

# Curriculum Vitae

## **CV Section 1: Employment History / Awards**

### **NAME**

Samuel Bechara

### **ADDRESS**

Department of Mechanical Engineering  
Colorado State University  
1374 Campus Delivery  
Fort Collins, CO 80521

### **EMAIL**

[samuel.bechara@colostate.edu](mailto:samuel.bechara@colostate.edu)

### **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 POSITIONS**

2017 – Present            Associate Professor of Practice  
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                  Reserach 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  
2019    Engineering College Council Smartest Professor Award  
2019    ASEE Best Presentation Award

**CV Section 2: Publications / Scholarly Record****PUBLISHED WORKS****Textbooks / Textbook Chapters:**

1. **SL Bechara**, "Introduction to Mechanical Engineering" 2019 *TopHat* ISBN: 978-1-77330-974-3
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*

**CV Section 3: Evidence of Teaching and Advising Effectiveness****TEACHING:**

<b>Courses Taught Outside CSU</b>			
<b><u>Year</u></b>	<b><u>Semester</u></b>	<b><u>Course No./Title</u></b>	<b><u>Cr. Hrs.</u></b>
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

<u>Year</u>	<u>Semester</u>	<u>Course No./Title</u>	<u>Cr. Hrs.</u>	<u>Enrollment</u>
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)	3	59+67
2021	Spring	BIOM 300 / Problem Based Learning Biomedical Engineering Laboratory	3	60
2021	Spring	MECH 105 / Problem Solving	3	76

**Course Syllabi, Assignments, and Other Materials:**

- MECH 103 Fall 2019 Course Syllabus (Appendix I)  
This particular syllabus is representative of other course syllabi developed by Dr. Bechara in that it emphasizes the *personal responsibility* that the student has for their learning. The syllabus also highlights the instructor's ability to provide transparent, honest, and fair policies that are enforced in the classroom.
- BIEN 1100: Surface Tension Laboratory (Appendix II)  
This laboratory was included because it highlights Dr. Bechara's ability to create compelling laboratory assignments that students enjoy while simultaneously being challenged to learn. This laboratory was given to Marquette University Biomedical Engineering freshman and was rated one of the most enjoyable laboratories by the students. In addition to being interesting and challenging to the students, the laboratory also includes examples of Discussion Questions that were developed to further student learning.
- MECH 105 Discussion Post (Appendix III)  
Dr. Bechara has developed a series of discussion posts (8 in total) showing the importance he places on student reflection and how he believes students should understand their role in society. The example discussion post is representative of the set in that it is fun for the students and can lead to humorous conclusions. However, it also challenges the students to approach information they read skeptically and intellectually and highlights a real challenge facing engineering and data science.

- MECH 103 Ethics Discussion Post (Appendix IV)  
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. 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 105 False Position Algorithm Development Assignment + Automated Grading Script (Appendix V)  
This appendix was included because it includes an example of a risky but innovative assignment type *and* it includes an automated grading script that was developed to streamline grading. Dr. Bechara teaches classes with 200+ students and as such, it is difficult to create assignments that are not “canned” or easily copied. This particular type of assignment is not typically assigned in large classes because of the time commitment necessary to grade. This assignment highlights Dr. Bechara’s desire to ensure that students have access to enriching and challenging homework assignments that they need to push their educational potential. The grading script also included in the appendix shows Dr. Bechara’s ability to streamline grading operations for not only himself, but his colleagues who might be future instructors of MECH 105.  
*Automated grading script created with help from: Nate Overton, M.S.*
- MECH 105 Homework Assignment (Appendix VI)  
The homework assignment in Appendix VI is representative of Dr. Bechara’s homework assignments in that it uses a non-contrived, real world example for the students to apply the learned principles. In this particular example, the students are asked to solve a simple linear algebra problem. However, instead of arbitrary numbers, the problem shows students how to apply the linear algebra to a real world situation.
- BIOM 441 Lecture Notes Example (Appendix VII)  
A representative copy of lecture notes is annotated and included in Appendix VII. The lecture notes show the organization and structure of a lecture. They include “Key Takeaways” which give student motivation and help them understand what is important in the lectures. The lecture shows how class is started with a compelling real world example. Finally, the notes show that the instructor has already prepared questions to ask students.

### **Peer Evaluations of Teaching**

- BIOM 300 evaluation by Dr. John Petro, Professor of Practice (Appendix VIII)  
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 IX)  
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

- BIEN 1120 Fall 2016 - Dr. Bechara gets up to speed quickly (Appendix X)  
After Dr. Bechara's first time teaching this course almost 41% of the students responded that the course was excellent. When including the students that rated the course as either excellent or very good, that number jumps to 81%. For an enrollment of over 97 students this highlights Dr. Bechara's ability to deliver effective courses with minimal preparation time and experience in a particular course. The student comments also show that Dr. Bechara cares for his students, is enthusiastic about teaching, and creates challenging but engaging homework assignments. *Note: The summary included here is summarized from both sections of BIEN 1120 which are included in Appendix X.*
- BIEN 4290 Spring 2017 – Dr. Bechara can deliver an excellent course (Appendix XI)  
These course surveys are from a small, senior level computing class that Dr. Bechara took over for a professor going on sabbatical. The course enrollment was small and 100% of the students rated the class as excellent or very good. Furthermore, student comments indicate that the students enjoyed the course but were challenged, a balance that Dr. Bechara strives for in all his classes.
- MECH 103 Fall 2018 – Dr. Bechara can be effective in large classes (Appendix XII)  
These course survey results were included to show that Dr. Bechara can be effective in very large courses. This particular course had an enrollment of 255 students and was one of the largest mechanical engineering courses in CSU's history. Despite the large class size, students still rated Dr. Bechara as highly effective (score 4.33/5 on question 23) and agreed that Dr. Bechara created an atmosphere that was respectful of student opinions, ideas, and differences (score 4.17/5 on question 20). Students rated Dr. Bechara highly despite agreeing that the class was intellectually challenging (score 3.94/5 on question 10).
- MECH 105 Spring 2017 – Dr. Bechara can be effective in challenging courses (Appendix XIII)  
Although students acknowledged that MECH 105 is an intellectually challenging course (score 4.44/5 on question 10) they still rated Dr. Bechara as highly effective (score 4.66/5 on question 23), highly enthusiastic (score 4.88/5 on question 14), and knowledgeable of the subject material (score 4.91/5 on question 12). This shows that Dr. Bechara has the ability to connect with students while still providing a rigorous academic challenge.

### 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.

### **Development of New Teaching Techniques**

- Random Student GUI  
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 with a graphical user interface to call on students randomly in class. For example, Dr. Bechara will ask students to 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 XIV)  
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 XV)  
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 XVI)  
In addition to the letters of support provided above, Appendix XVI includes several comments from students from course surveys. In summary, the comments highlight Dr. Bechara's ability to be challenging, fair, fun, excited, and motivating to undergraduate 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.

**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:****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 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)

**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)

**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)

## **CV Section 4: Evidence of Outreach and Service**

### **COMMITTEES**

- Mechanical Engineering Advisory Board Committee  
Department Level Committee (2017-Present)
- 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-Present)
- President's Commission on Diversity and Inclusion  
University Level Committee (2021-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 seperate times with different students ranging in grade from 9<sup>th</sup> to 12<sup>th</sup>.

#### **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 of 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.

# Appendices

Appendix I: MECH 103 Fall 2019 Course Syllabus

Appendix II: BIEN 1100: Surface Tension Laboratory

Appendix III: MECH 105 Discussion Post

Appendix IV: MECH 103 Ethics Discussion Post

Appendix V: MECH 105 False Position Algorithm Development Assignment and Automated Grading Script

Appendix VI: MECH 105 Homework Assignment

Appendix VII: BIOM 441 Lecture Notes Example

Appendix VIII: BIOM 300 Evaluation by Dr. John Petro, Professor of Practice

Appendix IX: MECH 105 Evaluation by Dr. Susan James, Professor

Appendix X: BIEN 1120 Fall 2016 Course Surveys

Appendix XI: BIEN 4290 Spring 2017 Course Surveys

Appendix XII: MECH 103 Fall 2018 Course Surveys

Appendix XIII: MECH 105 Spring 2017 Course Surveys

Appendix XIV: Letter of Support from Carissa Vos (current Undergraduate Student)

Appendix XV: Letter of Support from Kelsey Bilsbak (previous GTF Student)

Appendix XVI: Selected Comments from Student Evaluations

# **Appendix I**

## **MECH 103 Fall 2019 Course Syllabus**

# Introduction of Mechanical Engineering - MECH 103 - Fall 2019

## Administration

**Instructor:** Dr. Samuel Bechara (Dr.B)

**Email:** samuel.bechara@colostate.edu

**Lecture Time:** MW(F), 9:00-9:50AM Engineering 100

**Office:** Engineering A103L

**Office Hours:** MW 12:30-1:30 or by appointment

If you need to meet with me outside of my office hour times (and can't get your questions answered by MESA, tutoring, TA's, etc) then just drop me an email with your availability in the next 48 hours and briefly explain why you need to meet. **Please do not just swing by my office.** I leave my door open but I am usually busy working on things and it is unlikely I will appreciate being interrupted. Sometimes I will not be able to meet you the same day, but I will try my best to meet you within two.

**Graduate Teaching Fellow (GTF):** Joshua Christopher

**GTF Email:** joshuac@rams.colostate.edu

**GTF Office Hours:** W 10:00-11:00am

## A Note on Learning Assistants

In this class we will use learning assistants (LAs). LAs are undergraduates who have previously taken the course that are here to help you learn. All of the labs are led by LAs and some may have office hours (TBD). Please be respectful to the LAs. They are working hard for your learning!

## Course Contract (This Syllabus)

It is your responsibility to read this syllabus in it's 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.** Please be sure to read all of the supporting documentation and especially the academic integrity policy.

## Labs

The labs will be held on Fridays in lieu of lecture. Your lab will be led by a Learning Assistant and the goal is for you to learn about engineering computer technologies that will be critical in your academic career.

You will be randomly assigned a computer lab time and location. It is your responsibility to understand which lab you are assigned to, and where the lab is located. *Most* labs are held during the normal class time so there will be no conflict. Due to classroom constraints, one of the labs is in the afternoon. If you have a legitimate conflict (must be either work, commute, or class conflict related) with the lab time you are assigned, please gather supporting documentation and make an appointment with the instructor as soon as possible.

## Lab Time and Locations

Lab Group Number	Lab Room	Lab Time	LA
Lab 1	Academic Village C146	9-10am	Jenna
Lab 2	GIS Computer Classroom	9-10am	Courtney
Lab 3	Titan Design Studio	9-10am	Alden
Lab 4	Viking Design Studio	9-10am	Abbie
Lab 5	GIS Computer Classroom	<b>4-5pm</b>	Sydney

## Overview

This course is an introduction into the discipline of Mechanical Engineering. The course will cover some of the tools used in the profession and also help as a starting point in your academic and professional career in Engineering.

## Course Objectives

- Research, discuss, and formulate opinions on engineering related ethical issues.
- Demonstrate the skills necessary to function on multidisciplinary teams.
- Improve the ability to communicate technical content in a clear and concise manner.
- Identify various dimensions and units and apply these to basic mathematical and physical principles.
- Introduce and apply analysis, plotting, and organizational techniques in Microsoft Excel.
- Define and implement foundational MATLAB programming capabilities.
- Expose students to a range of resources, disciplines, and career paths in relation to Mechanical Engineering.

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

- Make engineering decisions related to ethical questions.
- Effectively work as a member of a diverse team.
- Formulate both written reports and oral presentations on technical content in a concise and clear fashion.
- Know the most common units for engineering problems and use dimensional analysis to determine proper units.
- Utilize Microsoft Excel and MATLAB to analyze and present data.

## e-Textbook

Text: Hands on Engineering - TopHat 1st Edition Wednesday The textbook we will use in the course was written specifically for this class by Dr. Samuel Bechara (yes, that is me). I decided to write a textbook for this course for a couple of reasons:

1. Traditional introduction to engineering textbooks are *boring*. I wrote a book that includes all of the material you need to be successful, but it is fun to read!
2. Traditional textbooks are **insanely expensive**. The previous textbook used for this course cost \$250 and you *didn't even get to keep it when the semester was finished*.

For these two reasons I embarked on a two year journey to write a better and less expensive engineering textbook. The publisher I used is called TopHat and they agreed to help me create a fun, interactive text that is much less expensive for students. You will receive an email from TopHat shortly after the semester starts to purchase the textbook. I highly recommend that you purchase the textbook through TopHat directly (as opposed to purchasing it in the bookstore) because the CSU bookstore marks the textbook up a little bit.

**You are required to purchase the e-Text in order to complete the homework and assignments that are automatically built into the textbook.** However, if you would like to purchase a print copy of the text, I will post a PDF copy of the book onto canvas that you can print. If enough students are interested (minimum 20), I can order hardcover printed copies of the book and will sell them at cost.

## MATLAB

We are going to be using MATLAB throughout this semester to solve problems. Please familiarize yourself with how to access MATLAB as a CSU student.

As of 2018, CSU now provides MATLAB licenses to students **FOR FREE**. This is huge and you should take advantage of it. A MATLAB license costs about \$500 so download it on your personal computer and learn how to use it!

Click here to go to the CSU MATLAB Portal and download your copy.

## Canvas

I am going to contact the class using canvas. 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 quizzes, homework assignments, labs, and discussion posts 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.

## Course Evaluation

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

Category	Percentage
Participation	5%
Quizzes	10%
Homework	15%
Labs	15%
Exams	50%
Final Project	5%

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
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

## Participation

You are paying (or someone is) a lot of money to attend CSU. Why? To learn stuff! Class attendance is an important part of the learning experience but **you** have to do the learning. I am not going to take attendance, but at random times throughout the semester, I will use the **random-student-gui** to call on students. Your performance when called on will determine your participation score in the course.

To show off how awesome MATLAB is, I have created a very simple program that tracks participation of students by generating a random number using `rStudent = randi(length(names))`

- **names** is a vertical array containing the entire roster of the class
- **rStudent** is an integer that corresponds to the row that the student occupies in the **names** array
- You can see for yourself and you should! Feel free to clone and hack the program. And no, I won't use your custom version that puts your row in the **blacklist** array. However, if you have a legitimate idea

to improve the program, I would be happy to show you how to clone the repository, create a branch, and try out your enhancement. <https://github.com/sbechara/random-student-gui>

I use `random-student-gui` to make sure that you are attending class and working on in class assignments. I will use it often throughout the semester.

A couple of last notes on the `random-student` caller.

- If you are not called on at any point during the semester, you will receive full credit.
- If you are in a large class (e.g. greater than 100) it is possible that you will be only called on once. If you miss that one call, *you will receive a 0 grade on all participation points*. This is non-negotiable and this rule will be strictly adhered to.
- The **only** exception that I will allow is for university sanctioned absences. If you are called on and have a university sanctioned absence, I will “skip” you and you will not get a 0 score for that call.

## Quizzes

Approximately 5 quizzes will randomly be assigned during the semester. You must be present and in class to take the quiz. Each quiz will take approximately 10 minutes and is designed to test your knowledge on current course topics. Your lowest quiz score will be dropped to accommodate *excused* absences. Please let the instructor know if you miss two quizzes due to excused absences.

## Absences

This course typically has ~200 students and it is very difficult for me to keep track of attendance so I do not try. I also understand that life happens and that you may have to miss class for some reason. If you miss class for a university sanctioned event or other excused reason it is *your responsibility* to seek instructor permission for the excused absence **and** to keep and save the documentation / correspondence that shows the excused absence. For example, at the end of the semester if you missed two classes because of excused absences and both of those dates you were called on by the `random_student_gui()`, I may ask for the documentation showing that those absences were excused.

## Homework Assignments

Homework assignments will be assigned periodically throughout the semester and will usually be due by the next class period (unless otherwise noted on the assignment). The assumption from you should be that it is due by the next class period unless otherwise noted on Canvas. Homework assignments will all be turned in on canvas.

**Late homework is not accepted for any reason, however I will drop your lowest homework score.** You are welcome to work with your classmates on homework but you are not allowed to access homework solutions from previous semesters. *Letting someone copy your work is considered cheating and will be dealt with as such.* I will drop your lowest homework assignment score.

## A final note on grading

I will round everybody’s final grade up at the end of the semester to the nearest integer using the MATLAB function `ceil()`. If you are unfamiliar with how this function works, please see the cooresponding MATLAB documentation. Please note, *this is the only form of curving, rounding, extra credit that I offer*. It does not matter how close your grade is to the next grade, to ensure the integrity of the course and out of fairness to everyone **I WILL NOT ENTERTAIN PLEAS TO CHANGE GRADES FOR ANY REASON**. The only exception to this is if a grade was entered incorrectly, in that case, I will be happy to change it to the correct grade.

## Rough Course Schedule (subject to change)

Week	Lecture Topic
1-4	Intro, Units, Dimensions
5-8	Excel
9-15	MATLAB

Please be sure to check canvas regularly for more specific reading and homework assignments.

**The instructor reserves the right to revise course policies, procedures, and schedule as required.**

## Exam Date and Location

Exams will likely be administered in an alternative classroom. In class and canvas announcements will be made to let you know where the exams will take place.

Exam	Date	Location
Exam 1	2 October 2019	TBD
Exam 2	20 November 2019	TBD
Final Exam	19 December 2019 (4:10-6:10pm)	TBD

## Exam Policies

Unfortunately because our class is large, we will have multiple choice exams. Multiple choice exams take a significant amount of time to develop and are dangerous because they are easy to cheat on. To maintain and defend the academic integrity of the course, I **do not allow students to keep their exams**. However, I acknowledge that correcting your mistakes is critical to the learning process. The exam will be saved 3 weeks after the exam date. During this window you can go to the GTF's office hours to view the exam and problems that you missed. However, you can not take the exam (or pictures) with you. At the end of the 3 week window, all exams will be shredded.

## Classroom Expectations

The classroom is a learning environment in which everyone is respected and everyone gets the opportunity to learn. I will expect it to be treated as such. When you come to class, you should be ready, willing, able to learn, and to help your classmates to learn. *I expect you to be engaged and working when we are in class.* For example, I don't have a cellphone or laptop policy because you are adults and both of those tools have legitimate educational utility. However, if you are playing candy crush or browsing reddit in class, I will get upset because you are not only wasting your time, but it is distracting to your classmates.

## Class Policies

- No makeup exams will be accepted. (Exceptions will be made in extenuating circumstances after conference with, substantiation, and approval of the instructor in accordance with CSU policy).
- No late homework assignments will be accepted for any reason. Please do not ask for exceptions.
- It is *your responsibility* to get notes from a classmate if you miss class. Do not ask the instructor or the TA for notes. You are expected to attend all classes.
- If you feel that a mistake has been made during grading, they must be brought up no later than *one week* after they are returned. If you have a grading question, please meet with the instructor and have a written explanation as to why your question was graded incorrectly.
- Only PE exam approved calculators will be allowed in Exams. Currently that is limited to:
  - Texas Instruments: All TI-30X and TI-36X models (must have “TI-30X” or “TI-36X” in its model name)
  - Hewlett Packard: The HP 33s and HP 35s models, but no others

- Casio: All fx-115 and fx-991 models (Any Casio calculator must have “fx-115” or “fx-991” in its model name.)
- NO OTHER CALCULATORS WILL BE ALLOWED ON EXAMS
- I randomly call on students in class to give you an opportunity to highlight your learning. You run the chance of getting called on at any point in class to answer any question. That means **it is ok to get it wrong, but it is not ok to not put in any effort.**
- If we are working on a problem in class, and it is easy to you, you need to help your classmates that are finding it difficult. If you struggle, it’s ok, but you need to find someone in class to help you. It’s ok if you don’t understand everything, that is the point of learning! It’s not ok to not try, or to be distracting.
- Do not pack your stuff to leave class until I am finished. A lot of my lectures come down to the wire and it is uncommon for me to lose track of time. It is disrespectful to your professors and distracting to your classmates to pack up before lecture is done.
- When I invite a guest to speak to the class I expect that you treat them with the upmost respect. Nothing will get you on my bad list faster than disrespecting a guest speaker. Understand that it reflects poorly on me when a class is disrespectful to a guest speaker. It doesn’t matter how boring you think it is, I expect you to give the guest speakers your undivided attention.

### A Note of Showing Up Late

Personally, I don’t understand showing up to class late. You (or someone) is paying a small fortune for you to attend classes and learning from your professors in class is a huge part of the learning process. Even though I don’t understand it, doesn’t mean it might not happen to you. A couple of things about showing up late:

- You can not make up work or points that you miss if you come in late. So don’t ask.
- If you can’t help it and you are going to be late, please enter the classroom as quietly and respectfully as possible. Don’t enter through the front doors, with your headphones on, and then ask people to stand up so you can get to the middle row (yes that has happened in my class before). **If you are late do not interrupt the class.** Try and enter the class through a back entrance and be quiet.

### A Note on Technology

I know it isn’t a requirement to have a laptop as a student at CSU and that as a student you have access to great computer labs. However, having a laptop for this class would be a significant advantage as you could bring it into office hours and the TA’s or myself can help you with your algorithms. If you do not currently have a laptop, I highly recommend getting a refurbished old thinkpad (like the one I am using) that will last you faithfully for the next 4 or 5 years. You do not need a \$2600 Macbook Pro with all the bells and whistles to write algorithms or code. I am a professional and I use a 5 year old thinkpad that I salvaged and had to repair.

Along that train of thought, you actually do not need to use MATLAB at all for this course. There is a free open-source alternative called Octave that you can use instead. Octave uses the exact same syntax and file types as MATLAB and has the added benefit of being free (so when you graduate you can still use it) and *super* fast. I will show you both Octave and MATLAB throughout the semester (even though I prefer Octave).

### 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.

When it comes to class conduct, you should always refer to your professors as either Professor [Last Name], or Dr. [Last Name] unless they tell you differently. This applies to emails, phone calls, or any other professional

communication. Respect and professionalism should always be your default. Furthermore, when dealing with the TA's I expect you to treat them the same way you treat your professors.

Relevant PhD Comic

## **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**

## **BIEN 1100: Surface Tension Laboratory**

# BIEN 1100: Surface Tension Laboratory

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Critical Surface Tension Laboratory

Dr. Bechara

## I. Introduction

Surface energy is an important surface characteristic that can determine the outcome of cell-material interactions due to the fact that protein adsorption is the first step in the biological response to materials<sup>1</sup>. Surface energy has been shown to have a significant impact on both protein<sup>2</sup> and cellular<sup>2,3</sup> adhesion to biomaterial surfaces.

A contact angle measurement is a simple and relatively inexpensive technique that can be used to determine the surface energy of any material surface<sup>4</sup>. The contact angle,  $\theta$ , is a quantitative measure of the angle maintained by a liquid at the boundary where liquid, solid, and gas phases intersect<sup>5</sup>. A contact angle of  $0^\circ$  indicates complete wettability of a surface, whereas a contact angle of  $180^\circ$  indicates a completely non-wettable surface.

When a drop of liquid is placed on a surface, there are two forces that determine how the drop spreads. When the cohesive force of the water molecules is lower than the force between the water molecules and molecules at the solid surface, the drop collapses and spreads on the surface. The material would be said to be *hydrophilic* (ancient greek for “water loving”). When the cohesive force between the liquid molecules exceeds the adhesive force between the water molecules and the solid surface, the drop beads up. This material would be referred to as *hydrophobic* (ancient greek for “water fearing”).

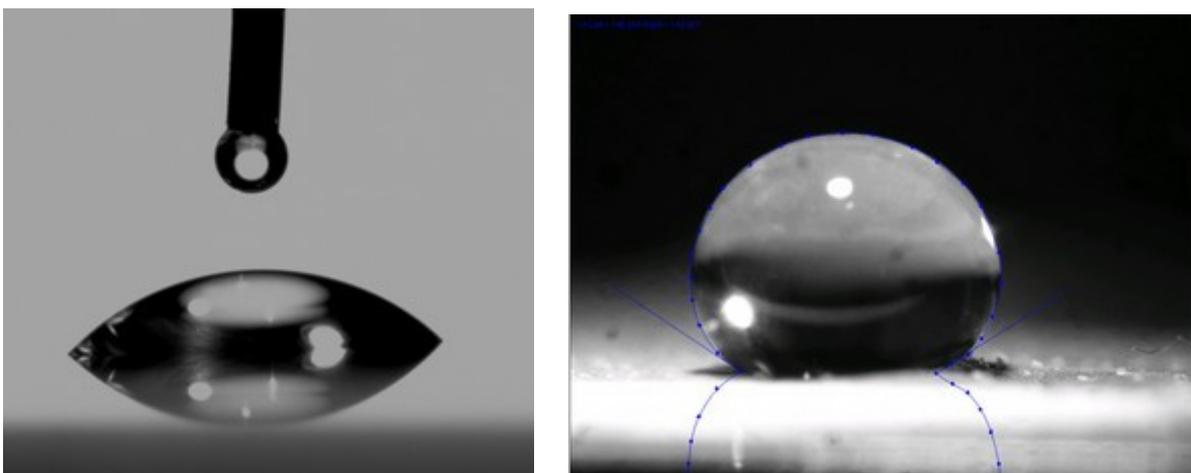


Figure 1: Photograph of water contact angle measurement showing a hydrophilic surface (left) and a hydrophobic surface (right)

The contact angle ( $\theta_c$ ) observed is dependent on the surface tensions (force per unit length) of the solid-vapor ( $\gamma_{SV}$ ), solid-liquid ( $\gamma_{SL}$ ), and liquid-vapor ( $\gamma_{LV}$ ) interfaces. We can relate the aforementioned variables using Young's equation.

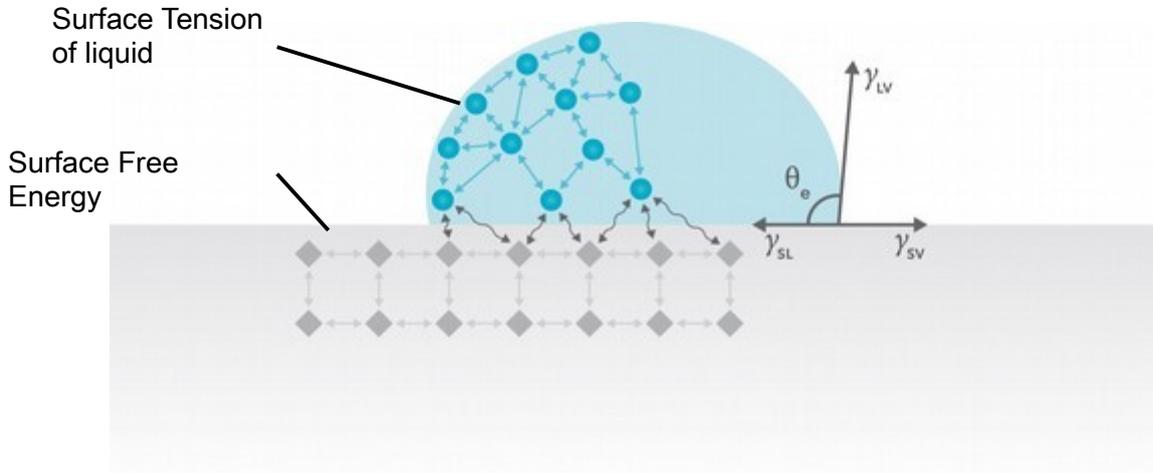


Figure 2: Schematic of contact angle of a liquid droplet wetted to a rigid solid surface<sup>6</sup>

Young's Equation<sup>7</sup>

$$\gamma_{SV} = \gamma_{SL} + \gamma_{LV} \cos(\theta_c) \quad [1]$$

where

$\gamma_{SV}$  = interfacial tension between the solid and the gas

$\gamma_{SL}$  = interfacial tension between the solid and the liquid

$\gamma_{LV}$  = interfacial tension between the liquid and the gas (aka surface tension of liquid)

$\theta_c$  = contact angle measured

Using equation [1] we can measure  $\theta_c$ , and the parameter  $\gamma_{LV}$  can be found in literature for several commonly used liquids. Therefore we have an equation with two unknowns. There are different methods to remedy this, in this case we will use the Zisman method. The method requires acquisition of different contact angles for several probe liquids on the solid surface in question. Next, the investigator plots the cosine of that angle against the known surface energy of the probe liquid. By constructing the Zisman plot (*figure 3*), one can calculate the critical surface tension of the solid ( $\gamma_c$ ).

**Table 1: Selected Surface Tensions of Aqueous Solutions at 25° C<sup>8</sup>**

Solute	Surface Tension [mN/m]
Water	71.97
Olive Oil	32.0
10% Acetic Acid in Water	54.56

The critical surface tension of a solid is a characteristic material property that describes the minimum surface tension of a liquid in which complete wetting will occur (i.e. contact angle = 0°). All liquids with a  $\gamma_{LV}$  value less than or equal to the  $\gamma_c$  value of the solid will completely wet the surface. Therefore,  $\gamma_c$  is an important material property and what will be investigated in this lab.

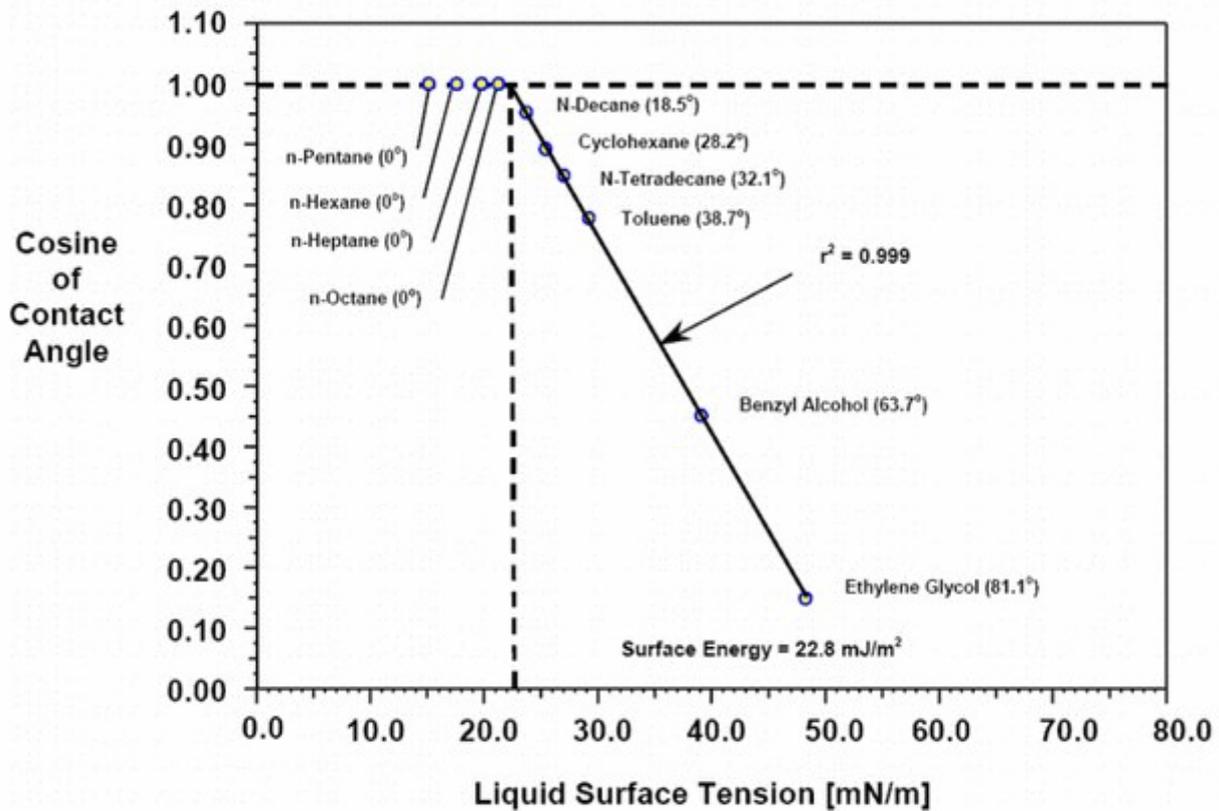


Figure 3: A Zisman Plot for Low Density Polyethylene Film

## II. Required software

Before starting the lab, download and configure the following software according to the instructions on the web. It will be different depending on your operating system. All software is free, requires minimal system resources, and is open-source. *NOTE: You must complete the installation of the software BEFORE coming to lab. See TA's or instructor if you need help.*

- [GIMP](#), or your favorite image editing software.
- [ImageJ](#) (download version 1.46)
- [Drop Shape Analysis Plugin for ImageJ](#)
  - *This one is a little different to install from your typical package. To install the plugin, extract the contents of the zip file into the ImageJ plugin folder. Depending on your operating system, the folder will be located in different locations. You are going to be engineers, figure it out!*
- Spreadsheet software with plotting and analysis capabilities
  - Microsoft Excel works if you have it or [LibreOffice](#) is a free and open-source alternative that has similar capabilities to the MS Office suite
  - MATLAB [recommended option]

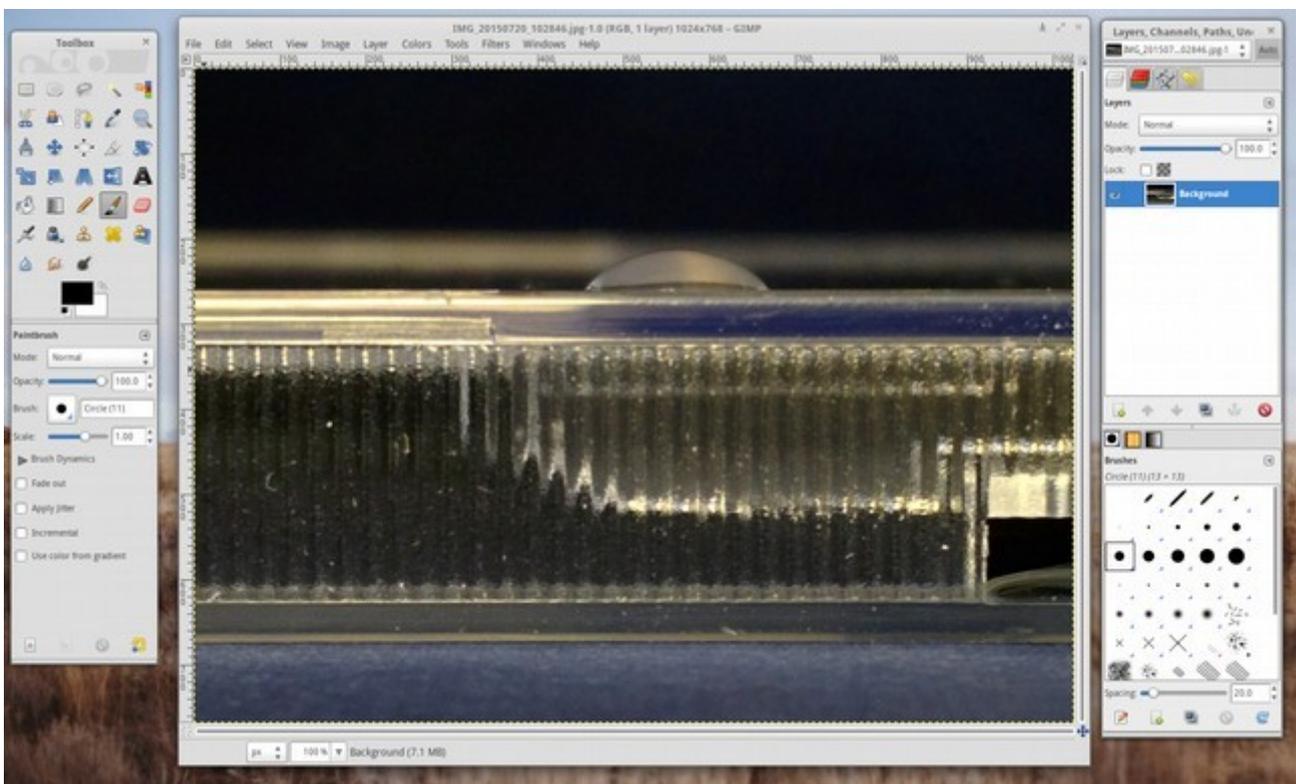
## III. Lab materials

- Corona discharge machine and safety enclosure

*Note: Corona discharge is potentially dangerous! Act cautiously and appropriately around the device.*
- HDPE sample squares
- Selected probe liquids
- Cell phone / digital camera. Feel free to bring your own! Just be sure to include whatever cables or extra hardware you need to offload the pictures onto your laptops.
- Tripod with bubble level
- Disposable pipettes

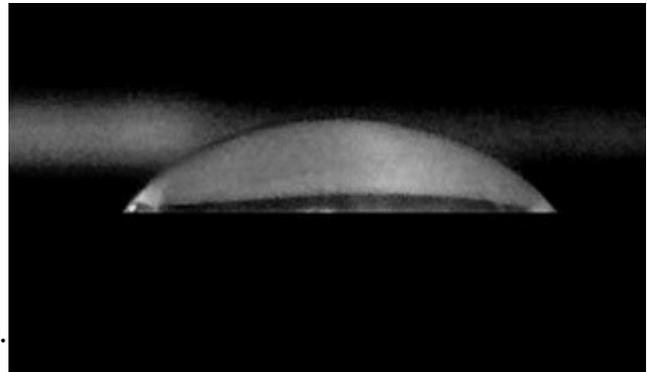
## IV. Methods

1. When handling the samples, use nitrile gloves to avoid adding your oils to the surface. These oils have the potential to significantly impact the surface energy which will change the contact angle.
2. Using a clean pipette, place one drop of the first liquid onto HDPE surface
3. Take several photographs. Ensure that the camera is level using the bubble level on the tripod. Review the photographs and select the clearest image. Be sure to note the treatment and the liquid of each photograph.
4. Repeat steps 2-4 with the two remaining liquids. NOTE: For each liquid and treatment, use a new sample.
5. Treat with corona discharge for 10-15 seconds.
6. Repeat steps 2-4 with all three liquids
7. At this point you should have a total of 6 images. 3 pictures are droplets on the sample *before* corona discharge treatment and 3 pictures are of droplets *after* corona discharge treatment.
8. Open the first image using GIMP
9. Your photo and GIMP screen should look something like the image below. Our goal is to isolate the drop and remove everything else from the image.



10. First, crop the image so that just the water droplet is showing. To do so, select an area to crop using the rectangular selection tool then to click “Image” → “Crop to selection”

11. Use the rectangular selection tool and the fill tool to remove any foreground or background that is not the droplet. To do so, select an area, click the fill tool, and color the area black.
12. Next convert the image to a grey-scale image. To do so click the menu bar item “Colors” → “Desaturate”. Select whichever option preserves the droplet the best.
13. Finally play around with the brightness and contrast settings by clicking the “Colors” → “Brightness and contrast”. The goal is to emphasize the outline of the droplet. You should end up with a final image similar to this one.

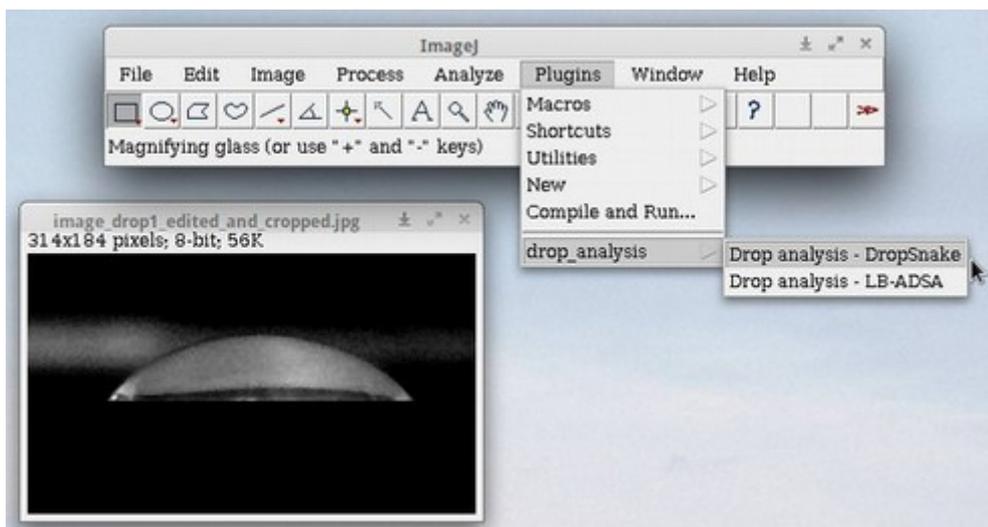


Save your image as a JPEG. Now open up ImageJ and open up your saved image.

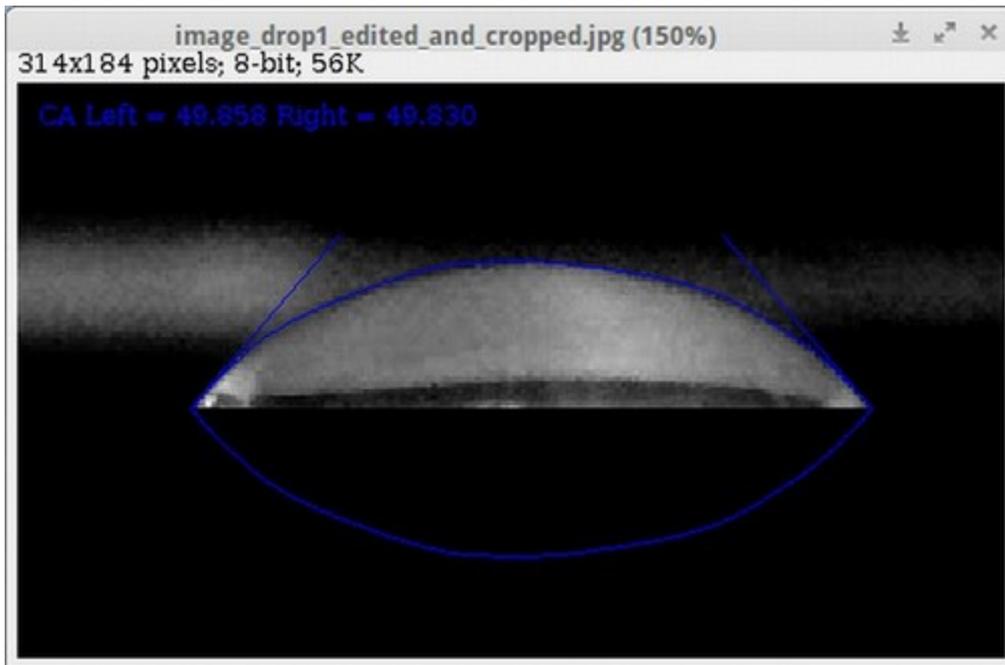
Next, click the menu item “Plugins” →

“drop\_analysis” → “Drop analysis - DropSnake” You should see a screen similar to below. There are two algorithms for determining the contact angle. We will be using DropSnake.

Feel free to read the documentation and play around with LD-ADSA.



14. You will notice that the icons on the ImageJ menubar have now changed. Zoom in as much as you can using the magnifying glass icon on the ImageJ menubar. Now, using the blue “Enter/Move knots” button we are going to begin tracing out the edge of our droplet. The most important points are near the edges of the droplet where it contacts the surface. Be extra careful with placing the first edge, then draw several points along the outside edge of the droplet. When you reach the opposite edge click the red box on the end you started at to complete the curve.



15. When you click the left-most red box the curve will be fitted to the droplet and your contact angles will be displayed in the top left-hand corner of the box in blue-font. Record the average of both angles in the appropriate table in the results section. In this example, the contact angle was  $49.858^\circ$  on the left side and  $49.830^\circ$  on the right side. Unless your surface is non-homogeneous, we would expect these angles to be similar. If your numbers are nonsensical, try tracing the droplet again.
16. Repeat process for drop analysis on all pictures

## V. Results

Record your observations for contact angle in the table below.

Treatment / Liquid	Average Contact Angle (°)
Non-treated / Water	
Non-treated / 30% Glycerol	
Non-treated / 10% Ethanol	
Corona Treated / Water	
Corona Treated / 30% Glycerol	
Corona Treated / 10% Ethanol	

Using spreadsheet or data analysis software, plot the liquid surface tension against the cosine of the contact angle. Create a graph for each treatment. Use linear regression analysis to extrapolate the data. The value at which the cosine of the contact angle would equal 1, is the critical surface tension of the solid (remember,  $\cos(0)=1$ ) Record those values below. Include your graph when you turn in the lab. Make sure that your graphs are labeled appropriately.

Critical Surface Tension, $\gamma_c$ [mN/m] <i>before</i> treatment	Critical Surface Tension, $\gamma_c$ [mN/m] <i>after</i> treatment

Calculate the observed percent change in  $\gamma_c$  when your surface was treated by corona discharge.

Percent Change in $\gamma_c$

## VI. Discussion Questions

1. Briefly explain how a water strider can walk on water



2. Qualitatively describe what a droplet of mercury (Hg) would look like if placed on a Acrylonitrile butadiene styrene (ABS) sample, given that  $\gamma_c$  of ABS = 38.5 mN/m? What about a droplet of Diethyl Ether? Explain your answer using what you know about contact angle and surface energy where appropriate.

All necessary values can be accessed in the 96<sup>th</sup> edition of the Handbook of Chemistry and Physics.

Hint: For easy online access to the CRC handbook of chemistry and physics:

- 1) go to <http://www.marquette.edu/library/>
- 2) search for "handbook of chemistry and physics"
- 3) click the "CONNECT to current edition online" link

3. You are working for a medical device company on a ureteral stent made of a material with a low surface energy. The stent will be inserted through a cystoscope into the patient's ureter and up into the kidney. To determine how far the stent has been inserted, the urologist will look through the cystoscope for markings on the side of the stent that indicate how far the stent has been inserted into the ureter.

As the design engineer, you have chosen a black ink to be applied in specific locations along the stent surface. When building prototypes, the manufacturing engineer informs you that the ink will not adhere to the stent surface.

- a) Based on what you learned in this lab about surface properties, what could be the cause of the problem?
- b) What possible solutions would you suggest to solve this problem?

## VII. References

1. Ratner, B. D., Hoffman, A. S., Schoen, F. J. & Lemons, J. E. *Biomaterials Science: An Introduction to Materials in Medicine*. (Academic Press, 2012).
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4. Young, T. An Essay on the Cohesion of Fluids. *Philos. Trans. R. Soc. London* **95**, 65–87 (1805).
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<<http://www.biolinscientific.com/attension/applications/?card=AA16>>
7. Chow, T. S. Wetting of rough surfaces. *J. Phys. Condens. Matter* **10**, L445–L451 (1998).
8. *CRC Handbook of Chemistry and Physics, 96th Edition*. (CRC Press, 2015). at  
<<https://books.google.com/books?id=RpLYCQAAQBAJ&pgis=1>>

# **Appendix III**

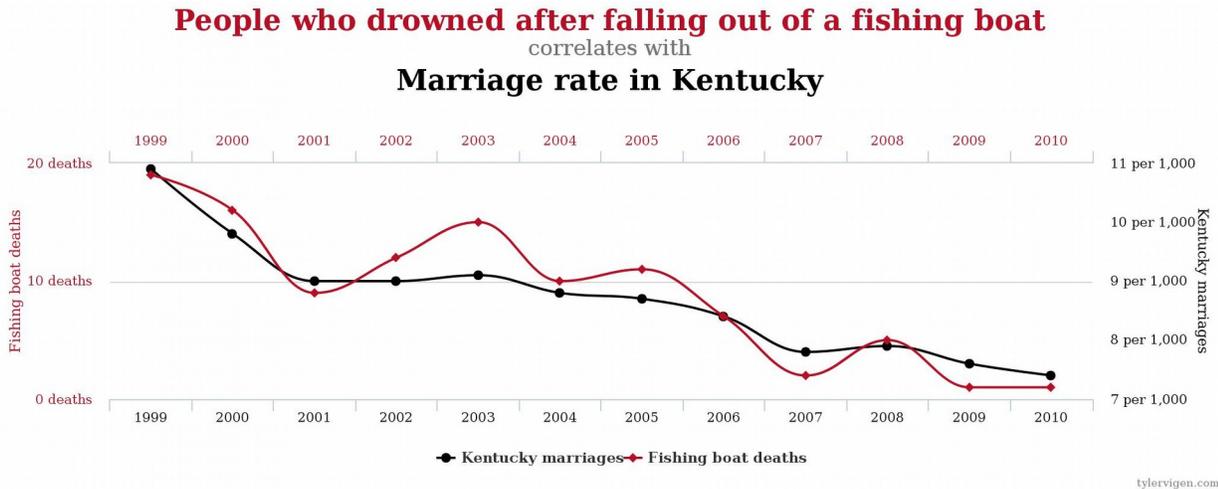
## **MECH 105 Discussion Post**

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 a selection are 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 IV**

## **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 week's 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 V**

## **MECH 105 False Position Algorithm Development Assignment and Automated Grading Script**

# MECH 105: Homework 11

## False Position Algorithm Development

### Rules / Suggestions

The following rules apply to ALL of our Algorithm Development Problems. These are helpful when you are testing your function and we will grade you on them.

1. You must use the correct function name.
2. Check number of function inputs and outputs (vector and scalar inputs)
3. Clear variables in workspace prior to running tests
4. If variable names are not given, use appropriate and consistent names
5. Check function for all possible number of inputs (use nargin during development to catch errors)
6. Run algorithm for at least 2 different input values
7. Check algorithm does not produce extraneous output
8. Comment code for readability

### False Position Algorithm

Develop a function named `falsePosition.m` which estimates the root of a given function. Your function should have the following:

Inputs:

- `func` - the function being evaluated
- `xl` - the lower guess
- `xu` - the upper guess
- `es` - the desired relative error (should default to 0.0001%)
- `maxiter` - the number of iterations desired (should default to 200)

Outputs:

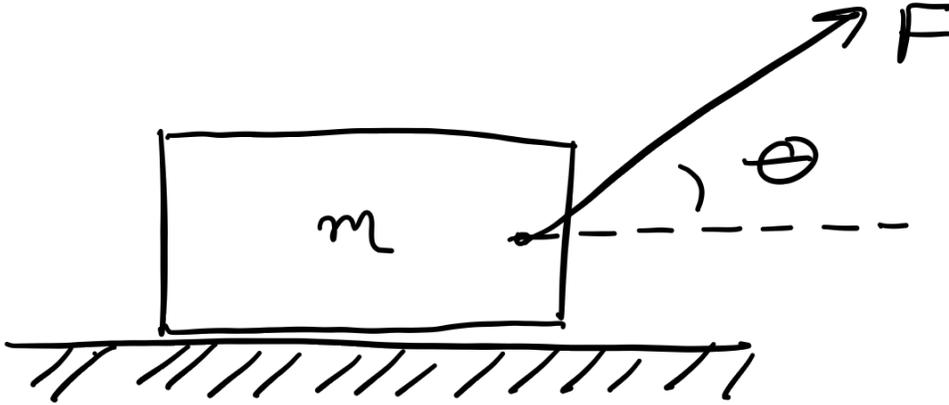
- `root` - the estimated root location
- `fx` - the function evaluated at the root location
- `ea` - the approximate relative error (%)
- `iter` - how many iterations were performed

### FOR TESTING PURPOSES ONLY

The following is included for testing purposes. DO NOT INCLUDE THIS IN YOUR FUNCTION FILE. Remember, the function should work independently of the problem. This problem just gives you an idea of HOW to use the function you developed.

Consider a box of mass  $m = 25\text{kg}$  being pulled by a rope. The force required to move is given by:

$$F = \frac{\mu mg}{\cos\theta + \mu\sin\theta}$$



Let:

- $\mu = 0.55$
- $g = 9.81\text{m/s}^2$

Create a MATLAB script that solves for  $\theta$  if  $F = 150\text{N}$ . Your script should create a plot of a function that is dependent on  $\theta$ . Use the `falsePosition` function in your script file. Finally, your script should include a pair of `fprintf` statement(s). Each should comment on the value selected as the root, how many iterations the method took, what the approximate error is and what  $f$  is evaluated at the root. You need a `fprintf` statement(s) for each function. Finally, when you run each function, use the default values of the function when you can.

Note: You should change the `format` to `long` early in your script.

```

function [points, notes] = fpGraderTest()
% Function to evaluate student submissions

% Total number of points
points = 200;
notes = '';

% symbolic
syms f(V);
% Use the VanDerWaals Equation
P = 6; % in atm
T = 323.15; % in K
n = 2; % in mol
R = 0.08206;
a = 3.59;
b = 0.0427;

% symbolic
f(V) = (P + ((n^2*a)/V^2))*(V-n*b)-(n*R*T);
% anonymous
fa = @(v) (P + ((n^2*a)./v.^2)).*(v-n*b)-(n*R*T);

% First test with default settings. Looks bad but stops student output
try % try symbolic
    evalc('[root,fx,ea,iter] = falsePosition(@(V) f(V),8,9)');
catch % try anonymous
    notes = [notes, 'Symbolic function argument failed.', ' '];
    try
        evalc('[root,fx,ea,iter] = falsePosition(fa,8,9)');
    catch
        notes = [notes, 'Anonymous function argument failed.', ' '];
        try
            evalc('[root,fx,ea,iter] = falsePosition(fa,8,9,0.0001,3)');
            notes = [notes, 'Function defaults do not work, -20.', ' '];
            points = points -20;
        catch
            try
                evalc('root = falsePosition(fa,8,9,0.001,3)');

                % most tests will fail, best score is 120 so assign and exit
                notes = ['Function output arguments incorrect, can not test code
-80.', ' '];
                fprintf(notes);
                fprintf('\n');
                points = 120;
                return
            catch
                notes = ['Function does not run -100.', ' '];
                fprintf(notes);
                fprintf('\n');
                points = 100;
                return
            end
        end
    end
end
end
end
end
% Answers should be...
% root = 8.6507    fx = -7.8566e-09    ea = 1.2562e-05    iter = 3
fprintf('First Test:\n')
if abs(root - 8.6507) > 1.0e-2 % > 8.651 || root < 8.620
    notes = [notes, 'Incorrect root ', num2str(root), ' vs ', '8.6507, -20.', ' '];
    points = points - 20;

```

```

elseif fx > 1e-6
    notes = [notes, 'Function not sufficiently converged, -20.', ' '];
    points = points - 20;
else
    fprintf(' Correct root\n')
end
if ea > 0.0001
    notes = [notes, 'Approximate error too large, -20.', ' '];
    points = points - 20;
else
    fprintf(' Approximate error within tolerance\n')
end
if iter == 3
    fprintf(' Number of iterations correct\n')
else
    notes = [notes, 'Number of iterations incorrect, -20.', ' '];
    points = points - 20;
end

% Check to make sure es is adjustable
%evalc('[root,fx,ea,iter] = falsePosition(@(V) f(V),8,9,0.1)');
try % try symbolic
    evalc('[root,fx,ea,iter] = falsePosition(@(V) f(V),8,9,0.1)');
catch % try anonymous
    try
        evalc('[root,fx,ea,iter] = falsePosition(fa,8,9,0.1)');
    catch
    end
end
% Answers should be...
% root = 8.6207    fx = -6.3227e-06    ea = 0.0101    iter = 2
fprintf('Second Test:\n')
% Not double counting errors for incorrect root or iterations
if ea > 0.1
    notes = [notes, 'Specified approximate error too high, -20.', ' '];
    points = points - 20;
elseif ea < 0.001
    notes = [notes, 'Specified approximate error too low, -20.', ' '];
    points = points - 20;
else
    fprintf(' Approximate error within tolerance\n')
end

% Check to make sure maxiter is adjustable
% evalc('[root,fx,ea,iter] = falsePosition(@(V) f(V),8,9,1e-15,4)');
try % try symbolic
    evalc('[root,fx,ea,iter] = falsePosition(@(V) f(V),8,9,1e-15,4)');
catch % try anonymous
    try
        evalc('[root,fx,ea,iter] = falsePosition(fa,8,9,1e-15,4)');
    catch
    end
end
% Answers should be...
% root = 8.6207    fx = -9.7604e-12    ea = 1.5607e-08    iter = 4
fprintf('Third Test:\n')
% Not double counting errors for root or ea
if iter == 4
    fprintf(' Number of iterations correct\n')
else

```

```

    notes = [notes, 'Specified number of iterations incorrect, -20.', ' '];
    points = points - 20;
end

% % First test with default settings. Looks bad but stops student output
% try % try symbolic
%     evalc('[root,fx,ea,iter] = falsePosition(@(V) f(V),8,9,1e-15,4)');
% catch % try anonymous
%     notes = [notes, 'Symbolic function argument failed.', ' '];
%     try
%         evalc('[root,fx,ea,iter] = falsePosition(fa,8,9,1e-15,4)');
%     catch
%         notes = [notes, 'Anonymous function argument failed.', ' '];
%         try
%             evalc('root = falsePosition(fa,8,9,1e-15,4)');
%             % most tests will fail, best score is 120 so assign and exit
%             notes = ['Function output arguments incorrect, can not test code -80.',
% ' '];
%             fprintf('%s\n', notes);
%             points = 120;
%             return
%         catch
%         end
%     end
% end
% % Answers should be...
% % root = 8.6507     fx = -9.7604e-12     ea = 1.5607e-08     iter = 4
% fprintf('First Test:\n')
% if abs(root - 8.6507) > 1.0e-3
%     notes = [notes, 'Incorrect root ', num2str(root), ' vs 8.65607, -20.', ' '];
%     points = points - 20;
% elseif abs(fx) > 1e-10
%     notes = [notes, 'Function not sufficiently converged, -20.', ' '];
%     points = points - 20;
% else
%     fprintf(' Correct root\n')
% end
% if ea > 2*1.5607e-08
%     notes = [notes, 'Specified approximate error to large, -20.', ' '];
%     points = points - 20;
% else
%     fprintf(' Approximate error within tolerance\n')
% end
% if iter == 4
%     fprintf(' Number of iterations correct\n')
% else
%     notes = [notes, 'Number of iterations incorrect, -20.', ' '];
%     points = points - 20;
% end
%
%
% % Check to make sure defaults exist
% try % try symbolic
%     evalc('[root,fx,ea,iter] = falsePosition(@(V) f(V),8,9)');
% catch % try anonymous
%     try
%         evalc('[root,fx,ea,iter] = falsePosition(fa,8,9)');
%     catch
%         notes = [notes, 'Function fails with default parameters -20.', ' '];
%         points = points - 20;
%         return
%     end
% end

```

```
% end
%% Answers should be...
%% root = 8.6507      fx = -7.8566e-09      ea = 1.2562e-05      iter = 3
fprintf('Third Test:\n')
%% Not double counting errors for root
% if ea > 2*1.2562e-05
%     notes = [notes, 'Default approximate error to large, -20.', ' '];
%     points = points - 20;
% else
%     fprintf(' Approximate error within tolerance\n')
% end
%% can't easily test default number of iterations without a messy function

fprintf('%s\n', notes);
% should never go negative
if points < 0, points = 0; end

end
```

# **Appendix VI**

## **MECH 105 Homework Assignment**

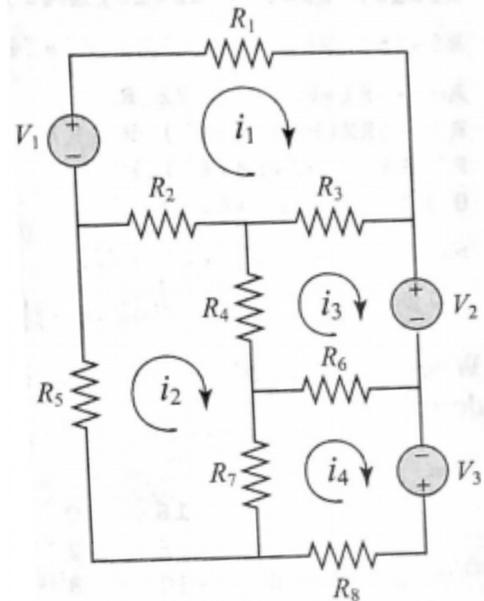
# Appendix X: Examples of Homework Assignments

Homework is important

## EXAMPLE) BIEN 1120 Homework Assignment

Kirchhoff's voltage law states that the sum of the voltage around a closed circuit is zero. In the mesh current method a current is first assigned for each mesh in the figure). Then Kirchhoff's voltage law is applied to each mesh. This results in a system of linear equations for the currents (in this case four equations). The solution gives the values of the mesh currents. The current in a resistor that belongs to two meshes is the sum of the currents in the corresponding meshes. It is convenient to assume that all the currents are in the same directions (clockwise in this case). In the equation for each mesh, the voltage source is positive if the current flows to the - pole, and the voltage of a resistor is negative for current in the direction of the mesh current.

The electrical circuit shown consists of resistors and voltage sources. Use MATLAB to determine the current in each resistor using the mesh current method, which is based on Kirchhoff's voltage law.



$$V_1 = 20 \text{ V}, V_2 = 12 \text{ V}, V_3 = 40 \text{ V}$$

$$R_1 = 18 \Omega, R_2 = 10 \Omega, R_3 = 16 \Omega, R_4 = 6 \Omega, R_5 = 15 \Omega, R_6 = 8 \Omega, R_7 = 12 \Omega, R_8 = 14 \Omega$$

The equations for the four meshes in the current problem are:

$$V_1 - R_1 i_1 - R_3 (i_1 - i_3) - R_2 (i_1 - i_2) = 0$$

$$-R_5 i_2 - R_2 (i_2 - i_1) - R_4 (i_2 - i_3) - R_7 (i_2 - i_4) = 0$$

$$-V_2 - R_6 (i_3 - i_4) - R_4 (i_3 - i_2) - R_3 (i_3 - i_1) = 0$$

$$V_3 - R_8 i_4 - R_7 (i_4 - i_2) - R_6 (i_4 - i_3) = 0$$

**HINT:** setup the linear algebra equation in the form  $[A][x]=[B]$ . You may have to rearrange the equations above.

# **Appendix VII**

## **BIOM 441 Lecture Notes Example**

## KEY TAKEAWAYS

- EQUILIBRIUM (Ch4 - LeVeau)
  - Concurrent force system acting on shoulder (p)
  - Cervical traction
  - The lateral malleolus as a pulley (pg 79)
  - Levers

Telling students explicit "takeaways" helps motivation and understanding

Include page numbers and source material so professors can prepare

Start class with compelling real world example

Consider the following problem → 12.16

A person holds a 500N dumbbell in his right hand. His forearm and hand are held stationary in the horizontal position with no rotation at the elbow joint. The forearm and hand segment weighs 17N, and the center of gravity of the forearm-hand segment is 0.23 m from axis of the elbow joint. The center of gravity of the dumbbell is 0.34 m from the elbow joint. If the muscle holding the arm in this position inserts 0.05 m from the elbow joint, how much force is required to keep the forearm-hand from rotating at the elbow joint?

Where to start? Break down the question

"To keep forearm-hand from rotating at elbow joint"

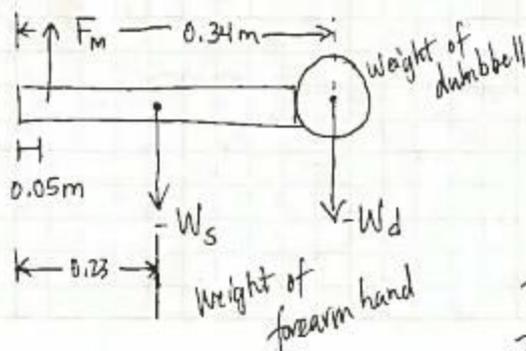
↳ fancy way of saying equilibrium aka no angular acceleration

$$\begin{array}{l} \text{No unbalanced forces} \\ \text{No unbalanced torques} \end{array} \quad \begin{array}{l} \sum F = 0 \\ \sum \tau = 0 \end{array}$$

Includes prompts to instructors reminding what questions to ask students

In this case we are interested in the torques. We need to identify the forces that have a moment arm and that can create a  $\tau$ .

CALL ON STUDENTS. HAVE THEM IDENTIFY



$$-W_d = -500 \text{ N}$$

$$-W_s = -17 \text{ N}$$

$$F_m = ?$$

$$\tau_m + \tau_d + \tau_s = 0$$

$$\tau_m = -\tau_d - \tau_s$$

$$\tau_m = -(-500 \cdot 0.34) - (-17 \cdot 0.23)$$

# **Appendix VIII**

**BIOM 300 Evaluation by Dr. John Petro,  
Professor of Practice**



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 IX**

**MECH 105 Evaluation by Dr. Susan  
James, Professor**



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 1 female) from the lecture in the bookstore immediately after class. All three confirmed they found

Sam a very effective instructor, they enjoyed the class and were learning a lot. However, the female student did confirm my observation above that sometimes when he said “figure it out on your own” she didn’t even know where to start to look for the information and was afraid to ask. I also conveyed to Sam that his approach to office hours for the course, which required signing up ahead of time and only during certain times, made it hard to attend office hours. In a course this large, office hours are always a challenge. Sam agreed with both these points about using “figure it out on your own” carefully, and that he’d work on making them more accessible.

Overall, I found Dr. Bechara to be an excellent and effective instructor who deeply cares about his students’ success and is always striving to improve his teaching.

Sincerely,

A handwritten signature in blue ink that reads "Susan James". The signature is written in a cursive, flowing style.

Susan P. James, Ph.D.  
Professor and Head, Mechanical Engineering  
Professor, Biomedical Engineering

# **Appendix X**

## **BIEN 1120 Fall 2016 Course Surveys**

Fall 2016 Course Evaluation (Session 1)  
Fall 2016

Marquette University  
General

Course: BIEN 1120 101 - Computing for Biomed Engineers

Department: BIEN

Responsible Faculty: Samuel Bechara

Responses / Expected: 58 / 60 (96.67%)

Class Evaluation	BIEN 1120 - 101							Course
	Responses (%)							
	E	VG	G	F	P	VP	N	Grp Med
Q1 How was this class as a whole?	31%	55.2%	8.6%	3.4%	0	1.7%	58	5.2
Q2 How was the content of this class?	36.2%	48.3%	13.8%	1.7%	0	0	58	5.2

Responses: [E] Excellent=6 [VG] Very Good=5 [G] Good=4 [F] Fair=3 [P] Poor=2 [VP] Very Poor=1

Class Evaluation	BIEN 1120 - 101							Course
	Responses (%)							
	SA	A	SA	SD	D	SD	N	Grp Med
Q3 This class positively impacted my comprehension of written material in this subject.	53.4%	36.2%	8.6%	0	1.7%	0	58	5.6
Q4 This class positively impacted my problem solving abilities in this subject.	43.1%	50%	3.4%	1.7%	1.7%	0	58	5.4
Q5 This class positively impacted my ability to communicate orally and/or in writing.	19%	37.9%	29.3%	8.6%	3.4%	1.7%	58	4.7
Q6 This class was intellectually challenging.	56.9%	37.9%	3.4%	0	1.7%	0	58	5.6
Q7 Evaluations of course work (e.g. exams, papers) were consistent with class learning objectives.	41.4%	39.7%	15.5%	0	1.7%	1.7%	58	5.3
Q8 Assistance and/or extra help were available outside of class time.	51.7%	34.5%	12.1%	0	0	1.7%	58	5.5
Q9 Expectations of students were presented clearly.	43.1%	41.4%	13.8%	0	1.7%	0	58	5.3

Responses: [SA] Strongly Agree=6 [A] Agree=5 [SA] Somewhat Agree=4 [SD] Somewhat Disagree=3 [D] Disagree=2 [SD] Strongly Disagree=1

Instructor Evaluation	Bechara, Samuel							Individual
	Responses (%)							
	E	VG	G	F	P	VP	N	Grp Med
Q10 How was the instructor's contribution to this class?	53.4%	36.2%	8.6%	0	0	1.7%	58	5.6
Q11 How effective was the instructor in this class?	43.1%	43.1%	8.6%	1.7%	3.4%	0	58	5.3

Responses: [E] Excellent=6 [VG] Very Good=5 [G] Good=4 [F] Fair=3 [P] Poor=2 [VP] Very Poor=1

Instructor Evaluation	Bechara, Samuel							Individual Grp Med
	Responses (%)							
	SA	A	SA	SD	D	SD	N	
Q12 This instructor provided explanations that reduced confusion.	37.9%	46.6%	13.8%	1.7%	0	0	58	5.2
Q13 This instructor was well organized.	39.7%	51.7%	5.2%	3.4%	0	0	58	5.3
Q14 This instructor was interesting.	69%	29.3%	0	0	1.7%	0	58	5.8
Q15 This instructor encouraged student participation.	62.1%	31%	6.9%	0	0	0	58	5.7

Responses: [SA] Strongly Agree=6 [A] Agree=5 [SA] Somewhat Agree=4 [SD] Somewhat Disagree=3  
[D] Disagree=2 [SD] Strongly Disagree=1

Question: Please provide additional feedback about this class.

Response Rate: 82.76% (48 of 58)

- 1 great class a lot more work than some of my 3 credit courses but overall very interesting material.
- 2 Was a very good laid out course that taught the basics of computing in matlab and in C.
- 3 Very well taught! It was hard but fun
- 4 This was a great course. The material was challenging, and I think I learned a lot about computer programming.
- 5 This was a very interesting class and I'm really glad that we are required to take it! I learned a lot especially since I have always wanted to learn how to code but never really got around to it  
This is one of the few classes I've taken that I actually felt I've learned something and was at times challenged (perhaps the only class at Marquette so far). I liked the amount of freedom we were allowed when approaching homework problems as well.
- 7 This course was my favorite class this semester and the workload was a good amount! I was able to manage all of our assignments without feeling as if I was investing more time than I should have been; the course content was interesting and valuable, and I think it was designed at a level that was complex enough for people with coding experience, but not too complicated for those with none.
- 8 This course was definitely challenging, however I feel that I have learned a lot throughout the semester as I came into this class not knowing a single thing about coding. I still feel that I am a little rocky on some subjects but I feel with extra practice I can improve.
- 9 This class allowed me to try something I never thought I would like. I actually like computer program now. It's also taught me how to problem solve.
- 10 This class was a very good introduction to programming. We learned all of the major concepts in programming, and it was great that we got to learn two languages and compare them.
- 11 This class was extremely interesting yet challenging at the same time. It made me push myself and learn a lot about the subject. I improved a lot in the subject area and the things learned in this class will for sure help me going forward.
- 12 This class was very challenging, and I feel that it really pushed me to improve my problem solving and coding skills. I feel that the homework really related to things that could come up in my career as a biomedical engineer.  
This class, while challenging, is extremely interesting. The content is very relatable and it's easy to see how
- 13 programming can be applied to our daily lives as engineers. Sometimes the class moves quite quickly, thus creating problems, however help is always available through emails and office hours.

14 This class was very challenging but I have learned a lot of skills that I will use as an engineer.

The material of the course was difficult to handle for many students because it was often their first exposure to the  
15 topic. However the professor was always very committed to everyone's understanding of the topic, and this allowed for a tremendous amount of learning to occur.

16 The intro class for java programming was very discouraging for me as the class was way beyond my expectations. This class really helped my understanding of programming and motivated me to stick to my major.

17 The content was great, however I wish the class could be longer

18 The content of this class was interesting but it was way too much work for a 2 credit class

19 The class was enjoyable, and informative. It doesn't move too fast, so it is relatively easy to grasp the concepts.

The class was challenging but I felt overwhelmed at some points because I was at a different level than other students  
20 programming wise. I was trying to learn and understand while others already fully understood which was frustrating and stressful. I learned a lot!

21 The class was very good as a whole but often the person who would grade the assignments would arbitrarily take off points that were not mentioned in the slightest bit on the assignment.

22 The class was challenging, but beneficial and I was able to walk away with better programming skills.

23 The TAs were very nit-picky and graded homework way too harshly. Grades did not necessarily reflect mastery of course objectives, as the concepts in the homework were did not relate to class, although interesting. (physics problems)

24 The TA's were the biggest help to me in class. I felt that the teacher tried and for people who have taken computing before they understood it better but for someone who is kind of new to the material it hurt me.

25 Sometimes the grading rubrics and oral instruction can backtrack and contradict each other.

26 Professor Bechara was a great professor and always was open for input from his students! He made coding interesting and easy to understand for someone to understand.

27 Overall the class was well structured and encourages learning from students

28 Overall the class was a great introduction to programming and definitely helped improve my problem solving skills.

On momentum one day I had a quote that said,"Do something that scares you everyday" and I do with this class. But I liked it.

29 But for real, Bechara was really good and I understand way more than I did before (which was nothing) and I feel pretty confident with walking through what you're supposed to do for both programs

30 Not everyone was at the same level coming in. The amount of material I learned was tremendous but it was more time consuming than a 2 hour course. I spent about 12 hours weekly on the homework.

31 It would be more helpful if you had given us an idea of how the grading worked on the homework and if it was done in a timely manner.

I really enjoyed this class. Dr. Bechara helped me to understand this topic a lot better. Going in I had no knowledge of the  
32 topic and now I feel fairly competent. The homework was engaging and made me think a lot about the content learned in class.

33 I looked forward to this class every week. Definitely one of my favorites so far in my college career.

34 I like that this year Matlab was learned before C, I heard in the past that it was the other way around. Matlab is more handholding and I feel as though that was beneficial to learn first

35 I had no computing background prior to this course so I am glad it was part of my major's curriculum. I have learned so much from this course and know that it has helped prepare me for the future when I need to write a program.

I had never taken a computing class before this one so I came in knowing nothing about coding. However, through

36 taking this class I feel like I know a good deal about coding and if I have to work with MATLAB or C in the future I could figure it out. I really enjoyed this class, even though the material was very frustrating at times.

37 I felt like this class was challenging, but I was given the tools to exceed in the class. I thought that the homework assignments were very relevant because it related to a lot of our other classes.

38 I enjoyed it

I enjoy computer programming, so I was very engaged in this class and had fun working through the homework assignments. I liked that I get to walk away with knowledge in both MATLAB and C. Although I had already taken a programming class, I learned a lot more about coding than just syntax and I have a much better understanding in how computers operate in general.

40 I came in with a background knowledge in programming, so I was expecting this class to be my easiest class this year and I would be able to completely blow it off and get an A. While I did have a huge advantage over my peers, I still felt challenge and I did learn quite a bit more in programming. I was expected to problem solve more than in my other classes, and I feel that I am a stronger programmer than I was before.

41 Great class.

42 From not knowing anything about coding previously, I think that this class made me learn a lot about coding software like MATLAB and C++. I thought that a lot of the homework assignments were challenging, but they were able to teach me a lot about what the programs can do. I think that it was hard, however, to finish Monday's assignments that were due on Wednesday. Also, I think that the discussions and journal entries did not serve any purpose other than a grade filler for me personally. I know that the Journal entries are very beneficial for the instructor to look at, but the discussion posts were irrelevant to the coursework and did not help with my learning.

43 Dr. Bechara is a very good professor. However, I was displeased with his grading scale and i also didnt think he was very accessible at times when i was confused

44 Course is challenging and rewarding

45 Class had a good format of learning where we had notes and examples in class and then sometimes time to do homework. Homework was standard and about what we learned in class. Homework included discussions and reflections which promoted applying learned material to the real world.

46 Class could have used a bit more organization, seemed hap hazard at times. The class as a whole was very informative and cleared up many concepts and had a fair work load.

47 Challenging and hard, but I learned a lot.

48 Challenging but necessary because without it students would not have the skills they need to do well in various different coding programs. Many important concepts were covered and pushed so that at least mot people understood them well. This made the mid term quite easy as I am sure will also be true for the final.

Faculty: Bechara, Samuel

Question: Please provide additional feedback about the instructor of this class.

Response Rate: 74.14% (43 of 58)

1 Your teaching style makes the class interesting and you provide a lot of class time to ask questions.

2 You are an awesome teacher.

3 Was very willing to work with the class in a way that would benefit the students the most. Took our suggestions for the class seriously

4 Very well organized and had a lot of knowledge on computing. Well rounded and introduced material that was on more than just what we were learning (practical applications).

5 Very interesting and always available to help.

6 Very enthusiastic about coding, nice and loud

7 The professor very clearly taught the material to the students. Despite many of the students having no experience with coding. Without this course and professor, I do not believe that I would have quite the grasp on coding that I do now.

The instructor was engaging and invested in the subject. He was available to help students and patient with questions. I think the amount of material that was covered was satisfactory, but the amount of outside study needs to be reduced.

8 For instance, the list of symbols that we were asked to fill out each week in addition to the conceptual assignments was daunting. However, he was available to help when needed and incredibly knowledgeable. He was not condescending-very, very patient. I appreciate this. He was also super open to feedback. I would have excelled with more time in class.

9 The class lectures were very interesting. He knows how to keep the class engaged. The homework was challenging but the problems were interesting. The discussion posts were fun and not boring. He encourages questions and students coming into office hours.

10 Thanks for teaching such a great class, pushed me to work hard and succeed! I even decided to switch from Biomechanics to Biocomputing!

11 I think that Dr. Bechara is a really good professor that takes the time out of his workday to help his students. He also wants to make sure that everyone comprehends the material to the best of their abilities in order to excel later with coding. Overall, I enjoyed Dr. Bechara as a professor and would take the class over again with him as a professor.

12 I really had a bad taste of programming after JAVA and you almost make me want to switch to bioC... almost

13 I enjoyed your blend of comedy and "teaching."

14 He's really funny and encourages questions. He's very smart and definitely qualified. The class material (if you have never had any experience in computing before) is challenging and makes you think, but that's the point of college and engineering. It made me think efficiently and he encouraged all of us to always try. 100/10 would recommend. Please keep him as a professor. I liked this class.

I will do better now that the Cubs have won the world series. 10/10

15 He's quick-paced and extremely knowledgeable in his craft which is great but can make him hard to understand. I get frustrated at times with the lingo and concepts having to do with code because it's all brand new to me but he appreciates that learning curve and emphasizes strongly that he is willing to help and that he wants us to succeed. This helps moral incredibly, and lets me know that I can be somewhat clueless and still do well because both he and the TA's are so willing to help.

16 He was a good instructor- sometimes expected us to know things when we never learned them but eventually would explain confusions next class.

17 He really allowed for someone with very little coding experience to understand what was going on in the class at all times! He was available for office hours and his variety of TA's really would help out in times of need! 10/10 would take again!!

18 He made class very interesting and the material easy to understand. He made an effort to know all of his students and was very friendly

19 He is a good instructor and very helpful. Easy to access when I need help.

20 He did a very good job at teaching. I've taken programming courses before and was completely confused during it, however, during this class all the material made sense and I think that came down to his good teaching method.

21 He did a good job of explaining certain concepts by using analogies and taking from well known ideas. I did feel that some lectures felt rushed but I think he explained these brand new concepts well!

22 Gave many opportunities for help outside of class, always willing to help, very organized

23 Dr. Bechara is one of my favorite professors this semester and he did a great job teaching this class. He did a fantastic job at explaining content and helping with problems, as well as keeping the class engaged! He was very available for those who needed help, and I feel as if he was always willing to go the extra mile for those who needed it!

- 24 Dr. Bechara was a great instructor for this course. He was accessible for help and could help explain the material. He also had some fun assignments and discussion posts.
- 25 Dr. Bechara is a great teacher that provides the necessary information in an efficient manner. He is flexible and very understanding, and more than willing to help. I would gladly take a class with him again.
- 26 Dr. Bechara keeps students involved and on track. Good with office hours and always willing to help
- 27 Dr. Bechara did an excellent job of keeping the content interesting and being there for students in the form of office hours. I actually enjoyed coming to class.
- 28 Dr. Bechara was an excellent and certainly interesting professor. He is very knowledgeable and funny and really wants us to succeed. I would take a class with him again in the future if that is possible.
- 29 Dr. Bechara was extremely accessible and helpful during his office hours. He made the course interesting and was very passionate about the material.
- 30 Dr. Bechara was very professional and interesting while teaching this subject matter. He did a very good job explaining the material and offering his help outside of class to reduce confusion.
- 31 Dr. Bechara did a really good job at keeping us interested in what we were learning in the class and gave us challenging enough questions to make us feel like we were actually growing and learning in programming.
- 32 Dr. Bechara really cares about his students and it is very apparent through his teaching style, and how available he is to give help. He is a quirky and fun individual, and he has truly made this class very enjoyable.
- 33 Dr. Bechara was very helpful and open to student opinion. I think he structured the material well and he made it easier by allowing students to drop in for help in his office.
- Dr. Bechara was an excellent teacher. However, his availability outside of class was not that great. I couldn't make office
- 34 hours so I had to email him. On one occasion I never got a response and when I did, the responses were short and not always helpful and delayed. IN all other aspects he exceeded my expectations fpr the class
- 35 Dr. Bechara did a great job lecturing and explaining concepts in class. He was engaging in class and brought the best out of students.
- Dr. Bechara was a very good instructor and I would recommend any person who wants to take a computing class to have him as an instructor. He really knows what he is doing and is able to explain the material in a way that makes sense
- 36 to almost anybody. He was always willing to help outside of class and answer any questions I had. I spent many days in his office hours going over the homework one-on-one with him and he was always very helpful. I really enjoyed working on the assignments and the material in this class because he enjoyed teaching coding so much and made it seem like a fun thing to know how to do.
- Dr. Bechara kept the class very interesting. Even after nights I hadn't gotten much sleep, I had no trouble staying awake
- 37 during class because the material was very interesting. The structure of the class with homework assignments, journal entries, and discussions was manageable and he was able to explain programming in easy-to-understand language. This was my favorite class this semester.
- Dr. Bechara is a fantastic professor. His nerdy passion for the course material is evident everyday which helps and a sense of humor to the lecture when I'm struggling to understand what he is talking about. He truly cares that we
- 38 understand the material and do well in his course. He is very welcoming and open to helping with assignments during his office hours (they are just at unfortunate times that conflict with other courses I have, so I've never gone). I would definitely recommend him as a professor to take a course with to future students and look forward to any other courses in my major that he teaches.
- 39 Dr. Bechara is an excellent instructor who I felt taught the class well and challenged the students. In and out of class, Dr. Bechara was helpful to talk to, and any problems I had related to any programming he helped with.
- 40 Bechara was fun, pretty chill, and assertive. He relates well with students with his humor and gets them to engage and learn.
- Bechara is a really interesting teacher but in a really good way. He is very effective in the way he teaches even though

- 41 this material can be challenging at times. He encourages questions and provides a lot of help when needed. 10/10 would recommend/would take again. I am definitely more knowledgeable about coding and MATLAB and C so I'm very thankful for that!
- 42 Awesome dude, super chill. Would definitely recommend. Although I didn't like his habit of randomly calling on people in class.
- 43 A very eccentric teacher but sometimes seemed a bit full of himself

Fall 2016 Course Evaluation (Session 1)  
Fall 2016

Marquette University  
General

Course: BIEN 1120 102 - Computing for Biomed Engineers

Department: BIEN

Responsible Faculty: Samuel Bechara

Responses / Expected: 36 / 37 (97.30%)

#### BIEN 1120 - 102

Class Evaluation	Responses (%)							Course	
	E	VG	G	F	P	VP	N	Grp Med	
Q1 How was this class as a whole?	47.2%	36.1%	16.7%	0	0	0	36	5.4	
Q2 How was the content of this class?	52.8%	41.7%	5.6%	0	0	0	36	5.6	

Responses: [E] Excellent=6 [VG] Very Good=5 [G] Good=4 [F] Fair=3 [P] Poor=2 [VP] Very Poor=1

#### BIEN 1120 - 102

Class Evaluation	Responses (%)							Course	
	SA	A	SA	SD	D	SD	N	Grp Med	
Q3 This class positively impacted my comprehension of written material in this subject.	72.2%	27.8%	0	0	0	0	36	5.8	
Q4 This class positively impacted my problem solving abilities in this subject.	52.8%	41.7%	5.6%	0	0	0	36	5.6	
Q5 This class positively impacted my ability to communicate orally and/or in writing.	30.6%	41.7%	27.8%	0	0	0	36	5.0	
Q6 This class was intellectually challenging.	69.4%	25%	0	5.6%	0	0	36	5.8	
Q7 Evaluations of course work (e.g. exams, papers) were consistent with class learning objectives.	44.4%	52.8%	2.8%	0	0	0	36	5.4	
Q8 Assistance and/or extra help were available outside of class time.	66.7%	25%	5.6%	2.8%	0	0	36	5.8	
Q9 Expectations of students were presented clearly.	44.4%	47.2%	5.6%	2.8%	0	0	36	5.4	

Responses: [SA] Strongly Agree=6 [A] Agree=5 [SA] Somewhat Agree=4 [SD] Somewhat Disagree=3 [D] Disagree=2 [SD] Strongly Disagree=1

#### Bechara, Samuel

Instructor Evaluation	Responses (%)							Individual	
	E	VG	G	F	P	VP	N	Grp Med	
Q10 How was the instructor's contribution to this class?	69.4%	27.8%	2.8%	0	0	0	36	5.8	
Q11 How effective was the instructor in this class?	72.2%	16.7%	11.1%	0	0	0	36	5.8	

Responses: [E] Excellent=6 [VG] Very Good=5 [G] Good=4 [F] Fair=3 [P] Poor=2 [VP] Very Poor=1

## Bechara, Samuel

Instructor Evaluation	Responses (%)						Individual	
	SA	A	SA	SD	D	SD	N	Grp Med
Q12 This instructor provided explanations that reduced confusion.	55.6%	33.3%	11.1%	0	0	0	36	5.6
Q13 This instructor was well organized.	38.9%	52.8%	8.3%	0	0	0	36	5.3
Q14 This instructor was interesting.	83.3%	13.9%	2.8%	0	0	0	36	5.9
Q15 This instructor encouraged student participation.	63.9%	36.1%	0	0	0	0	36	5.7

Responses: [SA] Strongly Agree=6 [A] Agree=5 [SA] Somewhat Agree=4 [SD] Somewhat Disagree=3 [D] Disagree=2 [SD] Strongly Disagree=1

Question: Please provide additional feedback about this class.

Response Rate: 94.44% (34 of 36)

- 1 very useful but often confusing, it would be nice if homework solution were given right away so we could check our work  
Useful in applications outside of class.
- 2 Provided clear examples of use in real world situations.  
Encouraged creative problem solving
- 3 This class was very interesting and i really enjoyed that we learned matlab as well as C because it helped me see the similarities and differences between the material.  
This class was very very very very hard but that to me is a good thing. You never get better unless your pushed past your
- 4 comfort zone and this class my friend pushes you out of your comfort zone. No matter how smart you think you are this class makes you humble!
- 5 This class was very challenging for me, however I feel like I have learned a lot over the course of the semester. The class material moved very quickly and it was difficult to keep up with at times.  
This class definitely made me a more algorithmic thinker! I appreciated how engaging Dr. Bechara was during lecture. He really made an effort (which ended up being successful, at least for me) to make sure that we understood the material. However, the homework assignments were often too much work for the short amount of time that was allotted to complete them. I wish that the TA's would have provided regular office hours, because that would have helped me a
- 6 lot. Dr. Bechara was available, but he also taught other classes at the time, so understandably his time to help us troubleshoot our code was limited. Overall, I learned a lot- the only negative part of this class was the amount of homework without enough time and/or help to do all of it. Again, that is a problem that was not necessarily caused by the class or Dr. Bechara and could be solved by having consistent TA office hours once or twice a week. Dr. Bechara did a great job teaching!
- 7 This class was a great learning experience on how to program effectively in two different programming languages. I learned a lot.
- 8 This class was very challenging because it was a completely new "language" for most people. The homework was very challenging, but that is how we learned the material.  
This class was challenging, but a good kind of challenging. It forced me to struggle to figure things out in new ways and utilize all the resources provided to get the help I needed. This course forced me to work and think in a more logical manner and develop my problem solving abilities.

- 9 The homework assignments were fair, as they directly related to the content learned in class. However, they were good for forcing us to learn how to implement things on our own, but the way they were graded was sometimes unclear.

This class is by far the best-structured class I have attended at Marquette thus far. The material may not be as personally challenging as it could be, but from a class perspective, it seems to be at the right level. Introducing 2  
10 languages was great. Possibly an optional course can be offered that covers an additional third language. The class truly taught and reaffirmed skills through the homework, discussions, feedback journals, and exams. I long for other classes to soon model the methods used in this one.

This class was helpful in learning how to code in MATLAB and C. It was also helpful in how to think algorithmically. I think I learned a lot from the assignments we were given. However, I do think that the homework should have been graded on the accuracy of the coding rather than the accuracy of the math (as in, we should be given what the correct  
11 mathematical values are for the program so that we know our answers are correct). There were also times that I felt the grading by the TAs was not in line with how Dr. Bechara would have graded the homework. I did really enjoy this class, even though it was a lot of hard work.

12 The matlab portion of the course was formatted much better, and was taught a lot better. I understand that the programs are fairly similar, but it just felt as if we brushed over C, and there wasn't much explanation.

The content of this class was very challenging, but I really learned a lot about computing/coding, especially coming from  
13 someone who has had no experience coding in the past. Based on the work load I think this class should have been more than three credits.

The class overall was very good at clearing up any confusion I had from previous knowledge of coding. The problems  
14 were challenging to a manageable extent and pulled in work from other major related subjects. Dr. Bechara did a very good job of keeping the class engaged throughout lectures.

The class was organized very well placing Matlab before C. The concepts were easy to grasp in Matlab and were a bit harder using C programming, but because I had a background from Matlab, it was easier to understand explanations  
15 and try things on my own. The class was well paced throughout the semester regarding homework. If I had to change one thing about the class, I would add object oriented programming in Matlab. OOP is used everywhere, so it would have been better to understand how it works in Matlab instead of trying to jump into it broadly in C at the last minute.

The class was run in a way that was different than any other class I have ever taken. I thoroughly enjoyed figuring out how coding works and how to figure the problems out in logical ways that actually have context in what we will be doing as engineers.

16 - do wish that there was a little more structure in how the homework assignments were graded - wasn't really certain on how those were graded

- wish there was a little more emphasis on reviewing the exams/learning from those.

The class covered material efficiently and the homework given allowed the individual to understand the material better.  
17 Allows even beginners in programming to understand what to do for the homework. In addition, the class helps the individual increase their problem solving skills and gives the student the ability to write code that connects with other class materials, such as physics.

18 Some of the grading for the assignments were overly harsh. The discussion posts were pretty worthless but fun.

19 Slower paced

20 Loved the class. I have never had coding experience, and this class made be much better. I am now able to understand code and write it pretty competently.

21 I really enjoyed this class overall. The homework assignments that were due on Wednesday after our Monday class I think should be shorter since we have less time but overall I thought it was very well structured.

I really enjoyed this course. The lecture structure was unconventional and really refreshing. The content of the class was

- 22 compact and useful. Dr. Bechara never ridiculed any students and made everyone feel included, even if they were stuck on a problem. I only wish that we could've done example problems in class to get us into the proper mindset for the homeworks.
- 23 I really enjoyed this class. I liked learning Matlab and really enjoyed learning C. I think that what I learned in this class will be very helpful for my future as an engineer.
- 24 I found that some of the material was similar to the material in the java class I took last year just using different programming languages. I don't think this is something able to be avoided though, as some people took that class and some didn't. This made the basics of the languages very easy, however, the later problems were challenging, and required deeper learning of coding.
- 25 I feel that there is a better method that could be used to teach this class, namely, that the most important element of these programming languages is the function. In MatLab, the FIRST THING that should be taught (after a general introduction to MatLab, of course) is function syntax. To be honest, I feel that the teacher really glossed over function syntax, which led to a lot of confusion early on. This cleared up as we went on, but it would have been easier for the others if they had been taught basic function syntax first. I ended up helping several friends, and once I went back and taught them basic function syntax, they quickly made huge strides in their understanding. For example, when you use a built in function in MatLab, you type the function name, open a set of parentheses, type in the input arguments in the correct order, and close the set of parentheses. When you write a function yourself, you call it the same way that you call a built in function. Same thing in C, you have to teach basic function syntax. It might be appropriate to teach it a little later than with MatLab because there are more bases to cover with C first, but it is still one of the most important things to teach.
- 26 I did not know what to expect from the class. I had no prior exposure to computer programming. The style of the class was a little different than I am used to, as it is heavily based around homework rather than exams or labs, but that was not a problem. The class was tailored towards learning and the homework was tailored towards applying the knowledge practically and efficiently. While that style of class is not exactly what I always have, it really proved to me how much I learned and how much I have progressed throughout the year. Overall the class did what it was supposed to, and while it was not easy it was a pleasure to learn.
- 27 I believe this class was really helpful as a whole and it has somewhat improved my problem solving skills. Before taking this class, I had no knowledge about programming but I believe I have been doing well.
- 28 Homeworks really were graded too harshly. This material is incredibly challenging, and there were multiple times when I felt that the TAs had not given credit where credit was due.
- 29 Discussion posts should not be used unless they are taken more seriously.
- 30 Class was very useful for my future and was taught very clearly so that I could be able to teach others and learn more about programming.
- 31 Awesome class, I loved it.
- 32 Awesome class
- 33 Although the homework assignments were really tough, I really enjoyed this class. I had no prior experience with programming prior to taking this course and I feel like I have learned so much.
- 34 -Provide clear expectations for the homework assignments(Possibly a rubric?)  
-Provide a greater background in the actual computer science aspect.  
-This course should definitely meet 3 times a week.

Faculty: Bechara, Samuel

Question: Please provide additional feedback about the instructor of this class.

Response Rate: 91.67% (33 of 36)

1 The instructor did an excellent job making sure that everyone was comprehending the material being covered. He is able to explain things very well. I would suggest keeping up the good work.

The instructor is very good at keeping students engaged, but he frequently discusses how "easy" a subject is to learn. It is the first exposure to programming for many of us and is actually not easy at all. Sometimes he treats students as if this is their highest priority and fails to understand how it could possibly not be. In doing so, he occasionally appears condescending. Dr. Bechara has a great understanding of all languages of programming, but he should take a step back to realize how little experience and understanding his students have.

2  
3 The instructor frequently used feedback from the class to change his teaching style which was very helpful, and made the content very easy to pick up on quickly. The instructor also was very passionate about programming, and was able to inspire that same passion in me. I found his homework problems much more interesting than a normal homework assignment because they were usually pertinent to other classes, or everyday life. I have actually used the programs I wrote outside of the classroom.

4 The communication between the instructor and the TA's was at times very frustrating. The homework was out of a low amount of points, and getting 1 or 2 points off put you at a fairly low homework score. Most of the time points were taken off for typing errors, where a number would be slightly off. It makes a lot more sense to me if the homework was graded off of the content of what we learned.

A lot of the times the homework pertained to what we were learning, but I think it some of the problems could have been designed better for understanding the content. For example, when learning about loops, it would make more sense to me if we printed out each loop to observe what was happening.

5 Teaching was well paced and informative.

6 Professor Bechara made the subject matter easy to understand even if you didn't have prior programming experience. He made the homework challenging but everything was talked about in class. He made sure to cover all topics that were in the homework and would even allow us time to start assignments in class in case we needed help.

7 Professor Bechara was a great professor. He made sure everyone understood the material he taught and gave us assignments every class to ensure that everyone practiced what he had taught in class. This was my first time taking a programming class but it was better than I anticipated.

8 Mr. Bechara teaches with a lot of energy and enthusiasm. It is very obvious he cares greatly about this class. He is very knowledgeable in subject area. He can talk very quickly at times and he moves from one thing to the next quickly which keeps class time interesting, however it can be difficult to keep up.

9 Knew all 100 ish students names within the first 2 weeks of the class and always made an effort to help us outside of class

10 Is always available for office hours and helps the student until they understand the material. Personally, I liked their teaching style since examples would be available for nearly every material covered, which helped me immensely in order to actually understand what was going on in the code. Their teaching style allowed the material to be easy to follow and helped me understand programming even though I've never done any coding before this class.

Interesting and appeared very knowledgeable on the subject.

Provided excellent preliminary guidance on the homework and examples.

11 Enjoyable to have as an instructor, made class fun and very worthwhile beyond the learning aspects.

#10/10 #BecharaAgain

Instructor was very good at teaching and making time for us, we always took the long road to solving problems so we could learn the most from each lesson and assignment. Best class this year by far.

12  
#10/10 #BecharaAgain

13 I really liked Dr. Bechara's approach to class problems and how to solve them using code. The homework was always interesting and the problems never felt contrived, we were always doing things that felt like they mattered. It is quite clear that Dr. Bechara knows a lot about coding and he is very effective at teaching those skills.

14 I really enjoyed the way that Dr. Bechara taught this class. I took the class last year and ended up dropping in the middle of the semester because I wasn't getting very good grades and I wasn't understanding the material. I think that that the way Dr. Bechara structured this class helped a lot because I was able to learn about the ideas in class and then immediately use them for homework, which really reinforced my overall understanding. He was always there when we needed help as well as the TAs. Overall I think the class was good and I learned a lot.

15 I enjoyed his approach to teaching. He didn't just lecture but engaged the students. Very good about helping students in need. Made himself and the TAs available if we needed help.

16 He was very blunt and sweet. He is very understanding and wants his students to succeed. Although this class is not an easy A, Dr. Bechara wants us to focus on the learning aspect of the class and not the grade you receive. He told us in the beginning of class that we aren't the smartest in the class and probably will never be. He didn't say it in a rude way, he said it in a way that made us take the focus off of getting a good grade and put it on actually learning the material.

17 Great professor, he is my favorite thus far at Marquette, I hope I have more classes with him.

18 Dr. Bokhara challenged me throughout the semester. I was forced to think in ways that I had never thought before. I wish that some ideas were presented more clearly in class, rather than expecting students to figure everything out on their own. On multiple occasions, I was forced to complete an assignment incorrectly, because I did not have the resources to figure out the assignment incorrectly.

19 Dr. Bechara was very helpful in class and in office hours. He makes the class very interesting and makes it easy to learn.

20 Dr. Bechara is extremely passionate about this class and strives to help us all perform to the best of our own capabilities. I feel that he did a great job teaching this and he would be a great choice for teaching it again. He always provided help and encouraged us to take more time out of class to study and practice the material so we would get a better understanding. In each lecture and with every assignment he connected what we were learning to real world examples and applications.

21 Dr. Bechara was so passionate about the subject, and was always so enthusiastic when it came to getting the students to participate and understand. You can tell that he really likes teaching and wants his students to succeed, which motivated me to do well and work hard. Although the material was hard, and his homework assignments were sometimes complicated, he was always willing to help both inside of class and outside. He was very knowledgeable on the subject as well. Dr. Bechara is my favorite professor this semester, and this being his first time teaching this class, he did a better job than some of my professors who have been teaching for awhile. I would definitely recommend him to my peers.

22 Dr. Bechara was the reason the class worked the way it did. He brought something special to the lectures- something that did not just encourage learning but evoked participation. His knowledge on the information coupled with his personal care for the learning of each student (not just grade, actual learning and comprehension) results in something that is very rare to see in a professor and is very much looked for. I could not see the class going as well for me if not for Dr. B.

23 Dr. Bechara was fantastic. He made himself available for help frequently. He taught the course in an effective manner that was also very interesting and engaging. Dr. Bechara is a big reason why this course was enjoyable.  
#10/10wouldbecharaagain

24 Dr. Bechara is a great professor who knows how to keep a class interested and how to keep people engaged. His examples were really relevant, but I wish his random student generator was a little more random. He should work on having that function better for next year. His enthusiasm kept things active and the homework kept things real.  
#10/10Becharaagain

25 Dr. Bechara was really engaging, organized, and helped me to think as an engineer. I appreciated his teaching style and learned a lot in this class.

26 Dr. Bechara was a very good professor for this class. He has a lot of experience programming which allows us to see that this skill is extremely useful after we graduate.

27 Dr. Bechara is one of the best professors I've had thus far at Marquette. He made class interesting and interactive that kept everyone engaged. I greatly appreciated his availability for extra help and the guidance he provided working through the homework assignments. I also appreciated how much he cared that we all understood, and that he pushed us to ask questions and make sure we understood. #10/10BecharaAgain

28 Dr. Bechara is one of the most skilled professors at teaching in a meaningful, interesting way that sticks in the minds of students. His readiness to help students out of class time, his explanations, and application of the material fully expound on the potential a class full of engineers has. As someone who had other commitments during all of his typical office hours, I found Dr. Bechara eager to meet outside of class when necessary. The TA's were also well informed and could usually assist. Overall, Dr. Bechara leaves a lasting impression on me as the ideal dedicated and skilled professor of Marquette.

29 Dr. Bechara was very knowledgeable and very helpful when you had a question, and was very good at keeping office hours and meeting with you whenever you needed it, even outside of office hours. However, he also rubbed me the wrong way a little bit. This is more a personal issue than anything, but I felt like he was a little too dismissive of us as students and didn't respect our ability to learn and think and use our brains as much as other teachers do.

30 Dr. Bechara is a great professor. He knows all of our names and makes an effort to get to know each of us on a personal level. I would take a class with Dr. Bechara again. He was very helpful during office hours and during class. He was an effective professor and taught me a great amount about coding. I really appreciate Dr. Bechara's help in this class.

31 Dr. B makes this class exciting to come to. I mean that. I don't always enjoy coming to class in general because it can be boring. Never the case in Dr. B's class. In fact, this was one class where I never even thought about not coming to. This was due mostly from a combination of being engaged with a really fun and funny professor as well as material that is worth learning. Dr. B really makes this class. It was rough at times being his first group of students for this course, but after a semester of working out the kinks, Dr. B's class next semester should be an amazing opportunity to learn the material he presents

32 Bechara is very exciting and motivational Professor, he is well fit for the job

33 Amazing. He did a great job teaching the class. He is very passionate and wants every student to succeed. He was always willing to help and give useful tips for problems. He also did a great job at explaining the course material and making it easy to understand and comprehend. Loved every minute of it!

# **Appendix XI**

## **BIEN 4290 Spring 2017 Course Surveys**

Spring 2017 Course Evaluation (Session 1)  
 Spr 2017

Marquette University  
 General

Course: BIEN 4290 101 - Biocomputers Design Lab 2

Department: BIEN

Responsible Faculty: Samuel Bechara

Responses / Expected: 10 / 11 (90.91%)

BIEN 4290 - 101

Class Evaluation	Responses (%)							Course	
	E	VG	G	F	P	VP	N	Mean	Grp Med
Q1 How was this class as a whole?	50%	50%	0	0	0	0	10	5.5	5.5
Q2 How was the content of this class?	30%	60%	10%	0	0	0	10	5.2	5.2

Responses: [E] Excellent=6 [VG] Very Good=5 [G] Good=4 [F] Fair=3 [P] Poor=2 [VP] Very Poor=1

BIEN 4290 - 101

Class Evaluation	Responses (%)							Course	
	SA	A	SA	SD	D	SD	N	Mean	Grp Med
Q3 This class positively impacted my comprehension of written material in this subject.	40%	50%	10%	0	0	0	10	5.3	5.3
Q4 This class positively impacted my problem solving abilities in this subject.	60%	40%	0	0	0	0	10	5.6	5.7
Q5 This class positively impacted my ability to communicate orally and/or in writing.	40%	30%	20%	10%	0	0	10	5.0	5.2
Q6 This class was intellectually challenging.	20%	60%	20%	0	0	0	10	5.0	5.0
Q7 Evaluations of course work (e.g. exams, papers) were consistent with class learning objectives.	40%	40%	10%	0	10%	0	10	5.0	5.3
Q8 Assistance and/or extra help were available outside of class time.	70%	30%	0	0	0	0	10	5.7	5.8
Q9 Expectations of students were presented clearly.	50%	30%	10%	0	10%	0	10	5.1	5.5

Responses: [SA] Strongly Agree=6 [A] Agree=5 [SA] Somewhat Agree=4 [SD] Somewhat Disagree=3 [D] Disagree=2 [SD] Strongly Disagree=1

Bechara, Samuel

Instructor Evaluation	Responses (%)							Individual	
	E	VG	G	F	P	VP	N	Mean	Grp Med
Q10 How was the instructor's contribution to this class?	60%	30%	10%	0	0	0	10	5.5	5.7
Q11 How effective was the instructor in this class?	50%	40%	10%	0	0	0	10	5.4	5.5

Responses: [E] Excellent=6 [VG] Very Good=5 [G] Good=4 [F] Fair=3 [P] Poor=2 [VP] Very Poor=1

Instructor Evaluation		Bechara, Samuel							Individual	
		Responses (%)							Mean	Grp Med
		SA	A	SA	SD	D	SD	N		
Q12	This instructor provided explanations that reduced confusion.	30%	60%	10%	0	0	0	10	5.2	5.2
Q13	This instructor was well organized.	30%	60%	10%	0	0	0	10	5.2	5.2
Q14	This instructor was interesting.	60%	40%	0	0	0	0	10	5.6	5.7
Q15	This instructor encouraged student participation.	70%	30%	0	0	0	0	10	5.7	5.8

Responses: [SA] Strongly Agree=6 [A] Agree=5 [SA] Somewhat Agree=4 [SD] Somewhat Disagree=3 [D] Disagree=2 [SD] Strongly Disagree=1

Question: Please provide additional feedback about this class.

Response Rate: 90.00% (9 of 10)

1 n/a

This course offered interested projects and laboratory exercises. The review of C programs, exploration of bash scripting, implementation of a recursive algorithm and exposure to a group collaboration project were very valuable and exciting to work.

2

Unfortunately, the two lectures about ontology were not interactive and I felt the class could not see the application.

3

This class was very interesting and a good culmination of our biocomputing experience. I enjoyed learning about bash and bioinformatics a lot! Some of the speakers near the end were quite boring and did not present material that seemed really relevant. I enjoyed the labs and great feedback was given from the TA on writing and coding that we haven't really received before. However, I did not like how the project at the end was kept a secret. It made planning and preparation difficult. The ideas were similar to real world applications but there is less suspense and unknowns with projects in the real world because you know what is coming far ahead of time.

4

This class did a very good job combining different material we had learned in past classes to real biomedical applications. All the material was presented in a way that would be useful to our careers in the future. The C++ lectures could have been more clear with additional example demos during class, specifically the copy constructor and deconstructor. The ontology lectures were not helpful at all since she mainly talked about how the different UI worked and not how a programmer would use ontology.

This class contrasted very sharply with the biocomputers design lab 1 course most of us took last semester. The material we learned in class seemed suited for a wider range of applications unlike the low-level programming we learned in Dr. Schiedt's class and therefore added a lot more motivation to the work we were doing!

5 Given Dr. Bechara was only teaching the class for one semester, the class also seemed a lot more student input driven, something I appreciated. At the end of the day - if you are unable to capture student's attention or at least provide a compelling reason for learning the material, it is hard for me to be engaged with a class. This class did a good job of providing engaging material!

6 The shell scripting part and the combination with executable from other languages was very helpful

Overall very nice and fun course

Guest lecture was super boring and there must be a better way of delivering this important subject she was talking about

Labs could have been more organized and clear in terms of what was expected; a lot of time was spent talking to Julie about what you "thought" wanted. Also lectures were sometimes not very organized and went off on tangents that weren't relevant to the main point.

I thought the content of the class was very interesting and digestible. It expanded on previous content we have learned and added new applicable and useful content. I enjoyed the lecture, lab, and outside work that we had to do. It felt like we had a constant supply of work, but was never overwhelming or undoable. I think more content could have been added, but overall very good.

Great industry focused look at specific BioC related problems.

Faculty: Bechara, Samuel

Question: Please provide additional feedback about the instructor of this class.

Response Rate: 80.00% (8 of 10)

1 n/a

He is a great professor! He is very interesting and makes class fun. He presents material effectively and makes us want to learn. I always looked forward to coming to class to hear Dr. Bechara lecture. He relates well to students and makes engineering interesting.

Explained everything perfectly fine and was flexible with teaching style and content

3 Overall good teaching (this is a review you can probably toss)

4 Dr. Bechara tries very hard to keep development practices modern, which is awesome (Very few professors do that). Very industry focuses, cares a lot, A+ professor.

Dr. Bechara was a great instructor. He was very interesting, brought a lot of life and humor to lecture. He also used many relevant (and some times irrelevant) stories to connect the content of class to. This kept the flow moving and kept all the student's attention.

Dr. Bechara did a very good job trying to select material that was relevant to today's work force and how to apply it. Additionally, the lectures were well organized and very well explained, which translated very well to the lab projects. The side tangents were also fun.

Dr. Bechara was an excellent instructor for this course. He was blunt and honest with the coursework and applications to industry. I greatly enjoyed his sharing of his own experiences and perspectives, and his realistic expectations of us as students (e.g. lazy coding is only cheating yourself at this point, context of students as graduating seniors). His explanations were straight-forward and he was very approachable. Demonstrations were clear and well-prepared. If I were to improve lectures, I would propose having more interaction, in the form of a kahoot competition. Admittedly, having laptops out during lecture lends itself to students working on other material if they are able to get by paying half-attention.

Dr. Bechara was one of the most authentic professors I have had during my time at Marquette and although his blunt teaching style might not be for everyone - I greatly appreciated it! With most of my engineering professors, I don't feel comfortable going to their office hours alone - for fear of being intimidated or made to feel stupid - but Dr. Bechara was very much the opposite. Dr. Bechara's teaching style rotates between good insight related to the course, and salty rants on millennials, but that's just who he is and it is because of this that the course was both informative and useful.

# **Appendix XII**

## **MECH 103 Fall 2018 Course Surveys**



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[Search Course Survey Results](#) > **Course Survey Report Summary****COURSE SURVEY REPORT SUMMARY****MECH103 INTRODUCTION TO MECHANICAL ENGINEERING, SECTION 001****Instructor:** Samuel Bechara, Assistant Professor**College and Department:** Walter Scott College of Engr, Mechanical Engineering**Term:** Fall 2018**Course Reference Number:** 72016**Enrollment:** 255**BRIEF SUMMARY OF COLLATED SURVEY ANSWERS FROM 221 RESPONSES****Scale:** Excellent = 5; Above Average = 4; Average = 3; Below Average = 2; Poor = 1; NA = Not Applicable; NR = No Response

	5	4	3	2	1	NA	NR	
1. How well were the course objectives communicated to students?	46	78	72	12	2	0	11	<b>Mean:3.73</b>
2. How well was the grading system communicated to students?	59	59	77	6	8	0	12	<b>Mean:3.74</b>
3. How well did class sessions increase your understanding of the subject?	42	68	69	24	7	0	11	<b>Mean:3.54</b>
4. How well did reading assignments increase your understanding of the subject?	23	43	101	17	10	16	11	<b>Mean:3.27</b>
5. How well did other course assignments increase your understanding of the subject?	47	85	54	16	4	2	13	<b>Mean:3.75</b>
6. How well did other learning resources	33	60	86	17	8	6	11	<b>Mean:3.46</b>

used in this course — such as related websites, software, study guides, and media — increase your understanding of the subject?								
7. How well was feedback provided — such as reviews, quizzes, critiques, and homework — to help you track your progress?	21	51	80	31	26	1	11	<b>Mean:3.05</b>
8. If you accessed course information through an online system — such as a website or RamCT — how do you rate the ease of finding information?	61	67	63	15	1	3	11	<b>Mean:3.83</b>
9. How do you rate the clarity and completeness of instructions provided in the course for engaging in class activities and completing course work?	44	80	63	16	7	0	11	<b>Mean:3.66</b>
10. How do you rate the intellectual challenge of this course?	59	94	47	6	4	0	11	<b>Mean:3.94</b>
11. How do you rate this course?	58	78	56	13	5	0	11	<b>Mean:3.81</b>
12. How do you rate the instructor's knowledge of the subject?	164	32	13	0	0	0	12	<b>Mean:4.72</b>
13. How effectively did the instructor facilitate student learning?	68	65	64	10	3	0	11	<b>Mean:3.88</b>
14. How do you rate the instructor's enthusiasm for teaching the subject?	167	35	8	0	0	0	11	<b>Mean:4.76</b>
15. How well did the instructor organize the course?	68	73	55	11	2	1	11	<b>Mean:3.93</b>
16. How prepared was the instructor for class sessions?	139	53	17	1	0	0	11	<b>Mean:4.57</b>
17. How do you rate the instructor's effectiveness at managing class sessions?	121	58	29	1	0	1	11	<b>Mean:4.43</b>
18. How do you rate the instructor's effectiveness at facilitating online and/or in-class interactions (communication, discussions, etc.)?	51	78	68	8	5	0	11	<b>Mean:3.77</b>
19. How do you rate the instructor's fairness and impartiality in the	70	63	62	12	2	1	11	<b>Mean:3.89</b>

assignment of grades?									
20. How well did the instructor create an atmosphere that was respectful of student opinions, ideas, and differences?	100	56	48	2	4	0	11		<b>Mean:4.17</b>
21. How effectively did the instructor communicate?	95	69	37	6	3	0	11		<b>Mean:4.18</b>
22. How do you rate the availability of the instructor to help students outside of class?	15	37	80	39	25	14	11		<b>Mean:2.89</b>
23. How do you rate this instructor?	110	66	28	6	0	0	11		<b>Mean:4.33</b>
24. How do you rate the overall quality of the classroom?	51	85	66	6	1	0	12		<b>Mean:3.86</b>
25. How do you rate the quality of the equipment (computers, projectors, and so on) in the classroom?	65	64	70	2	1	8	11		<b>Mean:3.94</b>
26. How do you rate your class attendance in this course?	123	38	42	6	1	0	11		<b>Mean:4.31</b>
27. How do you rate your level of effort in this course?	49	101	48	12	0	0	11		<b>Mean:3.89</b>
28. I am majoring in the department offering this course.	Yes	No	NR						
	201	6	14						
29. I expect to receive the following grade in this course.	A	B	C	D	F	S	U	NR	
	53	113	42	0	0	0	0	13	

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# **Appendix XIII**

## **MECH 105 Spring 2017 Course Surveys**



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[Search Course Survey Results](#) > **Course Survey Report****COURSE SURVEY REPORT****MECH105 – MECHANICAL ENGINEERING PROBLEM SOLVING – SECTION 001****Instructor:** Samuel Bechara, Assistant Professor**College and Department:** Walter Scott College of Engr, Mechanical Engineering**Term:** Spring 2018**Course Reference Number:** 23793**Section Enrollment:** 172**COLLATED SURVEY ANSWERS FROM 150 RESPONSES****Survey Version:** Survey approved in 2013.**1. How well were the course objectives communicated to students?**

	Above Excellent	Average	Average	Below Average	Poor	Not Applicable	No Response
	90	43	15	0	1	0	1

**Mean:** 4.48 (1-5 scale)**2. How well was the grading system communicated to students?**

	Above Excellent	Average	Average	Below Average	Poor	Not Applicable	No Response
	95	39	10	4	1	0	1

**Mean:** 4.50 (1-5 scale)**3. How well did class sessions increase your understanding of the subject?**

	Above Excellent	Average	Average	Below Average	Poor	Not Applicable	No Response
	107	31	6	1	2	0	3

**Mean:** 4.63 (1-5 scale)**4. How well did reading**

	Excellent	Above	Average	Below	Poor	Not	No

**Mean:** 3.51 (1-5 scale)

**assignments increase your understanding of the subject?**

	Average	Average	Average	Applicable	Response
35	40	48	20	7	0

**5. How well did other course assignments increase your understanding of the subject?**

Excellent	Above Average	Average	Below Average	Poor	Not Applicable	No Response
75	46	21	4	1	2	1

**Mean: 4.29 (1-5 scale)**

**6. How well did other learning resources used in this course — such as related websites, software, study guides, and media — increase your understanding of the subject?**

Excellent	Above Average	Average	Below Average	Poor	Not Applicable	No Response
52	52	29	9	1	5	2

**Mean: 4.01 (1-5 scale)**

**7. How well was feedback provided — such as reviews, quizzes, critiques, and homework — to help you track your progress?**

Excellent	Above Average	Average	Below Average	Poor	Not Applicable	No Response
58	31	41	16	3	0	1

**Mean: 3.84 (1-5 scale)**

**8. If you accessed course information through an online system — such as a website or RamCT — how do you rate the**

Excellent	Above Average	Average	Below Average	Poor	Not Applicable	No Response
66	45	18	2	1	17	1

**Mean: 4.31 (1-5 scale)**

**ease of finding  
information?**

**9. How do you rate  
the clarity and  
completeness of  
instructions  
provided in the  
course for  
engaging in  
class activities  
and completing  
course work?**

Excellent	Above Average	Average	Below Average	Poor	Not Applicable	No Response
94	38	13	4	0	0	1

**Mean: 4.49 (1-5 scale)**

**10. How do you rate  
the intellectual  
challenge of this  
course?**

Excellent	Above Average	Average	Below Average	Poor	Not Applicable	No Response
89	43	11	5	1	0	1

**Mean: 4.44 (1-5 scale)**

**11. How do you rate  
this course?**

Excellent	Above Average	Average	Below Average	Poor	Not Applicable	No Response
94	37	14	2	2	0	1

**Mean: 4.47 (1-5 scale)**

**12. How do you rate  
the instructor's  
knowledge of  
the subject?**

Excellent	Above Average	Average	Below Average	Poor	Not Applicable	No Response
139	9	2	0	0	0	0

**Mean: 4.91 (1-5 scale)**

**13. How effectively  
did the  
instructor  
facilitate  
student  
learning?**

Excellent	Above Average	Average	Below Average	Poor	Not Applicable	No Response
107	30	9	2	2	0	0

**Mean: 4.59 (1-5 scale)**

**14. How do you rate  
the instructor's  
enthusiasm for  
teaching the  
subject?**

Excellent	Above Average	Average	Below Average	Poor	Not Applicable	No Response
137	10	1	2	0	0	0

**Mean: 4.88 (1-5 scale)**

**15. How well did**

Excellent	Above Average	Average	Below Average	Poor	Not Applicable	No Response

the instructor organize the course?	<table border="1"> <thead> <tr> <th></th> <th>Average</th> <th></th> <th>Average</th> <th></th> <th>Applicable</th> <th>Response</th> </tr> </thead> <tbody> <tr> <td>107</td> <td>29</td> <td>11</td> <td>2</td> <td>1</td> <td>0</td> <td>0</td> </tr> </tbody> </table>		Average		Average		Applicable	Response	107	29	11	2	1	0	0	<b>Mean:</b> 4.59 (1-5 scale)							
	Average		Average		Applicable	Response																	
107	29	11	2	1	0	0																	
16. How prepared was the instructor for class sessions?	<table border="1"> <thead> <tr> <th></th> <th>Above</th> <th></th> <th>Below</th> <th></th> <th>Not</th> <th>No</th> </tr> <tr> <th>Excellent</th> <th>Average</th> <th>Average</th> <th>Average</th> <th>Poor</th> <th>Applicable</th> <th>Response</th> </tr> </thead> <tbody> <tr> <td>131</td> <td>14</td> <td>3</td> <td>2</td> <td>0</td> <td>0</td> <td>0</td> </tr> </tbody> </table>		Above		Below		Not	No	Excellent	Average	Average	Average	Poor	Applicable	Response	131	14	3	2	0	0	0	<b>Mean:</b> 4.83 (1-5 scale)
	Above		Below		Not	No																	
Excellent	Average	Average	Average	Poor	Applicable	Response																	
131	14	3	2	0	0	0																	
17. How do you rate the instructor's effectiveness at managing class sessions?	<table border="1"> <thead> <tr> <th></th> <th>Above</th> <th></th> <th>Below</th> <th></th> <th>Not</th> <th>No</th> </tr> <tr> <th>Excellent</th> <th>Average</th> <th>Average</th> <th>Average</th> <th>Poor</th> <th>Applicable</th> <th>Response</th> </tr> </thead> <tbody> <tr> <td>112</td> <td>26</td> <td>8</td> <td>1</td> <td>3</td> <td>0</td> <td>0</td> </tr> </tbody> </table>		Above		Below		Not	No	Excellent	Average	Average	Average	Poor	Applicable	Response	112	26	8	1	3	0	0	<b>Mean:</b> 4.62 (1-5 scale)
	Above		Below		Not	No																	
Excellent	Average	Average	Average	Poor	Applicable	Response																	
112	26	8	1	3	0	0																	
18. How do you rate the instructor's effectiveness at facilitating online and/or in-class interactions (communication, discussions, etc.)?	<table border="1"> <thead> <tr> <th></th> <th>Above</th> <th></th> <th>Below</th> <th></th> <th>Not</th> <th>No</th> </tr> <tr> <th>Excellent</th> <th>Average</th> <th>Average</th> <th>Average</th> <th>Poor</th> <th>Applicable</th> <th>Response</th> </tr> </thead> <tbody> <tr> <td>92</td> <td>42</td> <td>9</td> <td>5</td> <td>0</td> <td>1</td> <td>1</td> </tr> </tbody> </table>		Above		Below		Not	No	Excellent	Average	Average	Average	Poor	Applicable	Response	92	42	9	5	0	1	1	<b>Mean:</b> 4.49 (1-5 scale)
	Above		Below		Not	No																	
Excellent	Average	Average	Average	Poor	Applicable	Response																	
92	42	9	5	0	1	1																	
19. How do you rate the instructor's fairness and impartiality in the assignment of grades?	<table border="1"> <thead> <tr> <th></th> <th>Above</th> <th></th> <th>Below</th> <th></th> <th>Not</th> <th>No</th> </tr> <tr> <th>Excellent</th> <th>Average</th> <th>Average</th> <th>Average</th> <th>Poor</th> <th>Applicable</th> <th>Response</th> </tr> </thead> <tbody> <tr> <td>107</td> <td>24</td> <td>15</td> <td>0</td> <td>2</td> <td>1</td> <td>1</td> </tr> </tbody> </table>		Above		Below		Not	No	Excellent	Average	Average	Average	Poor	Applicable	Response	107	24	15	0	2	1	1	<b>Mean:</b> 4.58 (1-5 scale)
	Above		Below		Not	No																	
Excellent	Average	Average	Average	Poor	Applicable	Response																	
107	24	15	0	2	1	1																	
20. How well did the instructor create an atmosphere that was respectful of student opinions, ideas, and differences?	<table border="1"> <thead> <tr> <th></th> <th>Above</th> <th></th> <th>Below</th> <th></th> <th>Not</th> <th>No</th> </tr> <tr> <th>Excellent</th> <th>Average</th> <th>Average</th> <th>Average</th> <th>Poor</th> <th>Applicable</th> <th>Response</th> </tr> </thead> <tbody> <tr> <td>104</td> <td>32</td> <td>10</td> <td>2</td> <td>0</td> <td>1</td> <td>1</td> </tr> </tbody> </table>		Above		Below		Not	No	Excellent	Average	Average	Average	Poor	Applicable	Response	104	32	10	2	0	1	1	<b>Mean:</b> 4.61 (1-5 scale)
	Above		Below		Not	No																	
Excellent	Average	Average	Average	Poor	Applicable	Response																	
104	32	10	2	0	1	1																	
21. How effectively did the	<table border="1"> <thead> <tr> <th>Excellent</th> <th>Above</th> <th>Average</th> <th>Below</th> <th>Poor</th> <th>Not</th> <th>No</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Excellent	Above	Average	Below	Poor	Not	No								<b>Mean:</b> 4.55 (1-5 scale)							
Excellent	Above	Average	Below	Poor	Not	No																	

	Average	Average	Average	Applicable	Response			
<b>instructor communicate?</b>	103	29	16	2	0	0		
<b>22. How do you rate the availability of the instructor to help students outside of class?</b>	Above Excellent	Average	Average	Below Average	Poor	Not Applicable	No Response	<b>Mean: 4.07 (1-5 scale)</b>
	65	42	31	6	4	2	0	
<b>23. How do you rate this instructor?</b>	Above Excellent	Average	Average	Below Average	Poor	Not Applicable	No Response	<b>Mean: 4.66 (1-5 scale)</b>
	113	28	6	1	2	0	0	
<b>24. How do you rate the overall quality of the classroom?</b>	Above Excellent	Average	Average	Below Average	Poor	Not Applicable	No Response	<b>Mean: 4.53 (1-5 scale)</b>
	97	39	9	3	1	0	1	
<b>25. How do you rate the quality of the equipment (computers, projectors, and so on) in the classroom?</b>	Above Excellent	Average	Average	Below Average	Poor	Not Applicable	No Response	<b>Mean: 4.63 (1-5 scale)</b>
	99	42	6	0	0	2	1	
<b>26. How do you rate your class attendance in this course?</b>	Above Excellent	Average	Average	Below Average	Poor	Not Applicable	No Response	<b>Mean: 4.88 (1-5 scale)</b>
	134	14	2	0	0	0	0	
<b>27. How do you rate your level of effort in this course?</b>	Above Excellent	Average	Average	Below Average	Poor	Not Applicable	No Response	<b>Mean: 4.55 (1-5 scale)</b>
	95	46	6	2	1	0	0	
<b>28. I am majoring in the department offering this course.</b>	Yes	No	No Response					
	149	0	1					

**29. I expect to receive the following grade in this course.**

A	B	C	D	F	S	U	No Response
75	68	7	0	0	0	0	0

## STUDENT COMMENTS

### OPTIONS FOR SAVING YOUR COLLATED SCANTRON RESULTS

The first and second options deliver raw scans of your course survey.

The third option provides a condensed version of your collated results

Original forms are available for all courses beginning with the fall 2011 semester. Forms are kept on file for one year following the end of the semester in which it is offered and then the originals are destroyed. You may pick up your forms at the University Testing Center or you may have them mailed to your department office.

### SHARE SURVEY FORMS

The scanned survey forms (available below as PDF files) are intended solely for viewing by the course instructor. Students and other members of the CSU community do not have access to these forms. You may, however, provide access to the survey forms to selected individuals. You can remove access to the forms at any time.

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## **Appendix XIV**

### **Letter of Support from Carissa Vos (current Undergraduate Student)**

September 8<sup>th</sup>, 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](mailto:cvos@rams.colostate.edu).

Sincerely,



Carissa Vos

2<sup>nd</sup> Year Undergraduate, Mechanical Engineering  
Colorado State University

## **Appendix XV**

### **Letter of Support from Kelsey Bilsbak (previous GTF Student)**



Kelsey Bilsback  
1371 Campus Delivery  
Fort Collins, CO 80523  
[Kelsey.Bilsback@colostate.edu](mailto: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, showing 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 XVI**

## **Selected Comments from Student Evaluations**

# Selected Comments from Student Evaluations

“Dr. Bechara was the reason the class worked the way it did. He brought something special to the lectures- something that did not just encourage learning but evoked participation. His knowledge on the information coupled with his personal care for the learning of each student (not just grade, actual learning and comprehension) results in something that is very rare to see in a professor and is very much looked for. I could not see the class going as well for me if not for Dr. B.”

“Dr. Bechara is one of the most skilled professors at teaching in a meaningful, interesting way that sticks in the minds of students. His readiness to help students out of class time, his explanations, and application of the material fully expound on the potential a class full of engineers has. As someone who had other commitments during all of his typical office hours, I found Dr. Bechara eager to meet outside of class when necessary. The TA's were also well informed and could usually assist. Overall, Dr. Bechara leaves a lasting impression on me as the ideal dedicated and skilled professor of Marquette.”

“He is a great professor! He is very interesting and makes class fun. He presents material effectively and makes us want to learn. I always looked forward to coming to class to hear Dr. Bechara lecture. He relates well to students and makes engineering interesting.”

“Dr. Bechara is a one-of-a-kind professor. He's very knowledgeable, makes learning an adventure, and usually has the class entertained throughout. Maybe other than choosing engineering as a profession, he could have been a comedian- he is seriously funny. All in all, this was a badass class. Challenging, yet eventually it clicked and he left me wanting for more”

“Dr. Bechara is an excellent professor and was always excited to teach. Even though this course was extremely difficult, I still feel like it was worthwhile because of him”

“Dr. B makes this class exciting to come to. I mean that. I don't always enjoy coming to class in general because it can be boring. Never the case in Dr. B's class. In fact, this was one class where I never even thought about not coming to. This was due mostly from a combination of being engaged with a really fun and funny professor as well as material that is worth learning. Dr. B really makes this class.”

“Dr. Bechara was an excellent instructor for this course. He was blunt and honest with the coursework and applications to industry. I greatly enjoyed his sharing of his own experiences and perspectives, and his realistic expectations of us as students (e.g. lazy coding is only cheating yourself at this point, context of students as graduating seniors). His explanations were straight-forward and he was very approachable. Demonstrations were clear and well-prepared.”

“DrB cares about his students like they're his own children. He's committed to preparing them for the rest of college, and everything else in life, by helping them become people who can make their lives easier for themselves. He sacrifices his popularity to an extent by giving students what they need over what they want, but he makes up for it by being one of the most incredibly passionate, entertaining, effective teachers I've ever had. It should be impossible to make something like numerical methods as universally fun and engaging as he does, but he does it expertly. College courses are expensive, and he makes sure we get more than our money's worth. This is exactly the kind of professor and education that makes CSU so, so great.”

“This course has been a blast and a half and I've thoroughly enjoyed being Dr B's student. He is approachable, and blunt, and hilarious, and keeps the mood light, and does a dang good job of teaching. One specific example of his strong teaching ability was right before the midterm when we still had to learn about matrix inverse. I remember reading the McGraw-Hill chapter the night before class and not knowing what the heck was going on. None of it made sense and that was concerning to me given that it would be on the test in a matter of days. But the next day when Dr B taught the concepts in class it all came together seamlessly. That was a time when it really hit me how appreciative I am for his straightforward teaching style. All this, plus the material is so interesting to learn about and so gratifying to understand! I am going to miss having Dr B as a professor--so much so that it almost makes me want to stay in the Biomedical Engineering program....”

“I love having Dr. Bechara. He is interesting to listen to and makes the 200 student class feel closer to a one on one lesson than most 20 students classes do. He is very accepting of questions and tries to have everybody understand the subject. It is one of my favorite classes to go to because of the topic and Dr. B makes that interest even stronger.”

“The learning environment of this class is the most genuine one that i have ever been in. You can tell very clearly that the professor truly wants the students to learn, not just get a good grade to make himself look better. He is very willing to meet with students and answer emails back at a quick pace. Whenever i had any questions i felt extremely welcome and comfortable talking to him. Dr B wants to get to know each student on a personal level and makes every class fun and interesting to take part in. This was my favorite class of the semester.”