**Faculty End of Course Reflections**

A master document for course evaluations for all of my courses is [ABETcourseeval20202021b.docx](https://fit.instructure.com/files/43843919/download?download_frd=1), with CHE 1101 on p. 1, CHE 1102 on p. 2, CHE 3260 on p. 3, CHE 4288/5288 on p. 4, CHE 5252 on p. 5, CHE/CHM 1091 on p. 9, CHE 4563/5291/BME4050/5790 Materials Characterization Lab on p. 10, CHE 4567/5567/BME4050/5790 Nanotechnology on p. 8, and CHE 4568/5291/BME4050/5790 The Basics of Making on pp. 6-7 of that document. Within that master document, you will find links to course syllabi, mapping of course outcomes to program outcomes, links to pre-recorded and live lectures, in class lab exercises, lab demos, all assigned homework, quizzes, exams, examples of student work for each, and finally evaluation of what percentage of students met the student course outcomes and program outcomes. In Canvas, there is not room for the full list of course objectives for each course, so the evaluator is referred to the above master document and its links for more detail. An evaluation of all aspects of the course will be done for the 2020-2021 school year. In future years, examples of student work, blank homeworks, and exams will be copied and pasted, but the assessment of course outcomes and programmatic outcomes will be updated. For the purpose of the Canvas form, the three most important course objectives and assessments will be saved in a link to the electronic version of this file, and copied and pasted for future years.

Course(s) Page #'s of Course Summary Page #'s for Canvas Course Evaluation

in this document in this document

CHE 1101 2 12-13

CHE 1102 3 14-15

CHE 3260 4 16-17

CHE 4288/5288 5 18-19

CHE 5252 6 20-21

CHE/CHM 1091 10 26-27

CHE 4563/5291 11 28-29

BME 4050/5790 11 28-29

CHE 4567/5291 9 24-25

BME 4050/5790 9 24-25

CHE 4568/5291 7-8 22-23

BME 4050/5790 7-8 22-23

**CHE 1101 - Introduction to Chemical Engineering 1**

Course Overview and Course Evaluation Summary - [abetche1101evaluation2021.doc](https://fit.instructure.com/files/43840705/download?download_frd=1) - p. 1-16

[ABET Syllabus](https://fit.instructure.com/files/43514769/download?download_frd=1) - p. 2 [Syllabus for Students](https://fit.instructure.com/files/43525329/download?download_frd=1)

[Course Outcome <--> Accreditation matrix](https://fit.instructure.com/files/43840703/download?download_frd=1) - p. 3 [List of Course Outcomes](https://fit.instructure.com/files/43817333/download?download_frd=1) – pp. 1-2

[Entire Course Content](https://fit.instructure.com/files/43509619/download?download_frd=1)

[Lecture Notes with Audio](https://fit.instructure.com/files/43817331/download?download_frd=1) – p. 1 ["Live" Recorded Lectures](https://fit.instructure.com/files/43817331/download?download_frd=1) – p. 1

All homework assignments, unless otherwise noted, are in [che1101hwf20.doc](https://fit.instructure.com/files/43525331/download?download_frd=1), although additional documentation for many of the problems is also in [che1101syllabusplusallhomework.pdf](https://fit.instructure.com/files/43517331/download?download_frd=1)

Note that some assignments (8 and 9) have grades of 0 or 100, depending on whether they are done

Homework # Assignment .Zip Files with Best/Average/Poor Examples

1 No data collected (done or not done)

2 [hw2simpler.xls](https://fit.instructure.com/files/43517335/download?download_frd=1) [CHE1101hw2ABETbestavgpoor.zip](https://fit.instructure.com/files/43509255/download?download_frd=1)

[pvcqandi.pdf](https://fit.instructure.com/files/43525337/download?download_frd=1)

3 [CHE1101hw3ABETbestavgpoor.zip](https://fit.instructure.com/files/43509259/download?download_frd=1)

4 [CHE1101hw4ABETbestavgpoor.zip](https://fit.instructure.com/files/43509261/download?download_frd=1)

5 [CHE1101hw5ABETbestavgpoor.zip](https://fit.instructure.com/files/43509263/download?download_frd=1)

6 [CHE1101hw6ABETbestavgpoor.zip](https://fit.instructure.com/files/43509257/download?download_frd=1)

7 [CHE1101hw7ABETbestavgpoor.zip](https://fit.instructure.com/files/43509265/download?download_frd=1)

8 Project Selection No data collected (done or not done)

9 [Intro to CAD](https://fit.instructure.com/files/43525339/download?download_frd=1) No data collected (done or not done)

10 Group Project Flight Check Better summarized as part of presentation

Exam 1 [exam1partialanswer.pdf](https://fit.instructure.com/files/43509247/download?download_frd=1) [CHE1101exam1ABETbestavgpoor.zip](https://fit.instructure.com/files/43509249/download?download_frd=1)

[examanswers.pdf](https://fit.instructure.com/files/43525335/download?download_frd=1)

Project Presentation Presentation [CHE1101finalpresentations1.mp4](https://fit.instructure.com/files/43179635/download?download_frd=1)

[TALK.ppt](https://fit.instructure.com/files/43815129/download?download_frd=1) [CHE1101finalpresentations2.mp4](https://fit.instructure.com/files/43517753/download?download_frd=1)

[che1101evaldesign2016.xls](https://fit.instructure.com/files/43815125/download?download_frd=1) [CHE1101finalpresentationsABETbestavgpoor.zip](https://fit.instructure.com/files/43509251/download?download_frd=1)

Project Reports Final Report [CHE1101finalreportsABETbestavgpoor.zip](https://fit.instructure.com/files/43509253/download?download_frd=1)

[reportexpectations.txt](https://fit.instructure.com/files/43815127/download?download_frd=1) Reports are typically revised until all students in a

group have maximized their course grade

The [.zip file](https://fit.instructure.com/files/43815133/download?download_frd=1) contains final versions of reports

Professor Reflections

Homeworks: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 [abetche1101evaluation2021.doc](https://fit.instructure.com/files/43840705/download?download_frd=1) - pp. 4-12

Exam 1 [abetche1101evaluation2021.doc](https://fit.instructure.com/files/43840705/download?download_frd=1) - p. 13

Project Presentation [abetche1101evaluation2021.doc](https://fit.instructure.com/files/43840705/download?download_frd=1) - pp. 14-15

Project Reports [abetche1101evaluation2021.doc](https://fit.instructure.com/files/43840705/download?download_frd=1) - p. 16

Comparison of Student Performance to Desired Course Outcomes in

[abetche1101evaluation2021.doc](https://fit.instructure.com/files/43840705/download?download_frd=1) - p. 2

Comparison of Student Performance to Desired Program Outcomes in

[abetche1101evaluation2021.doc](https://fit.instructure.com/files/43840705/download?download_frd=1) - p. 3

**CHE 1102 - Introduction to Chemical Engineering 2**

Course Overview and Course Evaluation Summary - [abetche1102evaluation2021.doc](https://fit.instructure.com/files/43840709/download?download_frd=1) - pp. 1-16

[ABET Syllabus](https://fit.instructure.com/files/43514769/download?download_frd=1) - p. 4 [Syllabus for Students](https://fit.instructure.com/files/43524597/download?download_frd=1)

[Course Outcome <--> Accreditation matrix](https://fit.instructure.com/files/43840711/download?download_frd=1) - p. 5 [List of Course Outcomes](https://fit.instructure.com/files/43817333/download?download_frd=1) – pp. 3-4

[Entire Course Content](https://fit.instructure.com/files/43509479/download?download_frd=1)

[Lecture Notes with Audio](https://fit.instructure.com/files/43817331/download?download_frd=1) – p. 2 ["Live" Recorded Lectures](https://fit.instructure.com/files/43817331/download?download_frd=1) – p. 2

Most lecture content is in [coursepacks12.pptx](https://fit.instructure.com/files/43824725/download?download_frd=1).

All homework problems are in [CHE1102hws21.doc](https://fit.instructure.com/files/43524589/download?download_frd=1).

Homework # Answers .Zip Files with Best/Average/Poor Examples

1 [week1.zip](https://fit.instructure.com/files/43526699/download?download_frd=1) [CHE1102hw1ABETbestavgpoor.zip](https://fit.instructure.com/files/43526391/download?download_frd=1)

2 [week2.pdf](https://fit.instructure.com/files/43526683/download?download_frd=1) [CHE1102hw2ABETbestavgpoor.zip](https://fit.instructure.com/files/43526393/download?download_frd=1)

3 [week3.zip](https://fit.instructure.com/files/43526701/download?download_frd=1) [hw3.zip](https://fit.instructure.com/files/43832013/download?download_frd=1)

4 [week4.zip](https://fit.instructure.com/files/43526703/download?download_frd=1) [hw4.zip](https://fit.instructure.com/files/43823743/download?download_frd=1)

5 [week5.zip](https://fit.instructure.com/files/43526705/download?download_frd=1) [hw5.zip](https://fit.instructure.com/files/43823745/download?download_frd=1)

6 & 7 [sphericaltankdepth.xls](https://fit.instructure.com/files/43526445/download?download_frd=1) [hw6and7.zip](https://fit.instructure.com/files/43823747/download?download_frd=1)

[watergasshiftequilibrium.xls](https://fit.instructure.com/files/43526451/download?download_frd=1)

[watergasshift.pol](https://fit.instructure.com/files/43526449/download?download_frd=1)

8 in [week9.zip](https://fit.instructure.com/files/43526711/download?download_frd=1) [hw8.zip](https://fit.instructure.com/files/43823749/download?download_frd=1)

9 [fallingparticle.xls](https://fit.instructure.com/files/43526437/download?download_frd=1) done or not done

10 [numericintegrationtrapezoidalrule.xls](https://fit.instructure.com/files/43526435/download?download_frd=1) done or not done

11 [labviewHWinstructions.rtf](https://fit.instructure.com/files/43824715/download?download_frd=1) [LabViewHW11.zip](https://fit.instructure.com/files/43824713/download?download_frd=1)

Student Work

Exam 1 ["Take Home Excel Part"](https://fit.instructure.com/files/43514789/download?download_frd=1) ["Take Home Word Part"](https://fit.instructure.com/files/43514791/download?download_frd=1) [exam1.zip](https://fit.instructure.com/files/43823737/download?download_frd=1)

["In Class Excel Part"](https://fit.instructure.com/files/43515843/download?download_frd=1) ["In Class Word Part"](https://fit.instructure.com/files/43515841/download?download_frd=1) [exam2.zip](https://fit.instructure.com/files/43823739/download?download_frd=1)

Exam 2 ["Take Home"](https://fit.instructure.com/files/43515739/download?download_frd=1) [exam2.zip](https://fit.instructure.com/files/43823739/download?download_frd=1)

["In Class Word Part"](https://fit.instructure.com/files/43515733/download?download_frd=1) ["In Class Excel Part"](https://fit.instructure.com/files/43515735/download?download_frd=1) [exam2.zip](https://fit.instructure.com/files/43823739/download?download_frd=1)

Final Exam ["Word Part"](https://fit.instructure.com/files/43515731/download?download_frd=1) [final.zip](https://fit.instructure.com/files/43823741/download?download_frd=1)

["Excel Part"](https://fit.instructure.com/files/43515737/download?download_frd=1)

Professor Reflections

Homeworks: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 [abetche1102evaluation2021.doc](https://fit.instructure.com/files/43840709/download?download_frd=1) - pp. 4-13

Exam 1 Take Home [abetche1102evaluation2021.doc](https://fit.instructure.com/files/43840709/download?download_frd=1) - p. 14

Exam 1 In Class [abetche1102evaluation2021.doc](https://fit.instructure.com/files/43840709/download?download_frd=1) - p. 14

Exam 2 Take Home [abetche1102evaluation2021.doc](https://fit.instructure.com/files/43840709/download?download_frd=1) - p. 15

Exam 2 In Class [abetche1102evaluation2021.doc](https://fit.instructure.com/files/43840709/download?download_frd=1) - p. 15

Final Exam Take Home [abetche1102evaluation2021.doc](https://fit.instructure.com/files/43840709/download?download_frd=1) - p. 16

Final Exam In Class [abetche1102evaluation2021.doc](https://fit.instructure.com/files/43840709/download?download_frd=1) - p. 16

Comparison of Student Performance to Desired Course Outcomes in

[abetche1102evaluation2021.doc](https://fit.instructure.com/files/43840709/download?download_frd=1) - p. 2

Comparison of Student Performance to Desired Program Outcomes in

[abetche1102evaluation2021.doc](https://fit.instructure.com/files/43840709/download?download_frd=1) - p. 3

**CHE 3260 - Materials Science and Engineering**

Course Overview & Course Evaluation Summary - [abetche3260evaluation20202021.doc](https://fit.instructure.com/files/43843915/download?download_frd=1) pp. 1-5

[ABET Syllabus](https://fit.instructure.com/files/43514769/download?download_frd=1) - p. 6 [Syllabus for Students](https://fit.instructure.com/files/43524581/download?download_frd=1)

[Course Outcome <--> Accreditation matrix](https://fit.instructure.com/files/43843917/download?download_frd=1) - p. 7 [List of Course Outcomes](https://fit.instructure.com/files/43817333/download?download_frd=1) – pp. 5-6

[Entire Course Content](https://fit.instructure.com/files/43509685/download?download_frd=1)

[Lecture Notes with Audio](https://fit.instructure.com/files/43817331/download?download_frd=1) – p. 4 ["Live" Recorded Lectures](https://fit.instructure.com/files/43817331/download?download_frd=1) – p. 4

Homeworks 7 and 8 is a group assignment that is also used for evaluation of multidisciplinary teamwork and of ABET's non-technical outcomes.

Homework # Assignment .Zip Files with Best/Average/Poor Examples

1 [hw1che3260.pdf](https://fit.instructure.com/files/43504717/download?download_frd=1) [abetreadyCHE3260HW1-8.zip](https://fit.instructure.com/files/43822531/download?download_frd=1)

2 [hw2che3260.pdf](https://fit.instructure.com/files/43504721/download?download_frd=1) [abetreadyCHE3260HW1-8.zip](https://fit.instructure.com/files/43822531/download?download_frd=1)

3 [hw3che3260.pdf](https://fit.instructure.com/files/43504699/download?download_frd=1) [abetreadyCHE3260HW1-8.zip](https://fit.instructure.com/files/43822531/download?download_frd=1)

4 [hw4che3260.pdf](https://fit.instructure.com/files/43504723/download?download_frd=1) [abetreadyCHE3260HW1-8.zip](https://fit.instructure.com/files/43822531/download?download_frd=1)

5 [hw5che3260.pdf](https://fit.instructure.com/files/43504725/download?download_frd=1) [abetreadyCHE3260HW1-8.zip](https://fit.instructure.com/files/43822531/download?download_frd=1)

6 [hw6che3260.pdf](https://fit.instructure.com/files/43504727/download?download_frd=1) [abetreadyCHE3260HW1-8.zip](https://fit.instructure.com/files/43822531/download?download_frd=1)

7 & 8 [hw7and8che3260.pdf](https://fit.instructure.com/files/43504701/download?download_frd=1) [abetreadyCHE3260HW1-8.zip](https://fit.instructure.com/files/43822531/download?download_frd=1)

Exam 1 [che3260exam1f20.pdf](https://fit.instructure.com/files/43504703/download?download_frd=1) [CHE3260exam1ABETbestavgpoor.zip](https://fit.instructure.com/files/43504705/download?download_frd=1)

Exam 2 [che3260exam1f20.pdf](https://fit.instructure.com/files/43504713/download?download_frd=1) [CHE3260exam2ABETbestavgpoor.zip](https://fit.instructure.com/files/43504707/download?download_frd=1)

Exam 3 [che3260exam1f20.pdf](https://fit.instructure.com/files/43504715/download?download_frd=1) [CHE3260exam3ABETbestavgpoor.zip](https://fit.instructure.com/files/43504709/download?download_frd=1)

Final Exam [che3260finalexamf20.pdf](https://fit.instructure.com/files/43504719/download?download_frd=1) [CHE3260finalexamABETbestavgpoor.zip](https://fit.instructure.com/files/43504711/download?download_frd=1)

Professor Reflections

Homeworks: 1, 2, 3, 4, 5, 6, 7, 8 [abetche3260evaluation20202021.doc](https://fit.instructure.com/files/43843915/download?download_frd=1) pp. 6-13

Exam 1 [abetche3260evaluation20202021.doc](https://fit.instructure.com/files/43843915/download?download_frd=1) p. 14

Exam 2 [abetche3260evaluation20202021.doc](https://fit.instructure.com/files/43843915/download?download_frd=1) p. 15

Exam 3 [abetche3260evaluation20202021.doc](https://fit.instructure.com/files/43843915/download?download_frd=1) p. 16

Final Exam [abetche3260evaluation20202021.doc](https://fit.instructure.com/files/43843915/download?download_frd=1) p. 17

Comparison of Student Performance to Desired Course Outcomes

[abetche3260evaluation20202021.doc](https://fit.instructure.com/files/43843915/download?download_frd=1) p. 18

Comparison of Student Performance to Desired Program Outcomes broken down as follows:

All Program Outcomes: [abetche3260evaluation20202021.doc](https://fit.instructure.com/files/43843915/download?download_frd=1) p. 19

Multidisciplinary Teamwork: [abetche3260evaluation20202021.doc](https://fit.instructure.com/files/43843915/download?download_frd=1) p. 20

Non-Technical ABET Outcomes: [abetche3260evaluation20202021.doc](https://fit.instructure.com/files/43843915/download?download_frd=1) p. 25

Discipline-Specific Science/Engineering [abetche3260evaluation20202021.doc](https://fit.instructure.com/files/43843915/download?download_frd=1) p. 28

**CHE 4288/5288 - Petroleum Processing**

Course Overview and Course Evaluation Summary

[ABET Syllabus](https://fit.instructure.com/files/43514769/download?download_frd=1) - p. 8 Syllabus for Students

[Course Outcome <--> Accreditation matrix](https://fit.instructure.com/files/43514769/download?download_frd=1) - p. 9 List of Course Outcomes

Entire Course Content - [Part 1](https://fit.instructure.com/files/43509679/download?download_frd=1) and [Part 2](https://fit.instructure.com/files/43509681/download?download_frd=1)

[Lecture Notes with Audio](https://fit.instructure.com/files/43817331/download?download_frd=1) – p. 8 ["Live" Recorded Lectures](https://fit.instructure.com/files/43817331/download?download_frd=1) – p. 8

Homework # Assignment .Zip Files with Best/Average/Poor Examples

1 CHE4288hw1ABETbestavgpoor.zip

2 CHE4288hw2ABETbestavgpoor.zip

3 CHE4288hw3ABETbestavgpoor.zip

4 CHE4288hw4ABETbestavgpoor.zip

5 CHE4288hw5ABETbestavgpoor.zip

6 CHE4288hw6ABETbestavgpoor.zip

Exam 1 CHE4288Exam1ABETbestavgpoor.zip

Exam 2 CHE4288Exam2ABETbestavgpoor.zip

Exam 3 CHE4288Exam3ABETbestavgpoor.zip

Final Exam CHE4288FinalExambestavgpoor.zip

Professor Reflections

Homeworks: 1, 2, 3, 4, 5, 6 CHE4288HomeworkReflections.docx

Exam 1 CHE4288Exam1Reflection.docx

Exam 2 CHE4288Exam2Reflection.docx

Final Exam CHE4288FinalExamReflection.docx

CHE4288\_Comparison\_of\_Student\_Performance\_to\_Desired\_Learning\_Course\_Outcomes.docx

CHE4288\_Comparison\_of\_Student\_Performance\_to\_Desired\_Program\_Outcomes.docx

**CHE 5252 - Catalytic Reactor Design (also listed under CHE 4591 - Special Topics in ChE)**

Course Overview and Course Evaluation Summary

[ABET Syllabus](https://fit.instructure.com/files/43514769/download?download_frd=1) - pp. 23-24 Syllabus for Students

[Course Outcome <--> Accreditation matrix](https://fit.instructure.com/files/43514769/download?download_frd=1) - p. 25 List of Course Outcomes

[Lecture Notes with Audio](https://fit.instructure.com/files/43817331/download?download_frd=1) – p. 9 ["Live" Recorded Lectures](https://fit.instructure.com/files/43817331/download?download_frd=1) – p. 9

Homework # Assignment .Zip Files with Best/Average/Poor Examples

1 CHE5252hw1ABETbestavgpoor.zip

2 CHE5252hw2ABETbestavgpoor.zip

3 CHE5252hw3ABETbestavgpoor.zip

4 CHE5252hw4ABETbestavgpoor.zip

5 CHE5252hw5ABETbestavgpoor.zip

6 CHE5252hw6ABETbestavgpoor.zip

Exam 1 CHE5252Exam1ABETbestavgpoor.zip

Exam 2 CHE5252Exam2ABETbestavgpoor.zip

Final Exam CHE5252FinalExambestavgpoor.zip

Professor Reflections

Homeworks: 1, 2, 3, 4, 5, 6 CHE5252HomeworkReflections.docx

Exam 1 CHE5252Exam1Reflection.docx

Exam 2 CHE5252Exam2Reflection.docx

Final Exam CHE5252FinalExamReflection.docx

CHE5252\_Comparison\_of\_Student\_Performance\_to\_Desired\_Learning\_Course\_Outcomes.docx

CHE5252\_Comparison\_of\_Student\_Performance\_to\_Desired\_Program\_Outcomes.docx

**CHE 4568 - The Basics of Making** (also listed under CHE 4591 & 5291 - Special Topics in ChE

and BME 4050 & 5790 - Special Topics in BME)

[Course Overview and Course Evaluation Summary](https://fit.instructure.com/files/43840721/download?download_frd=1) - pp. 7 to end

[ABET Syllabus](https://fit.instructure.com/files/43514769/download?download_frd=1) - pp. 16-19 [Syllabus for Students](https://fit.instructure.com/files/43517155/download?download_frd=1)

[Course Outcome <--> Accreditation matrix](https://fit.instructure.com/files/43840713/download?download_frd=1) - pp. 20-21 [List of Course Outcomes](https://fit.instructure.com/files/43815139/download?download_frd=1)

[Lecture Notes with Audio](https://fit.instructure.com/files/43817331/download?download_frd=1) – p. 7 ["Live" Recorded Lectures](https://fit.instructure.com/files/43817331/download?download_frd=1) – p. 7

[In Class Participation Grades](https://fit.instructure.com/courses/551142/assignments/) (These are assessed on a pass/fail basis regarding whether the

student was able to execute the experiment.)

[Wiring Light Bulb Circuit](https://fit.instructure.com/courses/551142/assignments/4718023) [LabView - Conversion of C to F](https://fit.instructure.com/courses/551142/assignments/4718021)

[Arduino Blink](https://fit.instructure.com/courses/551142/assignments/4718025) [Soldering of Load Cell to Load Cell Shield](https://fit.instructure.com/courses/551142/assignments/4718027)

[Temperature Sensor Lab](https://fit.instructure.com/courses/551142/assignments/4718029) [Load Cell Sensor - Arduino](https://fit.instructure.com/courses/551142/assignments/4718031)

[pH Sensor](https://fit.instructure.com/courses/551142/assignments/4718033) [Electrical Conductivity / Salinity Sensor - Arduino](https://fit.instructure.com/courses/551142/assignments/4718035)

[Python Programming](https://fit.instructure.com/courses/551142/assignments/4718049) [Servo Motor - Arduino](https://fit.instructure.com/courses/551142/assignments/4718041)

[Stepper Motor and DC Motor - Arduino](https://fit.instructure.com/courses/551142/assignments/4718039) [Arduino & Bluetooth Robot Control](https://fit.instructure.com/courses/551142/assignments/4718045)

[3D Printer Configuration and Subsystems](https://fit.instructure.com/courses/551142/assignments/4724861) [CAD Drawing](https://fit.instructure.com/courses/551142/assignments/4718051)

[Microfluidic Flow & Lab-on-a-Chip](https://fit.instructure.com/courses/551142/assignments/4718047) [SpeakerBox - Soldering of LED's](https://fit.instructure.com/courses/551142/assignments/4718473)

[Editing of .stl Files with Meshmixer/Inkscape](https://fit.instructure.com/courses/551142/assignments/4718465)

[Conversion of CAD --> .stl](https://fit.instructure.com/courses/551142/assignments/4718463) [3D Printing](https://fit.instructure.com/courses/551142/assignments/4718467)

[SpeakerBox Construction & Wiring](https://fit.instructure.com/courses/551142/assignments/4718469) [Bluetooth Arduino SpeakerBox Configuration](https://fit.instructure.com/courses/551142/assignments/4718475)

[Laser Cutting of SpeakerBox Top](https://fit.instructure.com/courses/551142/assignments/4718471) [Electrochemical Concentration Monitoring](https://fit.instructure.com/courses/551142/assignments/4718043)

[Electrical Conductivity Calibration](https://fit.instructure.com/courses/551142/assignments/4718479)

[HW 1 - Kit Identification](https://fit.instructure.com/courses/551142/assignments/4713623) CHE4568hw1ABETbestavgpoor.zip

[HW 2 - Questions and Issues Sheet for Project](https://fit.instructure.com/courses/551142/assignments/4715741) see [thebasicsofmaking.htm](https://fit.instructure.com/files/43831953/download?download_frd=1)

[HW 3 - LabView Programming](https://fit.instructure.com/courses/551142/assignments/4718491) [hw3labview.zip](https://fit.instructure.com/files/43824693/download?download_frd=1)

[HW 4 - Python Programming](https://fit.instructure.com/courses/551142/assignments/4718499) done or not done

[HW 5 - CAD Drawing](https://fit.instructure.com/courses/551142/assignments/4718493) see [thebasicsofmaking.htm](https://fit.instructure.com/files/43831953/download?download_frd=1)

[HW 6 - Meshmixer Prep](https://fit.instructure.com/courses/551142/assignments/4719011) done or not done

[HW 7 - Data Acquisition, Mass & Energy Balance](https://fit.instructure.com/courses/551142/assignments/4718497) [hw7.zip](https://fit.instructure.com/files/43831871/download?download_frd=1)

Closure, Process Control, & Hazardous

Operability (HAZOP) Analysis

Lab Report

[CAD Drawing, 3D Printing, Fit & Finish](https://fit.instructure.com/courses/551142/assignments/4718495) see [thebasicsofmaking.htm](https://fit.instructure.com/files/43831953/download?download_frd=1)

Quizzes

[Quiz 1 - pH, Data Acquisition, and Acid/Base Titration](https://fit.instructure.com/courses/551142/assignments/4718489) CHE4568quiz1bestavgpoor.zip

[Quiz 2 - CAD Drawing](https://fit.instructure.com/courses/551142/assignments/4718485) CHE4568quiz2bestavgpoor.zip

Final Project Rubric for End-of-Semester Project ([multiple worksheets in Excel file](https://fit.instructure.com/files/43517417/download?download_frd=1))

Project Posters are linked in [thebasicsofmaking.htm](https://fit.instructure.com/files/43831953/download?download_frd=1)

Project Final Reports are linked in [thebasicsofmaking.htm](https://fit.instructure.com/files/43831953/download?download_frd=1)

End of Semester Project Performance & Complexity [CHE4568projectrubric.xlsx](https://fit.instructure.com/files/43517417/download?download_frd=1)

End of Semester Poster Presentation [CHE4568projectrubric.xlsx](https://fit.instructure.com/files/43517417/download?download_frd=1)

Final Project Report - Literature Review & Business Case [CHE4568projectrubric.xlsx](https://fit.instructure.com/files/43517417/download?download_frd=1)

Final Project Report [CHE4568projectrubric.xlsx](https://fit.instructure.com/files/43517417/download?download_frd=1)

Professor Reflections

In Class Assignments [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 14

Homeworks and Quizzes [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 15

End of Semester Project Performance &

Complexity [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 16

End of Semester Poster Presentation [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 16

Literature Review & Business Case [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 16

Final Project Report [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 16

Comparison of Student Performance to Desired Course Outcomes [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 17

Comparison of Student Performance to Desired Program Outcomes [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 18

**CHE 4567 - Nanotechnology** (also listed under CHE 5567 and BME 4050 & 5790 -

Special Topics in BME)

[Course Overview and Course Evaluation Summary](https://fit.instructure.com/files/43840721/download?download_frd=1) - pp. 1-5

[ABET Syllabus](https://fit.instructure.com/files/43514769/download?download_frd=1) - pp. 12-13 [Syllabus for Students](https://fit.instructure.com/files/43528459/download?download_frd=1)

[Course Outcome <--> Accreditation matrix](https://fit.instructure.com/files/43819845/download?download_frd=1) - pp. 14-15 [List of Course Outcomes](https://fit.instructure.com/files/43817337/download?download_frd=1) – pp. 8-11

[Lecture Notes with Audio](https://fit.instructure.com/files/43817331/download?download_frd=1) – p. 6 ["Live" Recorded Lectures](https://fit.instructure.com/files/43817331/download?download_frd=1) – p. 6

All homework questions are in [readdiscusstopicsall2007g.doc](https://fit.instructure.com/files/43820451/download?download_frd=1)

The homework answers are circled or bracketed in the news items, so there is no point in looking through best, average, and poor examples. Almost all students get 100's on the homeworks, and almost all get > 90.

Homework # .Zip Files with Homework Examples

1, 2, 3 [CHE4567hw1.zip](https://fit.instructure.com/files/43817535/download?download_frd=1), [CHE4567hw2.zip](https://fit.instructure.com/files/43817537/download?download_frd=1), [CHE4567hw3.zip](https://fit.instructure.com/files/43817539/download?download_frd=1)

4, 5, 6 [CHE4567hw4.zip](https://fit.instructure.com/files/43817541/download?download_frd=1), [CHE4567hw5.zip](https://fit.instructure.com/files/43817545/download?download_frd=1), [CHE4567hw6.zip](https://fit.instructure.com/files/43817547/download?download_frd=1)

7, 8, 9 [CHE4567hw7.zip](https://fit.instructure.com/files/43817549/download?download_frd=1), [CHE4567hw8.zip](https://fit.instructure.com/files/43817551/download?download_frd=1), [CHE4567hw9.zip](https://fit.instructure.com/files/43817553/download?download_frd=1)

10, 11, 12 [CHE4567hw10.zip](https://fit.instructure.com/files/43817555/download?download_frd=1), [CHE4567hw11.zip](https://fit.instructure.com/files/43817543/download?download_frd=1), [CHE4567hw12.zip](https://fit.instructure.com/files/43817557/download?download_frd=1)

13, 14 [CHE4567hw13.zip](https://fit.instructure.com/files/43817559/download?download_frd=1), [CHE4567hw14.zip](https://fit.instructure.com/files/43817561/download?download_frd=1)

Exam 1 [nanotechnologymidterms21.docx](https://fit.instructure.com/files/43528457/download?download_frd=1) [nanotechnologymidterms21takehome.docx](https://fit.instructure.com/files/43528453/download?download_frd=1)

[che45675567exam1s21CMCquestion.xlsx](https://fit.instructure.com/files/43524579/download?download_frd=1) [CHE4567Exam1QandIABETbestavgpoor.zip](https://fit.instructure.com/files/43504403/download?download_frd=1)

[BMENanotechnologyExam1QandIABETbestavgpoor.zip](https://fit.instructure.com/files/43504401/download?download_frd=1)

[CHE4567Exam1ExcelDataFitABETbestavgpoor.zip](https://fit.instructure.com/files/43504405/download?download_frd=1)

[BMENanotechnologyExam1ExcelDataFitABETbestavgpoor.zip](https://fit.instructure.com/files/43504397/download?download_frd=1)

[CHE4567Exam1InClassABETbestavgpoor.zip](https://fit.instructure.com/files/43504407/download?download_frd=1)

[BMENanotechnologyExam1InClassABETbestavgpoor.zip](https://fit.instructure.com/files/43504399/download?download_frd=1)

Final Presentation rubric for presentations + grad student reports = [che5567evalproject.xls](https://fit.instructure.com/files/43517451/download?download_frd=1)

[Links to all student presentations, grad student reports + evaluations of each](https://fit.instructure.com/files/43817563/download?download_frd=1)

[week15-5567-2021.mp4](https://fit.instructure.com/files/43813461/download?download_frd=1)

[week16wednesday-5567-2021.mp4](https://fit.instructure.com/files/43813481/download?download_frd=1)

[week16thursday-5567-2021.mp4](https://fit.instructure.com/files/43813471/download?download_frd=1)

Final Review Papers [Links to all student presentations, grad student reports + evaluations of each](https://fit.instructure.com/files/43817563/download?download_frd=1)

Professor Reflections

Homeworks: 1-14 [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 1

Exam 1 [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) pp. 1-3

Final Presentations [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 3

Final Review Papers (grad students): [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 3

Comparison of Student Performance to Desired Course Outcomes [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 4

Comparison of Student Performance to Desired Program Outcomes [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 5

**CHE/CHM 1091 - Nanotechnology Lab**

[Course Overview and Course Evaluation Summary](https://fit.instructure.com/files/43840721/download?download_frd=1) - pp. 11-12

[ABET Syllabus](https://fit.instructure.com/files/43514769/download?download_frd=1) - p. 25 [Syllabus for Students](https://fit.instructure.com/files/43514781/download?download_frd=1)

[Course Outcome <--> Accreditation matrix](https://fit.instructure.com/files/43840727/download?download_frd=1) - p. 26 [List of Course Outcomes](https://fit.instructure.com/files/43817337/download?download_frd=1) – pp. 1-2

[Entire Course Content](https://fit.instructure.com/files/43509683/download?download_frd=1)

[Lecture Notes with Audio](https://fit.instructure.com/files/43817331/download?download_frd=1) – p. 3 ["Live" Recorded Lectures](https://fit.instructure.com/files/43817331/download?download_frd=1) – p. 3

In Class Participation Grades - 20% (These are assessed on a pass/fail basis regarding whether the

student was able to execute the experiment. All students consistently succeed.)

Quizzes - 40% (10% each)

Quiz Assignment .Zip Files with Best/Average/Poor Examples

1 [STM/AFM](https://fit.instructure.com/files/43515097/download?download_frd=1) Two students got withdraw & retract reversed. One

student thought a blinking red light on the AFM would be

OK.

2 [Ag-SH & Catalyst Synthesis](https://fit.instructure.com/files/43515101/download?download_frd=1) [CHE1091Quiz2.zip](file:///C:\Users\jbrenner\Downloads\chechm1091\Agalkanethiolquiz.zip)

3 [Au Sputter Coat / SEM](https://fit.instructure.com/files/43519763/download?download_frd=1) [CHE1091Quiz3.zip](../../Downloads/chechm1091/SEMsputtercoatingquiz.zip)

4 [Ag Nanoparticles Toxicity](https://fit.instructure.com/files/43816789/download?download_frd=1) All students got a 100.

Ethics Exercise (20%) [EthicsBackground.mp4](https://fit.instructure.com/files/43521759/download?download_frd=1)

[Ethics2021.mp4](https://fit.instructure.com/files/43549561/download?download_frd=1) in lieu of best/average/poor

Entrepreneurship Exercise (20%) [EntrepreneurshipBackground.mp4](https://fit.instructure.com/files/43521757/download?download_frd=1) [LiteratureSearch.mp4](https://fit.instructure.com/files/43519763/download?download_frd=1)

[Entrepreneurship Exercise Student Examples 2020.mp4](https://fit.instructure.com/files/43521755/download?download_frd=1)

[Entrepreneurship2021.mp4](https://fit.instructure.com/files/43640487/download?download_frd=1) in lieu of best/average/poor

Professor Reflections

In Class Experiments [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 11

Quizzes: 1, 2, 3, 4 [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 11

Ethics: [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 11

Entrepreneurship [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 11

Comparison of Student Performance to Desired Course Outcomes [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 12

Comparison of Student Performance to Desired Program Outcomes [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 12

**CHE 4563 - Materials Characterization Lab** (also listed under & 5291 - Special Topics in

ChE and BME 4050 & 5790 - Special Topics in BME)

[Course Overview and Course Evaluation Summary](https://fit.instructure.com/files/43840721/download?download_frd=1) - pp. 6-10

[ABET Syllabus](https://fit.instructure.com/files/43514769/download?download_frd=1) - pp. 10 [Syllabus for Students](https://fit.instructure.com/files/43816791/download?download_frd=1)

[Course Outcome <--> Accreditation matrix](https://fit.instructure.com/files/43840729/download?download_frd=1) - p. 11 [List of Course Outcomes](https://fit.instructure.com/files/43817337/download?download_frd=1) – pp. 6-7

[Lecture Notes with Audio](https://fit.instructure.com/files/43817331/download?download_frd=1) – p. 5 ["Live" Recorded Lectures](https://fit.instructure.com/files/43817331/download?download_frd=1) – p. 5

In Class Participation Grades (These are assessed on a pass/fail basis regarding whether the

student was able to execute the experiment, except for the two students out of 50 who

took the "online" version of this class. Work by the professor and teaching assistants for

each of the topics below are recorded in Panopto Recordings. Student work was, in some

cases, recorded as [semphotos.zip](https://fit.instructure.com/files/43504791/download?download_frd=1), [2020SEM.zip](https://fit.instructure.com/files/43504793/download?download_frd=1) and [TEM.zip](https://fit.instructure.com/files/43505089/download?download_frd=1))

[Videos for all experiments](https://fit.instructure.com/files/43819839/download?download_frd=1)

[Group Preproposal (for online students only)](https://fit.instructure.com/files/43504859/download?download_frd=1)

Homework # Assignment .Zip Files with Best/Average/Poor Examples

1 [Image Analysis/Particle Size](https://fit.instructure.com/files/43527895/download?download_frd=1) [CHE4563hw1ABETbestavgpoor.zip](https://fit.instructure.com/files/43831049/download?download_frd=1)

2 [Materials Selection Tools](https://fit.instructure.com/files/43527747/download?download_frd=1) [CHE4563hw2ABETbestavgpoor.zip](https://fit.instructure.com/files/43505087/download?download_frd=1)

3 [Basics of Spectroscopy](https://fit.instructure.com/files/43527747/download?download_frd=1) [CHE4563hw3ABETbestavgpoor.zip](https://fit.instructure.com/files/43505085/download?download_frd=1)

Exam 1 [SEM/TEM/STM/AFM](https://fit.instructure.com/files/43816793/download?download_frd=1) [CHE4563Exam1ABETbestavgpoor.zip](https://fit.instructure.com/files/43505083/download?download_frd=1)

[exam1.pptx](https://fit.instructure.com/files/43816795/download?download_frd=1)

Final Exam [finalexamquestions.zip](https://fit.instructure.com/files/43504789/download?download_frd=1) [CHE4563FinalExamABETbestavgpoor.zip](https://fit.instructure.com/files/43505079/download?download_frd=1)

[BME4050FinalExamABETbestavgpoor.zip](https://fit.instructure.com/files/43505081/download?download_frd=1)

Grad Project [CHE4563GradProject.zip](https://fit.instructure.com/files/43504855/download?download_frd=1)

Professor Reflections

Ability to Conduct Experiments [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 8

Homeworks: 1, 2, 3 [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 6

Exam 1 [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 6

Final Exam [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) pp. 7-8

Grad Project [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 8

Comparison of Student Performance to Desired Course Outcomes [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 9

Comparison of Student Performance to Desired Program Outcomes [NanotechEvals.docx](https://fit.instructure.com/files/43840721/download?download_frd=1) p. 10

**CHE 1101**

Course Objective 1

1. 100% of students will be able to create a questions & issues sheet as a means for

determining the key requirements & showstoppers for a process or project

Students will be assessed individually on their second homework of CHE 1101, on their first hourly exam of CHE 1101, on their CHE 1101 final exam, and as part of a team project that covers the second half of CHE 1101. A passing grade will require at least 12 questions or issues formulated in such a way that they can be answered either yes or no or so that they lead directly to a set of experiments. The questions & issues sheet must cover all of the following categories: technical (science & engineering), government approval, social, economic, health, safety, legal, environmental, quality, etc.. The questions & issues sheet must be organized into categories, and the student must highlight the 1-3 questions & issues that he/she thinks are the most critical.

2. Is this a (check all that apply):

* Course objective - yes
* General education outcome - no
* Program outcome - part of multidisciplinary teamwork and non-technical

constraint ABET criteria

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

Students will be assessed individually on their second homework of CHE 1101, on their first hourly exam of CHE 1101, on their CHE 1101 final exam, and as part of a team project that covers the second half of CHE 1101. A passing grade will require at least 12 questions or issues formulated in such a way that they can be answered either yes or no or so that they lead directly to a set of experiments. The questions & issues sheet must cover all of the following categories: technical (science & engineering), government approval, social, economic, health, safety, legal, environmental, quality, etc.. The questions & issues sheet must be organized into categories, and the student must highlight the 1-3 questions & issues that he/she thinks are the most critical.

4. What were the results of that evaluation/assessment?

80% Level 4, 16% Level 3, 0% Level 2, 4% Level 1

96% met or exceeded the expectation level. This objective was not met. Typically, the students who do not achieve this objective are not coming to class and doing homework consistently; during a COVID year, one student who did not participate

sufficiently failed to meet this objective.

Course Objective 2

1. 100% of students will be able to make process flowsheets using a computer

Students will have at least one individual homework assignment, one hourly exam, and the CHE 1101 final exam for assessment. Every student must score at least 60% on this section of both the hourly exam and the final to receive credit for passing this proficiency. The flowsheet and proficiency will again be reinforced as part of the 2-month long group design project.

2. Is this a (check all that apply):

* Course objective (Yes)
* General education outcome (No)
* Program outcome (part of discipline-specific science/engineering)

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

Students will have at least one individual homework assignment, one hourly exam, and the CHE 1101 final exam for assessment. Every student must score at least 60% on this section of both the hourly exam and the final to receive credit for passing this proficiency. The flowsheet and proficiency will again be reinforced as part of the 2-month long group design project.

4. What were the results of that evaluation/assessment?

36% Level 4, 48% Level 3, 8% Level 2, 8% Level 1

92% met or exceeded the expectation level. This objective was not met. Typically, the students who do not achieve this objective are not coming to class and doing homework consistently; during a COVID year, there were more of those than usual.

**Course Objective 3**

1. 100% of students will plan and successfully execute and present a group design project both orally and in written form.

Students will have at least one brief in-class assignment and a 1/2 semester-long group design project in the second half of CHE 1101. Each student will have to get at least a C on both the presentation and the report for this design project AND get a rating from their peers saying that they did > 3/5 as much as the average student in their design group.

2. Is this a (check all that apply):

* Course objective (Yes)
* General education outcome (No)
* Program outcome (part of three ABET objectives)

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

Students will have at least one brief in-class assignment and a 1/2 semester-long group design project in the second half of CHE 1101. Each student will have to get at least a C on both the presentation and the report for this design project AND get a rating from their peers saying that they did > 3/5 as much as the average student in their design group.

4. What were the results of that evaluation/assessment?

40% Level 4, 48% Level 3, 8% Level 2, 4% Level 1

88% met or exceeded the expectation level. This objective was not met. One group of three students partially met the execution and oral presentation portions of this objective, but struggled with the teamwork and written communication portions.

**Final Reflection**

Based on the evaluation/assessments of the objectives and your experience in the course this semester, how will you improve this course in the future?

In non-COVID years, it was much easier to keep students on track with regard to homework and project work. It was possible to do so on Zoom, but only if the students actually communicated and did the work. The number of early homeworks used to solve this issue. Enforcing attendance is probably necessary going forward.

**CHE 1102**

Course Objective 1

1. 100% of students will be able to use Excel to perform spreadsheet calculations for ten

basic skills as determined by Dave Clough of Colorado

Students will have four homework assignments, one hourly exam, and the CHE 1102 final exam for assessment on each of these. Each student must score at least 70% on this section of both the hourly exam and the final to receive credit for passing this proficiency. One of the ten skills will be tested on each of the exams.

2. Is this a (check all that apply):

* Course objective - yes
* General education outcome - no
* Program outcome (part of data analysis criterion)

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

Students will have four homework assignments, one hourly exam, and the CHE 1102 final exam for assessment on each of these. Each student must score at least 70% on this section of both the hourly exam and the final to receive credit for passing this proficiency. One of the ten skills will be tested on each of the exams.

4. What were the results of that evaluation/assessment?

35% Level 4, 50% Level 3, 5% Level 2, 10% Level 1

85% met or exceeded the expectation level. This objective was not met. Failure to meet

this objective usually is a student attendance and homework submission issue, which in a

COVID year was significantly worse than usual. Typically, only 5% fail to meet this

objective, however. There were also a few more Level 3 students, most of whom in a

non-COVID year would be Level 4 students.

Course Objective 2

1. 100% of students will use Excel to make plots on linear, semi-log, and logarithmic axes

Students will have at least four homework assignments, one hourly exam, and the CHE 1102 final exam for assessment on each of these. Each student must score at least 70% on this section of both the hourly exam and the final to receive credit for passing this proficiency.

2. Is this a (check all that apply):

* Course objective (Yes)
* General education outcome (No)
* Program outcome (part of data analysis criterion)

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

Students will have at least four homework assignments, one hourly exam, and the CHE 1102 final exam for assessment on each of these. Each student must score at least 70% on this section of both the hourly exam and the final to receive credit for passing this proficiency.

4. What were the results of that evaluation/assessment?

50% Level 4, 35% Level 3, 5% Level 2, 10% Level 1.

85% met or exceeded the expectation level. This objective was not met due to very poor

attendance during a COVID year. Typically only 5% fail this objective.

Course Objective 3

1. 100% of students will be able to analyze data (linear & nonlinear regression) using DataFit

Students will have at least four individual homework assignments, one hourly exam, and the CHE 1102 final exam for assessment on each of these. Each student must score at least 70% on this section of both the hourly exam and the final to receive credit for passing this proficiency.

2. Is this a (check all that apply):

* Course objective (Yes)
* General education outcome (No)
* Program outcome (part of data analysis criterion)

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

Students will have at least four individual homework assignments, one hourly exam, and the CHE 1102 final exam for assessment on each of these. Each student must score at least 70% on this section of both the hourly exam and the final to receive credit for passing this proficiency.

4. What were the results of that evaluation/assessment?

40% Level 4, 45% Level 3, 5% Level 2, 10% Level 1

85% met or exceeded the expectation level. This objective was not met due to very poor

attendance during a COVID year. Typically only 5% fail this objective.

Final Reflection

Based on the evaluation/assessments of the objectives and your experience in the course this semester, how will you improve this course in the future?

In non-COVID years, it was much easier to keep students on track with regard to homework and project work. It was possible to do so on Zoom, but only if the students actually communicated and did the work. The number of early homeworks used to solve this issue. Enforcing attendance is probably necessary going forward.

**CHE 3260**

Course Objective 1

1. Bonding/Crystal Structure/Electrical Properties/Density/Reactivity/Anisotropy Relationships

90% of students will know the relationships between bonding, electrical properties,

crystal structure, mechanical properties, anisotropy, density, and chemical reactivity as

assessed by a grade of 60% on relevant sections of the 1st and 2nd hourly exams and the

final.

2. Is this a (check all that apply):

* Course objective - yes
* General education outcome - no
* Program outcome - part of discipline-specific science/engineering

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

90% of students will know the relationships between bonding, electrical properties,

crystal structure, mechanical properties, anisotropy, density, and chemical reactivity as

assessed by a grade of 60% on relevant sections of the 1st and 2nd hourly exams and the

final.

4. What were the results of that evaluation/assessment?

50% Level 4, 20% Level 3, 20% Level 2, 10% Level 1

90% met or exceeded the expectation level. This objective was met. Typically, only 5%

fail to meet this objective, however. There were also a lot more Level 2 students, most of

whom in a non-COVID year would be Level 3 students.

Course Objective 2

1. Read and apply phase diagrams

90% of students will know how to read and apply a phase diagram as assessed by a

grade of 60% on relevant sections of the 2nd hourly exam and the final.

2. Is this a (check all that apply):

* Course objective (Yes)
* General education outcome (No)
* Program outcome (part of discipline-specific science/engineering)

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

90% of students will know how to read and apply a phase diagram as assessed by a

grade of 60% on relevant sections of the 2nd hourly exam and the final.

4. What were the results of that evaluation/assessment?

65% Level 4, 15% Level 3, 5% Level 2, 15% Level 1.

85% met or exceeded the expectation level. This objective was not met due to very poor

attendance during a COVID year. Typically only 5% fail this objective.

Course Objective 3

1. Materials failure mechanisms and prevention (called root cause analysis)

90% of students will be able to understand materials failure mechanisms and how to

prevent them as assessed by a grade of 60% on relevant sections of the 3rd hourly

exam and the final.

2. Is this a (check all that apply):

* Course objective (Yes)
* General education outcome (No)
* Program outcome (part of discipline-specific science/engineering)

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

90% of students will be able to understand materials failure mechanisms and how to

prevent them as assessed by a grade of 60% on relevant sections of the 3rd hourly

exam and the final.

4. What were the results of that evaluation/assessment?

50% Level 4, 35% Level 3, 5% Level 2, 10% Level 1

90% met or exceeded the expectation level. This objective was met. Typically, only 5%

fail to meet this objective, however.

Final Reflection

Based on the evaluation/assessments of the objectives and your experience in the course this semester, how will you improve this course in the future?

This course has brought me many teaching awards over the years, but this year was a major challenge. Students took advantage of the fact that I pre-recorded lectures and posted videos after class as well. This is a class for which effort level is rewarded, and lack of effort is punished. I encourage live attendance, but with > 100 students, cannot enforce it, particularly in a cavern like Gleason. Moving the class back to OEC 118 once social distancing is over is definitely in order.

**CHE 4288/5288**

Course Objective 1

1. 90% of students will be able to properly identify the various fractions of crude oil and its refined products, as well as their physical and chemical properties as assessed by a grade of 70% on relevant sections of the 1st hourly exam and the final.

2. Is this a (check all that apply):

* Course objective - yes
* General education outcome - no
* Program outcome - ABET Outcome 1 on ability to design process/product

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

90% of students will be able to properly identify the various fractions of crude oil and its refined products, as well as their physical and chemical properties as assessed by a grade of 70% on relevant sections of the 1st hourly exam and the final.

4. What were the results of that evaluation/assessment?

**xx% Level 4, xx% Level 3, x% Level 2, x% Level 1**

**100% of students met or exceeded the expectation level. This objective was met.**

Course Objective 2

1. 90% of students will know how to solve mass balances for each of the unit operations in a petroleum refinery using an Excel workbook

2. Is this a (check all that apply):

* Course objective (Yes)
* General education outcome (No)
* Program outcome - ABET Outcome 1 on ability to design process/product

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

This is assessed via relevant questions on all three hourly exams and the final exam.

4. What were the results of that evaluation/assessment?

**xx% Level 4, xx% Level 3, x% Level 2, x% Level 1**

**100% of students met or exceeded the expectation level. This objective was met.**

Course Objective 3

1. 80% of students will be able to obtain a score of at least 70% on refinery economics (the

basis for ChE plant design economics) topics on the 3rd hourly exam and the final exam.

2. Is this a (check all that apply):

* Course objective (Yes)
* General education outcome (No)
* Program outcome - ABET Outcome 1 on ability to design process/product

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

This is assessed via relevant questions on the 3rd hourly exams and the final exam.

4. What were the results of that evaluation/assessment?

**xx% Level 4, xx% Level 3, x% Level 2, x% Level 1**

**100% of students met or exceeded the expectation level. This objective was met.**

**Final Reflection**

Based on the evaluation/assessments of the objectives and your experience in the course this semester, how will you improve this course in the future?

**CHE 5252**

**Course Objective 1**

1. 90% of students will be able to write and solve sets of algebraic and differential mass and

energy balances, with or without pressure drop

2. Is this a (check all that apply):

* Course objective - yes
* General education outcome - no
* Program outcome - ABET Outcome 1 on ability to design process/product

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

This is assessed via relevant questions on all three hourly exams and the final exam.

4. What were the results of that evaluation/assessment?

**xx% Level 4, xx% Level 3, xx% Level 2, xx% Level 1**

**xx% of students met or exceeded the expectation level. This objective was met.**

Course Objective 2

1. 100% of students will be able to use computational mathematics tools to help solve "C grade"

level reactor design problems, with 80% of students able to solve "B grade" level

problems and 50% of students able to solve "A grade" level problems

2. Is this a (check all that apply):

* Course objective (Yes)
* General education outcome (No)
* Program outcome - ABET Outcome 1 on ability to design process/product

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

This is assessed via relevant questions on all three hourly exams and the final exam.

4. What were the results of that evaluation/assessment?

**xx% Level 4, xx% Level 3, x% Level 2, x% Level 1**

**100% of students met or exceeded the expectation level. This objective was met.**

Course Objective 3

1. 80% of students will be able to properly identify and quantify the type and magnitude of transport limitations as assessed by a grade of 70% on relevant sections of the 3rd hourly

exam and the final.

2. Is this a (check all that apply):

* Course objective (Yes)
* General education outcome (No)
* Program outcome - ABET Outcome 1 on ability to design process/product

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

This is assessed via relevant questions on the third hourly exam and the final exam.

4. What were the results of that evaluation/assessment?

**xx% Level 4, xx% Level 3, x% Level 2, x% Level 1**

**100% of students met or exceeded the expectation level. This objective was met.**

**Final Reflection**

Based on the evaluation/assessments of the objectives and your experience in the course this semester, how will you improve this course in the future?

**CHE 4568/5291 & BME 4050/5790 - The Basics of Making**

**Course Objective 1**

1. 80% of students will successfully prepare a circuit connecting an electrical conductivity (EC) probe through a breadboard and an Arduino Uno to a computer, read the output, and then use EC (salinity) calibration standards and trim pots to adjust the voltage in their circuit to properly calibrate their EC probes BEFORE an in class lab. In lab, they will compare their "home results" with those of a commercial potentiostat measuring the same salt concentrations. In the ABET/KEEN spreadsheets, this will be called the "Concentration Monitoring and Potentiostats" outcome.

2. Is this a (check all that apply):

* Course objective - yes
* General education outcome - no
* Program outcome - part of ability to design/build engineering solution criterion

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

combination of pre-class homework and in class lab

4. What were the results of that evaluation/assessment?

90% Level 4, 10% Level 3, 0% Level 2, 0% Level 1

100% met or exceeded the expectation level.

**Course Objective 2**

1. All student groups will present a poster as part of the end-of-semester project on the design

and fabrication of a customized product. 80% of the products will successfully communicate acquired data via a USB interface to a computer. In the ABET/KEEN spreadsheets, this will be called the "Poster Presentation and Demonstration of Project" outcome.

2. Is this a (check all that apply):

* Course objective (Yes)
* General education outcome (No)
* Program outcome - part of ability to design/build engineering solution criterion

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

End of Semester Project Performance & Complexity [CHE4568projectrubric.xlsx](https://fit.instructure.com/files/43517417/download?download_frd=1)

End of Semester Poster Presentation [CHE4568projectrubric.xlsx](https://fit.instructure.com/files/43517417/download?download_frd=1)

Final Project Report - Literature Review & Business Case [CHE4568projectrubric.xlsx](https://fit.instructure.com/files/43517417/download?download_frd=1)

Final Project Report [CHE4568projectrubric.xlsx](https://fit.instructure.com/files/43517417/download?download_frd=1)

4. What were the results of that evaluation/assessment?

80% Level 4, 20% Level 3, 0% Level 2, 0% Level 1

100% met or exceeded the expectation level. This objective was met.

Course Objective 3

1. 90% of students will be able to function properly in multidisciplinary teams as assessed by

self, team, and faculty evaluations of their performance as being "acceptable" on the end

of semester project. In the ABET/KEEN spreadsheets, this will be called the

"Multidisciplinary Teamwork" outcome.

2. Is this a (check all that apply):

* Course objective (Yes)
* General education outcome (No)
* Program outcome - part of ability to design/build engineering solution criterion

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

End of Semester Project Performance & Complexity [CHE4568projectrubric.xlsx](https://fit.instructure.com/files/43517417/download?download_frd=1)

End of Semester Poster Presentation [CHE4568projectrubric.xlsx](https://fit.instructure.com/files/43517417/download?download_frd=1)

Final Project Report - Literature Review & Business Case [CHE4568projectrubric.xlsx](https://fit.instructure.com/files/43517417/download?download_frd=1)

Final Project Report [CHE4568projectrubric.xlsx](https://fit.instructure.com/files/43517417/download?download_frd=1)

4. What were the results of that evaluation/assessment?

80% Level 4, 20% Level 3, 0% Level 2, 0% Level 1

100% met or exceeded the expectation level. This objective was met.

**Final Reflection**

Based on the evaluation/assessments of the objectives and your experience in the course this semester, how will you improve this course in the future?

This course was such a massive success during its initial offering that the only improvements to make are to pre-record all labs (Only some are recorded, as this was last offered in 2019, pre-COVID) and lectures (now recorded). The course is to be offered nationwide to fellow Kern Entrepreneurial Engineering Network (KEEN) partner schools and worldwide to our alumni. Appropriate modifications to allow students to do this class remotely have largely already been completed.

**CHE 4567/5567 & BME 4050/5790 - Nanotechnology Lecture**

Course Objective 1

1. 90% of students will be able to graphically demonstrate the relationships between pH, particle size, and zeta potential (surface charge) and be able to compare and contrast the advantages and limitations of different types of microscopy (TEM, SEM, AFM, STM, confocal laser scanning microscopy), particle size analysis, and spectroscopic equipment as assessed by a grade of 80% on relevant sections of the 1st hourly exam. In the ABET spreadsheets, this will be called the "Materials Characterization Tool Selection" outcome.

2. Is this a (check all that apply):

* Course objective - yes
* General education outcome - no
* Program outcome - part of discipline-specific science/engineering

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

relevant sections of the midterm exam and an end-of-semester group project

4. What were the results of that evaluation/assessment?

65% Level 4, 35% Level 3, 0% Level 2, 0% Level 1

100% of students met or exceeded the expectation level. This objective was met.

Course Objective 2

1. 90% of students will be able to demonstrate an understanding of the materials

science, chemistry, biology, and physics of the nanotechnology literature. This

will be assessed by a grade of 90% on each of the completed homeworks, 80% on

relevant sections of the 1st hourly exam, and 80% on the final presentation. In the

ABET spreadsheets, this will be called the "Discipline-Specific Science"

outcome.

2. Is this a (check all that apply):

* Course objective (Yes)
* General education outcome (No)
* Program outcome (part of discipline-specific science/engineering)

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

90% on each of the completed homeworks, 80% on relevant sections of the 1st hourly

exam, and 80% on the final presentation

4. What were the results of that evaluation/assessment?

75% Level 4, 25% Level 3, 0% Level 2, 0% Level 1.

100% of students met or exceeded the expectation level. This objective was met.

Course Objective 3

1. All students will be able to conduct a thorough examination and summary of the

literature as assessed in a end-of-semester multidisciplinary group project. All

students will prepare PowerPoint slides of that literature for their end-of-

semester presentation and then make the presentation in a logical order and free

of technical errors, as assessed by an 80 on the students' presentations. In the

ABET spreadsheets, this will be called the "Oral Literature Review" outcome.

2. Is this a (check all that apply):

* Course objective (Yes)
* General education outcome (No)
* Program outcome (oral communication ABET criterion)

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

Final Presentation rubric for presentations + grad student reports = [che5567evalproject.xls](https://fit.instructure.com/files/43517451/download?download_frd=1)

[Links to all student presentations, grad student reports + evaluations of each](https://fit.instructure.com/files/43817563/download?download_frd=1)

[week15-5567-2021.mp4](https://fit.instructure.com/files/43813461/download?download_frd=1)

[week16wednesday-5567-2021.mp4](https://fit.instructure.com/files/43813481/download?download_frd=1)

[week16thursday-5567-2021.mp4](https://fit.instructure.com/files/43813471/download?download_frd=1)

Final Review Papers [Links to all student presentations, grad student reports + evaluations of each](https://fit.instructure.com/files/43817563/download?download_frd=1)

4. What were the results of that evaluation/assessment?

75% Level 4, 20% Level 3, 5% Level 2, 0% Level 1

95% met or exceeded the expectation level. This objective was met except for one

student whose preparation was more than adequate but struggled with "stage fright"

during the presentation.

**Final Reflection**

Based on the evaluation/assessments of the objectives and your experience in the course this semester, how will you improve this course in the future?

The organization of not only topics, but precise search criteria and even a Zotero-hosted database of all articles on all subjects dramatically improved the quality of the literature reviews. The only group that struggled with the literature review process not only picked their own topic about a month later than expected, but chose to use their own articles instead of those the faculty member recommended.

At this point, after many iterations, this class is pretty well optimized.

**CHE/CHM 1091 - Nanotechnology Lab 1**

**Course Objective 1**

1. 100% of students will be able to be able to conduct basic microscopic (TEM, SEM,

AFM, and STM) skills, as assessed by direct observation by either the faculty

member or a teaching assistant. STM skills include cutting an STM tip, loading a

tip into the STM, completing an approach without crashing the tip, imaging

graphite with someone else's tip, and imaging graphite with one's own tip. AFM

skills include loading an AFM tip in place on the scan head, completing an AFM

approach without crashing the tip, and imaging one or more of the following:

mica, a CD, or a computer chip. TEM of a carbon nanotubes (CNT's) on an Fe/Al2O3 sample teaches students about atomic number contrast, as the Fe particles are quite black and the carbon is quite faint. Students are asked to look for whether the Fe is well dispersed. Typically, the Fe, Co, or Ni used as a catalyst for preparing nanotubes grows to the point where it occludes much of the alumina support material's surface area, which is undesirable. The carbon nanotubes, especially if only tethered on one end, may move under the electron beam, thereby providing a relatively straightforward introduction to electron beam damage. All students perform condenser alignment, focus on the CNT's, and take a snapshot. SEM and energy dispersive spectroscopy (EDS) involves a) matching up the written step by step procedure with the appropriate actions to take on the instrument, b) imaging a sample of diatoms with guidance and the written step-by-step instructions, with emphasis on focusing and stigmation skills, and c) simultaneous SEM/EDS elemental mapping of a sample with multiple metals. In the ABET spreadsheets, this will be called the "Materials Characterization Tools" outcome.

2. Is this a (check all that apply):

* Course objective - yes
* General education outcome - no
* Program outcome - part of discipline-specific science/engineering

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

in class visual observation by the professor and teaching assistants

4. What were the results of that evaluation/assessment?

94% Level 4, 6% Level 3, 0% Level 2, 0% Level 1

100% met or exceeded the expectation level. This objective was met.

**Course Objective 2**

1. 80% of students will successfully conduct a range of syntheses including a) pore

volume filling via incipient wetness impregnation, b) catalyst preparation, c) ferrofluids synthesis, c) hydrophobic coatings on Ag, d) a polymer/ceramic nanocomposite, e) sputter coating of Au, and f) nanoparticle syntheses of Au and Ag, as

assessed by direct observation by either the faculty member or a teaching assistant. In the

ABET spreadsheets, this will be called the "Nanotech Syntheses" outcome.

2. Is this a (check all that apply):

* Course objective (Yes)
* General education outcome (No)
* Program outcome (part of discipline-specific science/engineering)

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

in class visual observation by the professor and teaching assistants

4. What were the results of that evaluation/assessment?

100% Level 4, 0% Level 3, 0% Level 2, 0% Level 1

100% met or exceeded the expectation level. This objective was met.

**Course Objective 3**

1. 90% of students will be able to function properly in multidisciplinary teams as

assessed by self, team, and faculty evaluations of their performance as being

"acceptable" on the end of semester entrepreneurship project. In the ABET spreadsheets,

this will be called the "Multidisciplinary Team" outcome.

2. Is this a (check all that apply):

* Course objective (Yes)
* General education outcome (No)
* Program outcome (part of teamwork ABET criterion)

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

90% of students will be able to function properly in multidisciplinary teams as

assessed by self, team, and faculty evaluations of their performance as being

"acceptable" on the end of semester entrepreneurship project.

4. What were the results of that evaluation/assessment?

100% Level 4, 0% Level 3, 0% Level 2, 0% Level 1

100% met or exceeded the expectation level. This objective was met.

**Final Reflection**

Based on the evaluation/assessments of the objectives and your experience in the course this semester, how will you improve this course in the future?

Having the characterization labs pre-recorded helped immensely. Now that there are recordings of all synthesis labs as well, this class is pretty much optimized.

**CHE 4563/5291 & BME 4050/5790 - Materials Characterization Lab**

Course Objective 1

1. All students will be required to pass written exams on both the theory and practice of

microscopic (TEM, SEM, AFM, and STM) skills before the students will be permitted to work on any of the instruments. In the ABET spreadsheets, this will be

called the "Materials Characterization Theory" outcome. As of 2020, this was further

confirmed via a first ever final exam.

2. Is this a (check all that apply):

* Course objective - yes
* General education outcome - no
* Program outcome - part of discipline-specific science/engineering

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

All students will be required to pass written exams on both the theory and practice of

microscopic (TEM, SEM, AFM, and STM) skills before the students will be permitted to work on any of the instruments. In the ABET spreadsheets, this will be

called the "Materials Characterization Theory" outcome. As of 2020, this was further

confirmed via a first ever final exam.

4. What were the results of that evaluation/assessment?

75% Level 4, 25% Level 3, 0% Level 2, 0% Level 1

100% of students met or exceeded the expectation level. This objective was met.

Course Objective 2

1. 100% of students will be able to be able to conduct basic and intermediate microscopic (TEM, SEM, AFM, STM, and confocal microscopy with fluorescence) skills, as assessed by direct observation by either the faculty member or a teaching assistant. Each students' understanding of each of the microscopies will be upgraded to an intermediate level defined as follows:

a) Each student can start up, perform most necessary alignments, collect and image, and shut down the equipment under supervision.

b) Students will know when an SEM or TEM image is out of focus, stigmated, etc., which alignment knobs to adjust (and which not to adjust), and when to ask for assistance.

c) Students will recognize artifacts in images (e.g. resonance in AFM images; tip

dragging in STM and AFM images).

d) Students will notice pores, non-round crystals, periodicity in structure such as

lattice fringe images in TEM and STM, and Moiré fringes.

e) Students will demonstrate the understanding outlined in b, c, and d both in class

and on a final exam.

In the ABET spreadsheets, this will be called the "Materials Characterization Practice" outcome.

2. Is this a (check all that apply):

* Course objective (Yes)
* General education outcome (No)
* Program outcome (part of discipline-specific science/engineering)

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

See item 1 for Course Objective 2.

4. What were the results of that evaluation/assessment?

90% Level 4, 10% Level 3, 0% Level 2, 0% Level 1.

100% of students met or exceeded the expectation level. This objective was met.

Course Objective 3

1. All students will be given both a homework assignment and a set of exam problems where they will be given a class of nanomaterials and a set of information to be obtained for that class of nanomaterials. Eighty percent of the students will be expected to get a score of at least an 80 with regard to a) materials analytical tool selection, b) justification regarding why the particular tool was selected, and c) a description of the advantages and limitations of the tool selection. In the ABET spreadsheets, this will be called the "Materials Characterization Selection" outcome.

2. Is this a (check all that apply):

* Course objective (Yes)
* General education outcome (No)
* Program outcome (part of discipline-specific science/engineering)

3. How did you evaluate/assess the achievement of this course objective? (identify the assignment, test question, etc.)

Relevant questions on the final exam

4. What were the results of that evaluation/assessment?

70% Level 4, 30% Level 3, 0% Level 2, 0% Level 1

100% met or exceeded the expectation level. This objective was met.

**Final Reflection**

Based on the evaluation/assessments of the objectives and your experience in the course this semester, how will you improve this course in the future?

Significant upgrades were made to this class during the school year. All labs were recorded, and most of them were recorded prior to the students executing them. The students knew what to expect far better than in prior years. No further improvement is necessary.