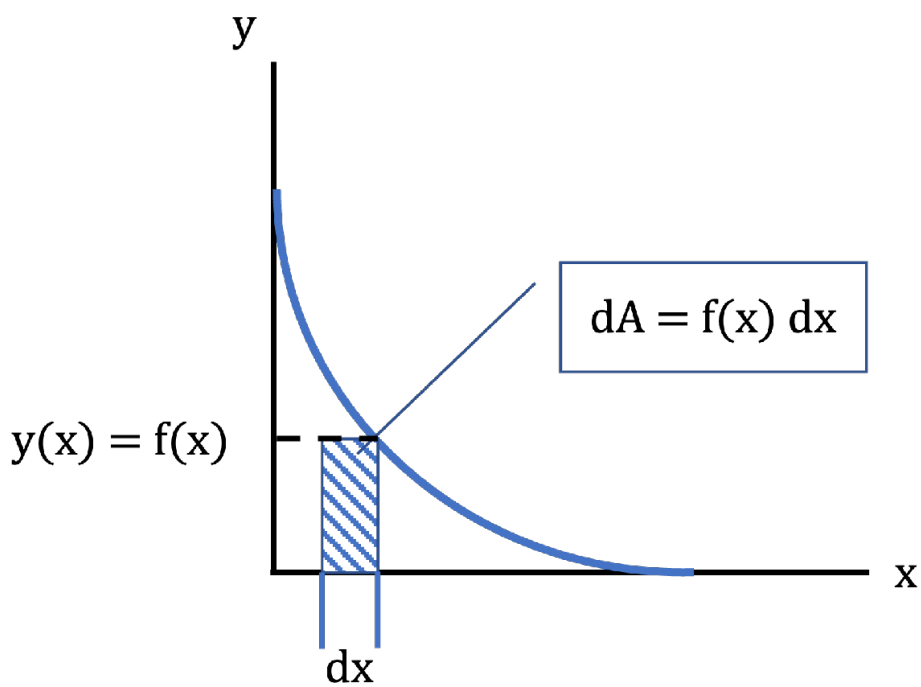


Figure 1.4: Showing an example of an integral, highlighting the incremental area dA

So that means all an integral is, is summing up all of the areas of an infinite number of rectangles that comprise of the "area under the curve".

1.3 An example of variable Force and the impact on Work

For this example, let's consider the case where the block is moved a total distance of 1 m and that the force on the block can be characterized by:

$$F(x) = 3x^2 + 2x \quad \text{[units in Newtons]}$$

This means that the work done on the object is:

$$W = \int_0^1 3x^2 + 2x \, \mathrm{dx} \quad \text{[units in Joules]}$$

To investigate this situation, first calculate the integral **by hand.** Recall that this is called the "analytical solution". You should get:

$$W = \int_0^1 3x^2 + 2x \, \mathrm{dx} = 2 \text{ Joules}$$

Once you are done let's first plot, then calculate the integral numerically:

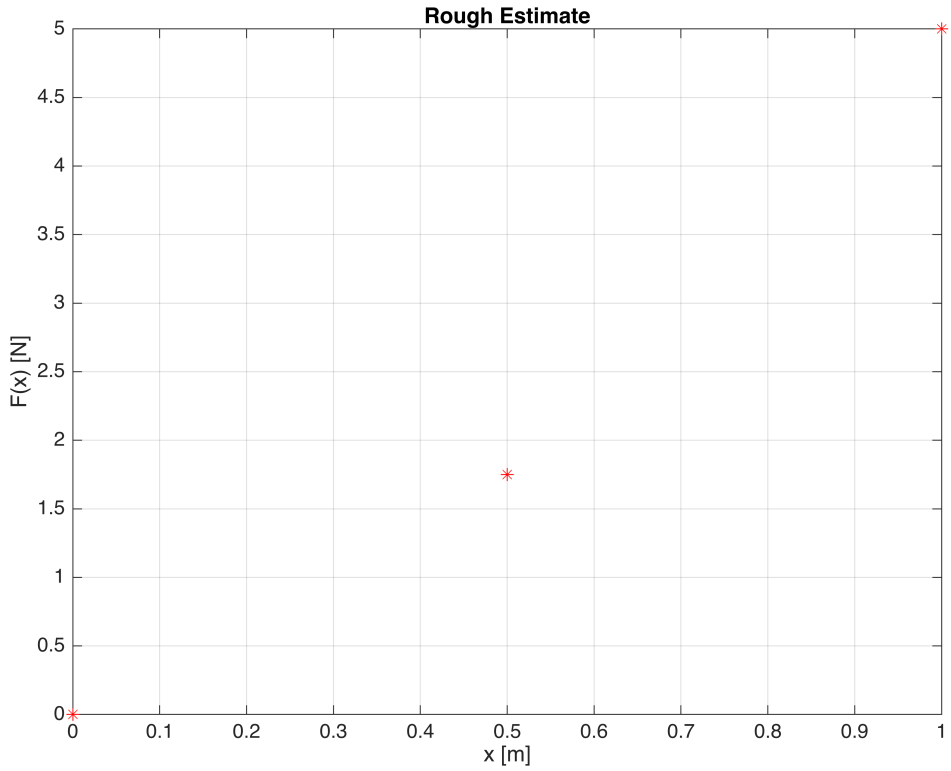
```
% When calculating integrals in MATLAB, the MOST IMPORTANT decision you
% make, is how "fine" your independent variable is. To invesitage what this
% means, let's estimate the integrals using both a "rough" x and a "fine" x
% Typically, engineers call this the "step size"

x_rough = 0:0.5:1; % Create an array to calculate our function values
x_fine = 0:0.05:1;

f_rough = 3*x_rough.^2 + 2 * x_rough;
f_fine = 3*x_fine.^2 + 2 * x_fine;

% Students need to understand that there are WAY more points in f_fine than
% in f_rough
length(f_rough)
```

```
ans =
     3
```

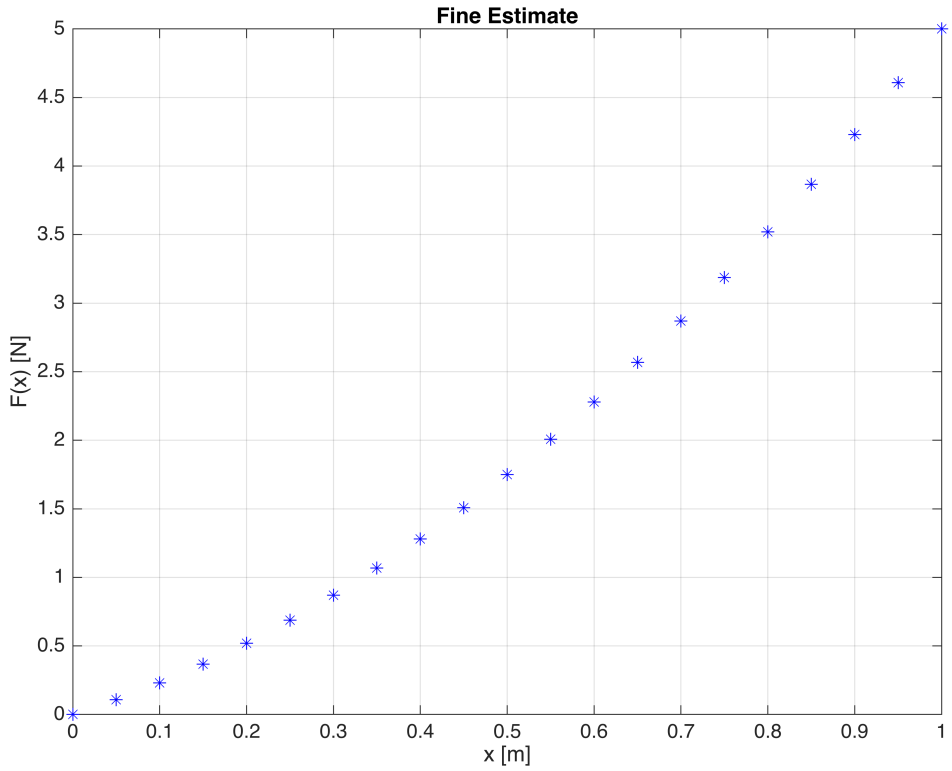
```
length(f_fine)
```

```
ans =
    21
```

```
% Plot both fine and rough estimates
plot(x_rough,f_rough,'r*')
title('Rough Estimate')
grid
xlabel('x [m]')
ylabel('F(x) [N]')
```




```
figure

plot(x_fine,f_fine,'b*')
title('Fine Estimate')
grid
xlabel('x [m]')
ylabel('F(x) [N]')
```



1.4 The Trapezoidal Method of Numerical Integration

Notice the number of function values that were calculated in the "rough" step size vs "fine" step size case are significantly different. This is incredibly important! The way that MATLAB estimates integrals is by creating "trapezoids" between all of the $F(x)$ values that are calculated and then sums up the areas of those trapezoids. It is important to realize that this is an estimate and will not be exact to the actual integral.

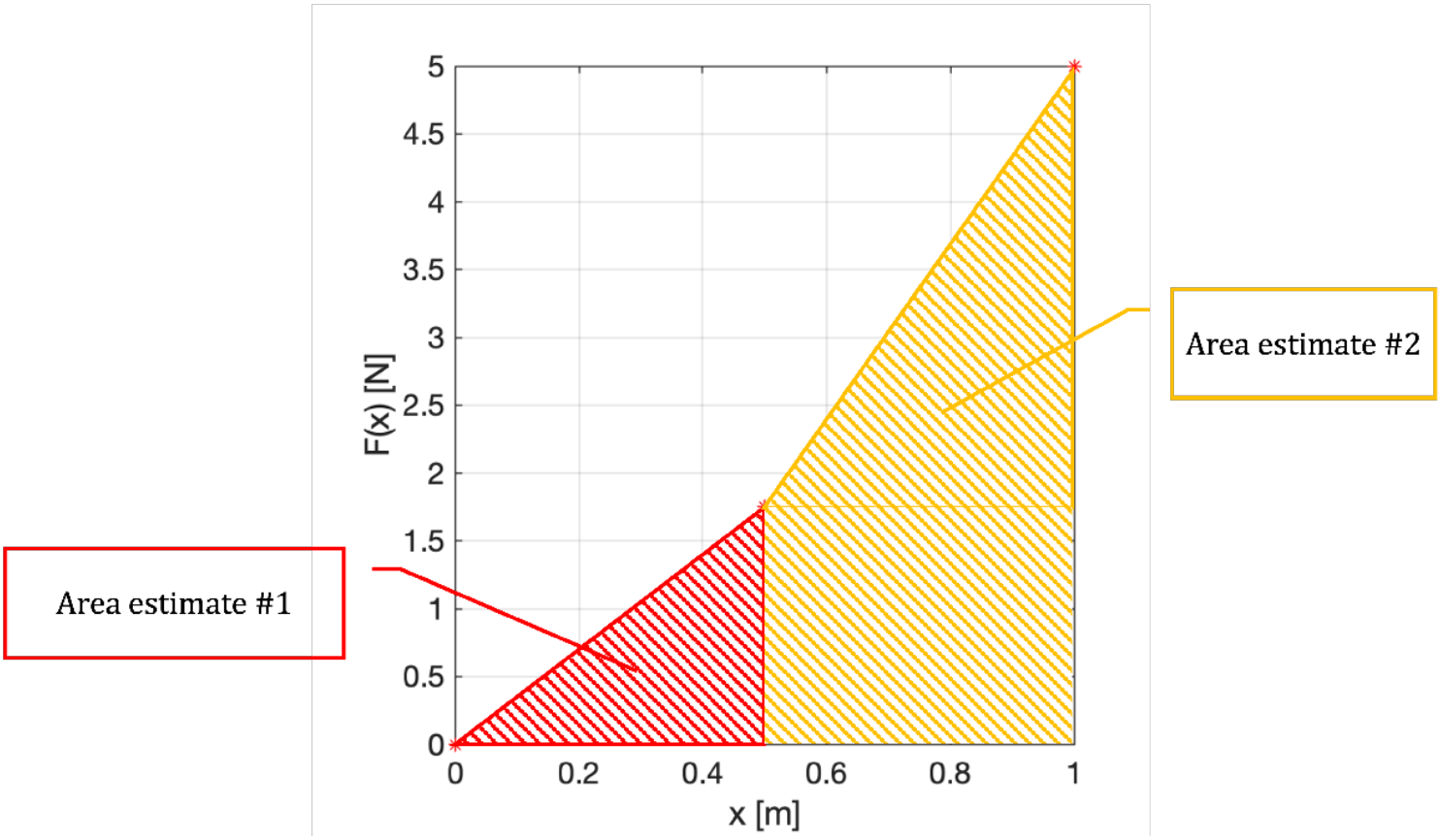


Figure 1.5: A diagram showing HOW MATLAB will estimate the integral of the "rough" version. Look at how the plot generated above for the "rough" example compares to this figure.

We can validate this by first just calculating the areas of the objects shaded in Figure 1.5 above. Notice that the first area estimate is just a triangle (a special kind of trapezoid). Recall that the are of a triangle is: $A = \frac{1}{2}(b \times h)$. Further, notice that the "height" of the triangle is simply $f(0.5) = 1.75$. That implies that the first area estimate is:

$$\text{Area Estimate \#1} = \frac{1}{2}(0.5\,m * 1.75\,N) = 0.4375 \text{ Joules}$$

Next let's calculate Area Estimate #2. Notice how the trapezoid can be thought of as a rectangle and a triangle stacked on eachother (in figure 1.5 I include a faint line so that you can visualize what I mean). The rectangle has dimensions: $\text{Area} = 0.5\,m \times 1.75\,N$. The triangle on top of it has $b = 0.5\,m$ and $h = 5\,N - 1.75\,N = 3.25\,N$. That means that the area estimate #2 is:

$$\text{Area Estimate \#2} = \text{Area of Rectangle} + \text{Area of Triangle} = (0.5\,m \times 1.75\,N) + \left(\frac{1}{2}\,0.5\,m \times 3.25\,N\right) = 1.6875\,\text{Joules}$$

Finally, we can get our total integral estimate by adding up the two areas we estimated the curve with:

$$\text{Integral Estimate} = 0.4375\,\text{Joules} + 1.6875\,\text{Joules} = 2.125\,N$$

First you should notice that our estimate *overestimated* the actual integral (the analytical solution was 2 Joules). This discrepancy arises because we are only ESTIMATING the integral when we calculate a numerical solution with a bunch of trapezoids (the analytical solution summed an infinite number $F(x) \times \mathrm{dx}$ values). Further, it should be clear to you that this is incredibly tedious to calculate by hand. Especially in the "fine" case. Remember, we are only doing this to PROVE that this is the way that MATLAB works.

1.5 The MATLAB `trapz()` function

To calculate a numerical integration in MATLAB, we use the `trapz()` function. For example, the code Z = `trapz(x,y)` computes computes the integral of y with respect to x using the trapezoidal method and stores the result in the variable Z.

(Note: there are several other algorithms in MATLAB for solving numerical integrals, but those will be covered in a future engineering programming course).

```
% Int Estimate Rough
integral_rough = trapz(x_rough,f_rough) % It's the same as our estimate we calculated
```

```
integral_rough =
   2.125000000000000
```

```
error_rough = abs(2-integral_rough)
```

```
error_rough =
   0.125000000000000
```

```
% Int Estimate Fine
integral_fine = trapz(x_fine,f_fine)
```

```
integral_fine =
   2.001250000000000
```

```
error_fine = abs(2-integral_fine)
```

```
error_fine =
   0.001250000000000
```

Notice how the `trapz()` function returned the exact same value as our "by hand" calculation using the trapezoidal method! Further, you should notice how the error for the "fine" estimate is significantly smaller than the error for the "rough" estimate. That should make sense. As you continually decrease the distance between points that you are using to calculate $F(x)$ values, you get more and more accurate estimates as to the actual integral. You should realize that if you made the points *infinitely* close together that would be the actual integral!

Assignment

2. Another Work Problem

For this first part of this assignment, consider the same case as in the Exploration above. Start by calculating the work done on an object moved 1 m by a variable force that can be described by:

$$F(x) = 2\sin\left(\frac{\pi}{2}x\right) + 3\cos\left(\frac{\pi}{2}x\right) \text{ [Units in Newtons]}$$

2.1 Problems:

1. Calculate the analytical solution of the work done on the object (MATT, CAN THEY DO THIS?)
2. Plot Force vs Distance using a step size of 0.1
3. Calculate the numerical integral using a step size of 0.1.
4. What is the error associated with the estimate in problem 3?
5. Plot Force vs Distance using a step size of 0.0001.
6. Calculate the numerical integral using a step size of 0.0001.
7. What is the error associate with the estimate in problem 6?

3. Turbulent Flow in a Pipe

The flow rate Q (volume of fluid per second) in a round pipe can be calculated by:

$$Q = \int_0^r 2\pi v r \, \mathrm{dr}$$

Where r is the radius of the pipe and v is the velocity profile of the fluid flowing in the pipe (you guessed it, it isn't constant over the pipe radius). In this case, r is the independent variable and v is dependent on r.

Flow is typically characterized as "turbulent" or "laminar" (if you click the link, it will take you to a quick little video that shows you an example of highly ordered laminar flow turning into chaotic turbulent flow). The figure below is from a USDOE handbook on fluid flow. It is describing how different velocity "profiles" of flow look like in a pipe.

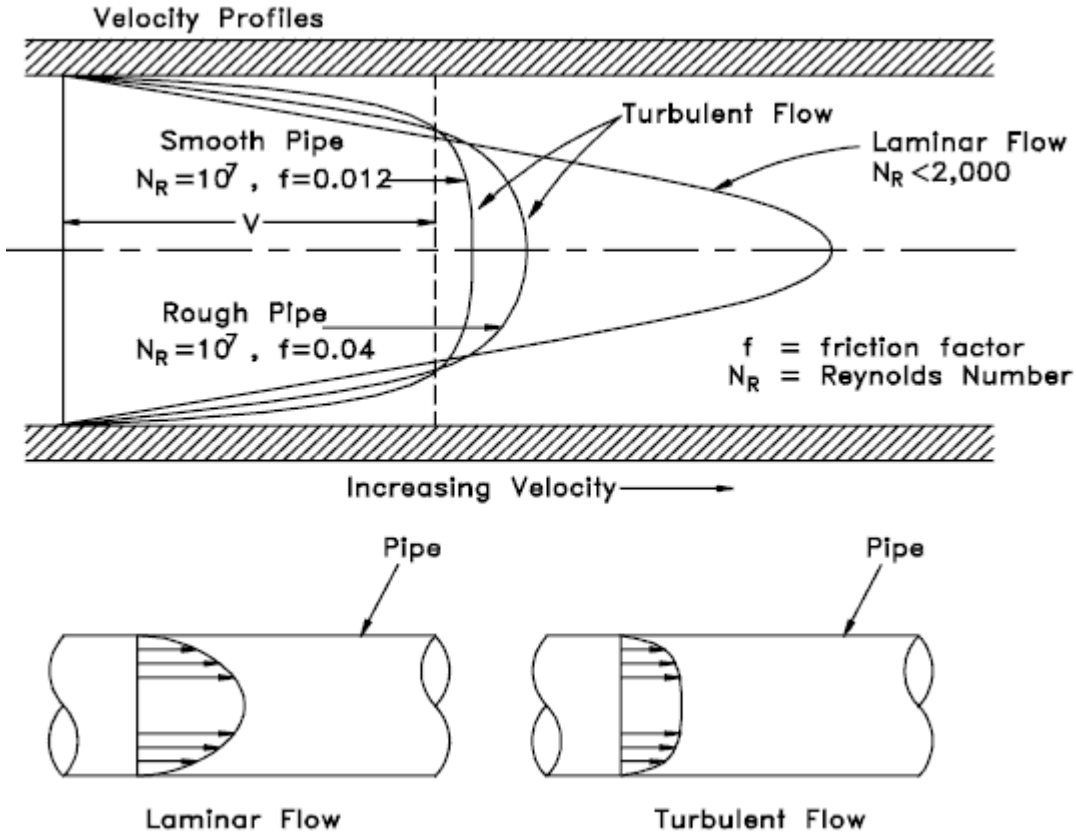


Figure 3.1: A picture describing different velocity profiles for laminar vs turbulent flow. Source: U.S. Department of Energy, THERMODYNAMICS, HEAT TRANSFER, AND FLUID FLOW. DOE Fundamentals Handbook, Volume 1, 2 and 3. June 1992.

For turbulent flow, the velocity profile can be estimated by:

$$v = v_{\max}\left(1 - \frac{r}{R}\right)^{\frac{1}{n}}$$

Where $v_{\max}$ is the maximum velocity in the profile (according to figure 1.3 that occurs in the very middle of the pipe), R is the *total* radius of the pipe, and the exponent n is a constant whose value depends on the **Reynolds number**. Remember, little r is the independent variable and is different than big R.

3.1 Problems

1. Determine Q for $R = 0.25\,\text{in}$, $n = 7$, and $v_{\max} = 80\ \frac{\text{in}}{s}$ using MATLAB.

Appendix XI

Letter of Support from Carissa Vos

September 8th, 2019

To Whom It May Concern,

This letter of support is for Dr. Samuel Bechara. It was a privilege to have Dr. Bechara as my professor for Introduction to Mechanical Engineering (MECH103) and Mechanical Engineering Problem Solving (MECH105). Dr. Bechara has a true passion for teaching and it shows. He clearly wants his students to be successful in and out of class.

To set up his students for success, Dr. Bechara creates an inclusive learning environment, particularly for female and minority students. For example, throughout MECH103 and MECH105 I personally appreciated Dr. Bechara's assistance in understanding course content. He was always happy to individually review exams or course concepts that I was struggling with. This individual support caused me to feel included and set up to succeed. In class, Dr. Bechara had the ability to control a large classroom environment while also providing challenging, but entertaining assignments outside of lecture time. In order to control a large classroom environment, Dr. Bechara used his ability to connect with students by creating entertaining lectures that also delivered critical course content. By creating assignments that related to real-world applications, Dr. Bechara seamlessly provided challenging, yet entertaining assignments. Discussions stretched our thought processes, meanwhile homework assignments typically allowed us to practice course concepts on real-world examples.

In addition to excelling as a professor, Dr. Bechara also pushes his students to excel outside of his courses. Throughout MECH103 and MECH105 he took time out of his busy schedule to meet with me to discuss internships, resumes, student organizations, and personal passions. More recently, despite that I no longer have him as a professor for my current classes, he has continued to advise me on professional and educational goals. On numerous occasions Dr. Bechara has been a mentor to me and other students, pushing us to be the best versions of ourselves.

It has been clear since the beginning of MECH103 and MECH105 that he wants all of his students to succeed as learners and future engineers. Dr. Bechara has definitely impacted my life, and I am certain that he will continue to impact many other student's lives. I am confident that Dr. Bechara will continue to be an outstanding professor who creates an inclusive, controlled, and entertaining learning environment. If you would like to discuss Dr. Bechara's strengths in more detail, I am available at cvos@rams.colostate.edu.

Sincerely,

Carissa Vos

2nd Year Undergraduate, Mechanical Engineering

Colorado State University

Appendix XII

Letter of Support from Kelsey Bilsback

Kelsey Bilsback
1371 Campus Delivery
Fort Collins, CO 80523
Kelsey.Bilsback@colostate.edu

September 9, 2019

Dear Promotion Committee:

I enthusiastically recommend Dr. Samuel Bechara for promotion to Associate Professor of Practice. I worked with Dr. Bechara during the spring semester of 2018 when I was a graduate teaching fellow (GTF) for *Introduction to Mechanical Engineering* (MECH 103) at Colorado State University. The GTF program pairs a senior PhD student with a faculty member in an introductory level engineering class. During the program, Dr. Bechara mentored me on teaching in an academic setting. I also attended all the lectures for the course, so I was able to observe his teaching regularly.

Working with Dr. Bechara, it is clear that he is an exceptional instructor. He has a high level of enthusiasm making his lectures engaging and highly informative. His office hours were always filled with students demonstrating that he is an approachable and effective teacher. During the semester, we spent a considerable amount of time reflecting on what worked well and what could be improved, show-casing his passion for continuously improving the course for future students. Dr. Bechara is also passionate about classroom engagement. With both the random student generator (a MATLAB program he wrote) and the welcoming atmosphere he created in the classroom, even students who were initially tentative to participate in classroom discussions were sharing by the end of the course. This created a positive learning environment that provided an opportunity for the whole class to perform at a higher level.

As a GTF, I found Dr. Bechara to be a dedicated mentor. He gave me both autonomy and support when I was preparing lectures for the course. Additionally, each time I lectured, he provided me with detailed feedback helping me improve as an instructor throughout the semester. Dr. Bechara also did a phenomenal job mentoring our learning assistant (LA) Chon Chia Ang. Through Dr. Bechara's mentoring, Ang had greatly improved his communication skills during the computer laboratory sessions. I confidently recommend Dr. Bechara for promotion to Associate Professor of Practice. I think the students at Colorado State University would be lucky to have him as an instructor and mentor. Please feel free to contact me if you have any additional questions.

Sincerely,

Kelsey Bilsback
Postdoctoral Fellow in Atmospheric Science

Appendix XIII

Selected Comments from Student Evaluations

MECH 202 Fall 2023

- “Dr. B is one of the best professors I have ever had. Im currently in a military program that I lead 20 cadets in and the way Dr. B cares for students and leads them is a way I try to use in my own leadership style. One of my cadets is in Dr. Bs Mech 103 class and she has really struggled with the math part but she always talks about how impactful Dr. B has been on her life. Shes dropping the major but she told me how much she loved Dr. B and how she wants to invite him to her future wedding. Teachers like Dr. B are people who make me want to give back and become a teacher myself so I can become an impactful leader like him. Some people tell me you either love Dr. B or you hate him and I think that is completely wrong. Dr. B expects highly of his students and those who are used to skating by are not used to it and transfer it into blaming him for their failures. I believe in the concept of we should produce the "best engineers" not the "most engineers." Im truly thankful for Dr. B and think without him I wouldnt have made it this far into engineering. I hope other professors can be inspired by Dr. B as well and us it to help their students better.”

- “I think that Dr. B has really brought MECH 202 back to life. This class is meant to be a pivotal part of engineering students education, and it was exactly that. Not only did he push us intellectually, but he also pushed us to be better versions of ourselves. He made us advocate for ourselves, but also never abandoned us. He led through example to show us how cool and important this class was. He risked his reputation to make the Battle Boat Competition huge to show us he had faith in us as engineers to make him proud. Dr. B is truly a gem in the college of engineering. He is always motivated by students best interest and gives us his best. In exchange, he expects the best from us and will not give up until we but our best foot forward. I also found it really thoughtful that he made sure out textbook was free and accessible to all.”

- “Dr. B is an incredible professor. His passion is contagious as well as his enthusiasm. His vision for this class is incredible. The Battle Boat competition was a highlight of my CSU experience. I cant wait to see what he does for the upcoming years; I just know that the design projects are going to become more spectacular and streamlined in the years to come, under Dr. Bs influence. “

MECH 103 Fall 2023

- “Dr. B slays. The way he teaches lectures and interacts with the students has made me much more enthusiastic about mechanical engineering!”

- “This class was one of if not was the most fun classes I had this semester, it was only that way because of Dr. Bechara. I can not express how grateful I am that he was the teacher and how grateful I am that he could be my teacher in the future. It truly was a pleasure to be in this class.”

- “Dr. Bechara was a great teacher with an even greater sense of humor. Coming to class was very easy to do because each lecture was interesting and fun. We had class discussions as well as special guests from the work force come in. I very much enjoyed this class and hope it stays mostly the same for incoming mechanical engineers.”