

Academic year 2024-2025

BS in Chemical Engineering - BS-CHEN Learning Outcomes

An ability to identify, formulate, and solve complex engineering probl

An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
 Description:

This outcome measures the ability of students to analyze an open ended problem, identify conflicting technical issues and then appropriately apply engineering, science and math to propose a result that incorporates elements of optimization.

Course:



CHEN 3311 Momentum Transfer

Assessment Instrument:

Design Project

Outcome Categories:

1. Identifies and Formulates Complex Problems
2. Can solve problems with conflicting technical issues
3. Appropriately applies math, engineering, and science to achieve a solution

MEASURES	RESULTS	ACTIONS
<p>Identifies and Formulates Complex Problems</p> <p>Can convert an open-ended problem with no obvious solution into a quantitative problem statement by applying engineering, mathematical, and scientific theory, but may be in a way that produces sub-optimal results.</p> <p>Direct - Assignment</p> <p><i>Momentum Transfer: CHEN 3311</i></p> <p>Target</p> <p>75% of the students will meet expectations</p>	<p>MET</p> <p>Identifies and Formulates Complex Problems</p> <p>■ Met ■ Not Met</p>  <p>0% 100%</p> <p>Met: 88%</p> <p>Not Met: 12%</p> <p>Met Total: 88%</p> <p>Not Met Total: 13%</p>	<p><i>No actions have been added.</i></p>
<p>Can solve problems with conflicting technical issues</p> <p>Can find a reasonable solution to an open-ended problem with conflicting technical issues, even if optimization is somewhat limited.</p> <p>Direct - Assignment</p> <p><i>Momentum Transfer: CHEN 3311</i></p> <p>Target</p> <p>At least 80% of students meet expectations</p>	<p>NOT MET</p> <p>Can solve problems with conflicting technical issues</p> <p>■ Met ■ Approached</p>  <p>0% 100%</p> <p>Met: 13%</p> <p>Approached: 87%</p> <p>Met Total: 13%</p> <p>Not Met Total: 88%</p> <p>Analysis</p> <p>The number of students who could solve a problem with conflicting technical issues with some form of optimization did not meet the threshold.</p>	<p>Revise Curriculum</p> <p>IN PROGRESS</p> <p>Include optimization curriculum into CHEN 2300 Chemical Engineering Applied Mathematics. Include review of optimization using calculus and software tools, such as goalseek, in CHEN 3311 Momentum.</p> <p>Recommended Due Date: 12/10/2025</p>
<p>Appropriately applies math, engineering, and science to achieve a solution</p>	<p>MET</p>	<p><i>No actions have been added.</i></p>

<p>The solution method to the complex problem uses the correct theory from math, engineering, and science, but some theoretical or computational errors are allowable</p> <p>Direct - Assignment</p> <p><i>Momentum Transfer: CHEN 3311</i></p> <p>Target</p> <p>At least 80% of students meet expectations</p>	<p>Appropriately applies math, engineering, and science to achieve a solution</p> <p>■ Met ■ Not Met</p> <p>0% 100%</p> <p>Met: 75% Not Met: 25%</p> <p>Met Total: 75% Not Met Total: 25%</p>	
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An ability to apply engineering design to produce solutions

An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

Description:

This outcome measures the student's ability to create a capstone design project will considering important design and ethical factors

Course:

CHEN 4340 Plant Design II




Assessment Instrument:





Capstone Project Project


Outcome Categories:

1. Meets specific needs
2. Considers public health
3. Considers safety
4. Considers welfare
5. Considers global factors
6. Considers cultural factors
7. Considers social factors
8. Considers environmental factors
9. Considers economic factors

MEASURES	RESULTS	ACTIONS
<p>Meets Specific Needs</p> <p>The project meets most of the specific needs and requirements of the design specifications while respecting most of the design constraints.</p> <p>Direct - Presentation</p> <p><i>Plant Design II: CHEN 4340</i></p> <p>Target</p> <p>At least 75% of students meet expectations</p>	<p>MET</p> <p>Meets Specific Needs</p> <p>■ Met</p> <p>0% 100%</p> <p>Values are not shown when too close to each other. Click or use arrow keys to see details.</p> <p>Met: 100% Met Total: 100% Not Met Total:</p>	<p>No actions have been added.</p>
<p>Considers Public Health</p> <p>Public health was adequately considered in the context of their unique design solution</p> <p>Direct - Other</p>	<p>MET</p> <p>Considers Public Health</p> <p>■ Met</p>	<p>No actions have been added.</p>

<p><i>Plant Design II: CHEN 4340</i></p> <p>Target</p> <p>At least 75% of students meet expectations</p>	 <p>0% 100%</p> <p><i>Values are not shown when too close to each other. Click or use arrow keys to see details.</i></p> <p>Met: 100%</p> <p>Met Total: 100%</p> <p>Not Met Total:</p>	
<p>Considers Safety</p> <p>Safety was adequately considered in the context of their unique design solution</p> <p>Direct - Other</p> <p><i>Plant Design II: CHEN 4340</i></p> <p>Target</p> <p>At least 75% of students meet expectations</p>	<p>MET</p> <p>Considers Safety</p> <p>■ Met</p>  <p>0% 100%</p> <p><i>Values are not shown when too close to each other. Click or use arrow keys to see details.</i></p> <p>Met: 100%</p> <p>Met Total: 100%</p> <p>Not Met Total:</p>	<p>No actions have been added.</p>
<p>At least 75% of students meet expectations</p> <p>Welfare was adequately considered in the context of their unique design solution</p> <p>Direct - Other</p> <p><i>Plant Design II: CHEN 4340</i></p> <p>Target</p> <p>Considers Welfare</p>	<p>MET</p> <p>At least 75% of students meet expectations</p> <p>■ Met</p>  <p>0% 100%</p> <p><i>Values are not shown when too close to each other. Click or use arrow keys to see details.</i></p> <p>Met: 100%</p> <p>Met Total: 100%</p> <p>Not Met Total:</p>	<p>No actions have been added.</p>

<p>Considers Global Factors</p> <p>The global effects of the project were adequately considered in the context of their unique design solution</p> <p>Direct - Other</p> <p><i>Plant Design II: CHEN 4340</i></p> <p>Target</p> <p>At least 75% of students meet expectations</p>	<p>MET</p> <p>Considers Global Factors</p> <p>■ Met</p>  <p>0% 100%</p> <p><small>Values are not shown when too close to each other. Click or use arrow keys to see details.</small></p> <p>Met: 100%</p> <p>Met Total: 100%</p> <p>Not Met Total:</p>	<p>No actions have been added.</p>
<p>Considers Cultural Factors</p> <p>The cultural effects of the project were adequately considered in the context of their unique design solution</p> <p>Direct - Other</p> <p><i>Plant Design II: CHEN 4340</i></p> <p>Target</p> <p>At least 75% of students meet expectations</p>	<p>MET</p> <p>Considers Cultural Factors</p> <p>■ Met</p>  <p>0% 100%</p> <p><small>Values are not shown when too close to each other. Click or use arrow keys to see details.</small></p> <p>Met: 100%</p> <p>Met Total: 100%</p> <p>Not Met Total:</p>	<p>No actions have been added.</p>
<p>Considers Social Factors</p> <p>The social effects of the project were adequately considered in the context of their unique design solution</p> <p>Direct - Other</p> <p><i>Plant Design II: CHEN 4340</i></p> <p>Target</p> <p>At least 75% of students meet expectations</p>	<p>MET</p> <p>Considers Social Factors</p> <p>■ Met</p>  <p>0% 100%</p> <p><small>Values are not shown when too close to each other. Click or use arrow keys to see details.</small></p> <p>Met: 100%</p> <p>Met Total: 100%</p> <p>Not Met Total:</p>	<p>No actions have been added.</p>
<p>Considers Environmental Factors</p> <p>The environmental effects of the project were adequately considered in the context of their unique design solution</p> <p>Direct - Other</p> <p><i>Plant Design II: CHEN 4340</i></p>	<p>MET</p> <p>Considers Environmental Factors</p> <p>■ Met</p>  <p>0% 100%</p>	<p>No actions have been added.</p>

Target At least 75% of students meet expectations	<p><i>Values are not shown when too close to each other. Click or use arrow keys to see details.</i></p> <p>Met: 100%</p> <p>Met Total: 100%</p> <p>Not Met Total:</p>	
Considers Economic Factors The economic effects of the project were adequately considered in the context of their unique design solution Direct - Other <i>Plant Design II: CHEN 4340</i> Target At least 75% of students meet expectations	<p>MET</p> <p>Considers Economic Factors</p> <p>■ Met</p>  <p>0% 100%</p> <p><i>Values are not shown when too close to each other. Click or use arrow keys to see details.</i></p> <p>Met: 100%</p> <p>Met Total: 100%</p> <p>Not Met Total:</p>	No actions have been added.

An Ability to Communicate with a Range of Audiences

An Ability to Communicate with a Range of Audiences

Description:

This outcome measures a students ability to communicate to a technical, non-technical audience in written form as well as to communicate orally and through a poster.

Course:


CHEN 4340 Plant Design II





Assessment Instrument:

Capstone Project Project, poster and oral presentation

Outcome Categories:

1. Report Communication
2. Ability to communicate to a technical audience
3. Ability to communicate to a non-technical audience
4. Poster communication
5. Oral communication

MEASURES	RESULTS	ACTIONS
Report Communication Report contains all required information with minimal writing errors per page. Sample calculations are correct and explained. Direct - Other <i>Plant Design II: CHEN 4340</i> Target At least 75% of students meet expectations	<p>MET</p> <p>Report Communication</p> <p>■ Met</p>  <p>0% 100%</p> <p><i>Values are not shown when too close to each other. Click or use arrow keys to see details.</i></p> <p>Met: 100%</p> <p>Met Total: 100%</p> <p>Not Met Total:</p>	No actions have been added.

<p>Ability to communicate to a technical audience</p> <p>The communication is comprehensible and appropriate to academic, industrial, and technical people in the field.</p> <p>Direct - Other</p> <p><i>Plant Design II: CHEN 4340</i></p> <p>Target</p> <p>At least 75% of students meet expectations</p>	<p>MET</p> <p>Ability to communicate to a technical audience</p> <p>■ Met</p>  <p>0% 100%</p> <p><i>Values are not shown when too close to each other. Click or use arrow keys to see details.</i></p> <p>Met: 100%</p> <p>Met Total: 100%</p> <p>Not Met Total:</p>	<p>No actions have been added.</p>
<p>Ability to communicate to a non-technical audience</p> <p>The communication is comprehensible and appropriate to a non-technical audience.</p> <p>Direct - Other</p> <p><i>Plant Design II: CHEN 4340</i></p> <p>Target</p> <p>At least 75% of students meet expectations</p>	<p>MET</p> <p>Ability to communicate to a non-technical audience</p> <p>■ Met</p>  <p>0% 100%</p> <p><i>Values are not shown when too close to each other. Click or use arrow keys to see details.</i></p> <p>Met: 100%</p> <p>Met Total: 100%</p> <p>Not Met Total:</p>	<p>No actions have been added.</p>
<p>Poster Communication</p> <p>Figures and tables are appropriately formatted, referenced, legible and explained with minimal errors. References are complete and appropriate</p> <p>Direct - Presentation</p> <p><i>Plant Design II: CHEN 4340</i></p> <p>Target</p> <p>At least 75% of students meet expectations</p>	<p>MET</p> <p>Poster Communication</p> <p>■ Met ■ Not Met</p>  <p>0% 100%</p> <p>Met: 88%</p> <p>Not Met: 12%</p> <p>Met Total: 88%</p> <p>Not Met Total: 13%</p>	<p>No actions have been added.</p>
<p>Oral Communication</p> <p>Group presentation can be up to 2 minutes longer or 4 minutes too shorter than assigned duration. Up to one of the following can be lacking: Good eye contact, use of proper American English, appropriate response to questions</p>	<p>NOT MET</p> <p>Oral Communication</p> <p>■ Met ■ Not Met</p>  <p>0% 100%</p>	<p>No actions have been added.</p>

and general professionalism (appropriate attire, etc.).	Met: 60%	
Direct - Presentation	Not Met: 40%	
<i>Plant Design II: CHEN 4340</i>	Met Total: 60%	
Target	Not Met Total: 40%	
At least 75% of students meet expectations	Analysis	
	It was clear to the assessors that the presentation teams hadn't practiced their presentations and some of the students were going through their part of the presentation for the first or second time during the final draft.	
	Students will receive extra training and instruction on presentation preparation and maintaining eye contact with the audience.	
	Exact actions will be determined after consultation with faculty per our continuous improvement process.	

An ability to recognize ethical and professional responsibilities

An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

Description:

This outcome describes the student's ability to create a capstone design project will considering important effects of engineering design and ethical implications

Course:


CHEN 4360 Plant Design I





Assessment Instrument:

Semester report

Outcome Categories:

1. Recognizes ethical and professional responsibilities
2. Understands the global effect of engineering solutions
3. Understands the economic effect of engineering solutions
4. Understands the environmental effect of engineering solutions
5. Understands the societal effect of engineering solutions

MEASURES	RESULTS	ACTIONS
Recognizes ethical and professional responsibilities Is aware of the ethical and professional responsibilities of an engineer and mostly makes informed engineering judgement Direct - Assignment <i>Plant Design II: CHEN 4340</i> Target At least 75% of students meet expectations	MET Recognizes ethical and professional responsibilities ■ Met ■ Not Met  0% 100% Met: 91% Not Met: 9% Met Total: 91% Not Met Total: 9%	No actions have been added.
Understands The global effect of engineering solutions	MET	No actions have been added.

<p>Is aware of how their ethical and professional judgement leads to engineering solutions that could have an effect at the global scale.</p> <p>Direct - Assignment</p> <p><i>Plant Design II: CHEN 4340</i></p> <p>Target</p> <p>At least 75% of students meet expectations</p>	<p>Understands The global effect of engineering solutions</p> <p>■ Met ■ Not Met</p>  <p>0% 100%</p> <p>Met: 91% Not Met: 9%</p> <p>Met Total: 91% Not Met Total: 9%</p>	
<p>Understands the economic effect of engineering solutions</p> <p>Is aware of how their ethical and professional judgement leads to engineering solutions that could have an economic effect.</p> <p><i>Plant Design II: CHEN 4340</i></p> <p>Target</p> <p>At least 75% of students meet expectations</p>	<p>MET</p> <p>Understands the economic effect of engineering solutions</p> <p>■ Met ■ Not Met</p>  <p>0% 100%</p> <p>Met: 78% Not Met: 22%</p> <p>Met Total: 78% Not Met Total: 22%</p>	No actions have been added.
<p>Understands the environmental effect of engineering solutions</p> <p>Is aware of how their ethical and professional judgement leads to engineering solutions that could have an environmental effect.</p> <p>Direct - Assignment</p> <p><i>Plant Design II: CHEN 4340</i></p> <p>Target</p> <p>At least 75% of students meet expectations</p>	<p>MET</p> <p>Understands the environmental effect of engineering solutions</p> <p>■ Met</p>  <p>0% 100%</p> <p><i>Values are not shown when too close to each other. Click or use arrow keys to see details.</i></p> <p>Met: 100%</p> <p>Met Total: 100% Not Met Total:</p>	No actions have been added.
<p>Understands the societal effect of engineering solutions</p> <p>Is aware of how their ethical and professional judgement leads to engineering solutions that could have a societal effect.</p> <p>Direct - Assignment</p> <p><i>Plant Design II: CHEN 4340</i></p> <p>Target</p>	<p>MET</p> <p>Understands the societal effect of engineering solutions</p> <p>■ Met</p>  <p>0% 100%</p> <p><i>Values are not shown when too close to each other. Click or use arrow keys to see details.</i></p>	No actions have been added.

At least 75% of students meet expectations	Met: 100% Met Total: 100% Not Met Total:	
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An ability to function effectively on a team

An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

Description:

This outcome measures the student's ability to collaborate, set goals and work in a team

Course:

CHEN 4310 Laboratory I

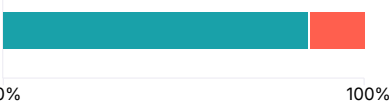
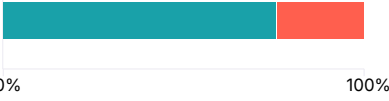
Assessment Instrument:

Capstone Project Project

Outcome Categories:

1. Planning and participation
2. Collaborating, inclusiveness and sharing
3. Establishes goals and objectives
4. Leadership and teamwork

MEASURES	RESULTS	ACTIONS
Planning and Participation Routinely present at team meetings or work sessions. Contributes a fair share to the project workload. Is prepared for the group meeting with clearly formulated ideas. Direct - Other <i>Laboratory I: CHEN 4310</i> Target At least 75% of students meet expectations	MET Planning and Participation ■ Met ■ Not Met 0% 100% Met: 90% Not Met: 10% Met Total: 90% Not Met Total: 10% Analysis Student Objective was met, no action item required.	No actions have been added.
Collaboration, inclusiveness and sharing Shares credit for success with others and accountability for team results. Shares information with others and aids others Direct - Other <i>Laboratory I: CHEN 4310</i> Target At least 75% of students meet expectations	MET Collaboration, inclusiveness and sharing ■ Met ■ Not Met 0% 100% Met: 94% Not Met: 6% Met Total: 94% Not Met Total: 6% Analysis	No actions have been added.

	The student objective was met. No action item required.	
<p>Establishes goals and objectives</p> <p>Goals and objectives are created, but minor deficiencies in some critical components such as clarity, attainability, or incomplete planning in the planning stage is acceptable.</p> <p>Direct - Other</p> <p>Laboratory I: CHEN 4310</p> <p>Target</p> <p>At least 75% of students meet expectations</p>	<p>MET</p> <p>Establishes goals and objectives</p> <p>■ Met ■ Not Met</p>  <p>0% 100%</p> <p>Met: 85% Not Met: 15%</p> <p>Met Total: 85% Not Met Total: 15%</p> <p>Analysis</p> <p>Student Objective was met, no action item required.</p>	No actions have been added.
<p>Leadership and teamwork</p> <p>The team establishes a leadership structure, but some ambiguity of responsibility is acceptable. Some minor lapses in teamwork are acceptable.</p> <p>Direct - Other</p> <p>Laboratory I: CHEN 4310</p> <p>Target</p> <p>At least 75% of students meet expectations</p>	<p>MET</p> <p>Leadership and teamwork</p> <p>■ Met ■ Not Met</p>  <p>0% 100%</p> <p>Met: 76% Not Met: 24%</p> <p>Met Total: 76% Not Met Total: 24%</p> <p>Analysis</p> <p>This student objective was barely met. We will provide more coaching and instruction to the students about a leadership structure and carefully watch future scores.</p>	No actions have been added.

An ability to develop and conduct appropriate experimentation

An ability to develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgement to draw conclusions.
 Description:

This outcome measures the student's ability to perform experiments, document and understand the data and use theory to interpret the results

Course:




CHEN 4310 Laboratory I

Assessment Instrument:

Laboratory reports

Outcome Categories:

1. Develop and conduct experiments
2. Analyze and interpret data
3. Use engineering judgement to draw conclusions

MEASURES	RESULTS	ACTIONS
<p>Develop and conduct experiments</p> <p>Unsafe lab procedures are infrequently observed.</p> <p>Data is documented but may have some minor lapses in documentation. Needs only some or limited guidance in operating equipment and instrumentation (E&I)</p> <p>Direct - Assignment</p> <p>Laboratory I: CHEN 4310</p> <p>Target</p> <p>At least 75% of students meet expectations</p>	<p>MET</p> <p>Develop and conduct experiments</p> <p>■ Met ■ Not Met</p>  <p>0% 100%</p> <p>Met: 83% Not Met: 17%</p> <p>Met Total: 83% Not Met Total: 17%</p>	<p>No actions have been added.</p>
<p>Analyze and interpret data</p> <p>Applies appropriate theory to data but some misinterpretation of physical significance is allowed. No to minimal unit errors.</p> <p>Is aware of measurement error and accounts for it, but some errors in application may be observed.</p> <p>Seeks information for experiments from a few sources or more.</p> <p>Direct - Assignment</p> <p>Laboratory I: CHEN 4310</p> <p>Target</p> <p>At least 75% of students meet expectations</p>	<p>MET</p> <p>Analyze and interpret data</p> <p>■ Met ■ Not Met</p>  <p>0% 100%</p> <p>Met: 92% Not Met: 8%</p> <p>Met Total: 92% Not Met Total: 8%</p>	<p>No actions have been added.</p>
<p>Use Engineering judgement to draw conclusions</p> <p>The conclusions are appropriate, but minimal aspects of engineering fundamentals not being properly expressed or explained is allowable.</p> <p>Direct - Assignment</p> <p>Laboratory I: CHEN 4310</p> <p>Target</p> <p>At least 75% of students meet expectations</p>	<p>MET</p> <p>Use Engineering judgement to draw conclusions</p> <p>■ Met ■ Not Met</p>  <p>0% 100%</p> <p>Met: 92% Not Met: 8%</p> <p>Met Total: 92% Not Met Total: 8%</p>	<p>No actions have been added.</p>

an ability to acquire and apply new knowledge as needed

an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Description:

This outcome measures the student's ability to identify the need to and independently find information outside of the classroom environment and apply it to solve open ended problems.

Course:

CHEN 4340 Plant Design II

Assessment Instrument:

Capstone Project Project

Outcome Categories:

1. Ability to prepare projects using new knowledge from up-to-date materials found outside of class
2. Ability to apply appropriate learning and research strategies to solve open ended problems
3. Recognize the need to acquire new knowledge

MEASURES	RESULTS	ACTIONS
<p>Ability to prepare projects using new knowledge from up-to-date materials found outside of class</p> <p>The students were able to find the required information from relevant and up to date sources from outside of class.</p> <p>Direct - Assignment</p> <p><i>Momentum Transfer: CHEN 3311</i></p> <p>Target</p> <p>At least 75% of students meet expectations</p>	<p>MET</p> <p>Ability to prepare projects using new knowledge from up-to-date materials found outside of class</p> <p>■ Met ■ Not Met</p> <p>0% 100%</p> <p>Met: 93% Not Met: 7%</p> <p>Met Total: 93% Not Met Total: 7%</p>	<p><i>No actions have been added.</i></p>
<p>Ability to apply appropriate learning and research strategies to solve open ended problems</p> <p>Can apply appropriate learning and research strategies to solve open ended problems. The solution/conclusion is logical with convincing, minor insufficiencies in evidence are allowed.</p> <p>Direct - Assignment</p> <p><i>Momentum Transfer: CHEN 3311</i></p> <p>Target</p> <p>At least 75% of students meet expectations</p>	<p>NOT MET</p> <p>Ability to apply appropriate learning and research strategies to solve open ended problems</p> <p>■ Met ■ Not Met</p> <p>0% 100%</p> <p>Met: 71% Not Met: 29%</p> <p>Met Total: 71% Not Met Total: 29%</p> <p>Analysis</p> <p>Exact actions will be determined after consultation with faculty per our continuous improvement process.</p>	<p><i>No actions have been added.</i></p>
<p>Recognize the need to acquire new knowledge</p> <p>Identifies the need for acquiring new knowledge. Some vagueness in implementation strategies is allowable.</p>	<p>MET</p> <p>Recognize the need to acquire new knowledge</p> <p>■ Met ■ Not Met</p>	<p><i>No actions have been added.</i></p>

Direct - Assignment	<div> <div></div> <div></div> </div>	
Momentum Transfer: CHEN 3311	0%	100%
Target	Met: 77%	
	Not Met: 23%	
At least 75% of students meet expectations	Met Total: 77%	
	Not Met Total: 23%	