

BINDER FOR OUTCOME "4"

"An ability to (1) 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 factor"

**COLLEGE OF ENGINEERING
CHEMICAL ENGINEERING DEPARTMENT
PRAIRIE VIEW A&M UNIVERSITY**

**BINDER CONTAINING REPRESENTATIVE
ASSIGNMENTS FROM ALL COURSES USED TO ASSESS
OUTCOME "4"**

Last 4 Academic Years

09/15/2022 Revision

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 - CHEG 4304 Chemical Process Design and Analysis**
 - CHEG 4247 Senior Design and Professionalism I**

2. Description of Outcome "4" and its Performance Criteria

Outcome 4:

"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."

Sub-Outcomes and Performance Criteria

- 4.1: An ability to recognize ethical and professional responsibilities in engineering situations involving global, and societal contexts.
- 4.2: An ability to make informed judgements on ethical and professional responsibilities in engineering while considering the impact of engineering solutions in global, economic, environmental, and societal contexts.

3. List of Courses Used to Assess the Outcome

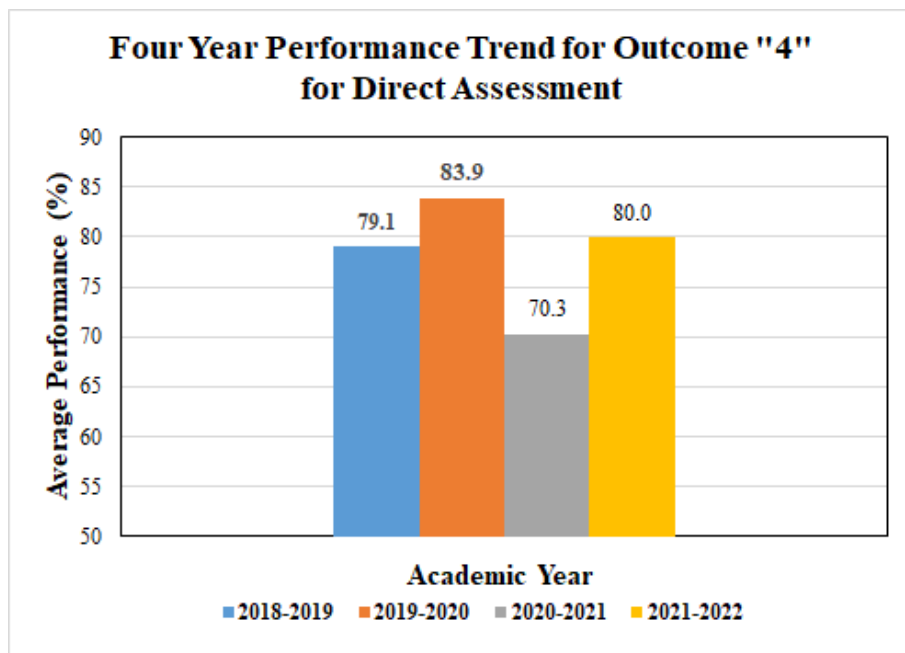
Outcome 4 is assessed in the following courses:

CHEG 4304 Chemical Process Design and Analysis

CHEG 4247 Senior Design and Professionalism I

4. Summary Assessment Results and Continuous Improvements for Outcome "4" over the Assessment Years.

The average performance for all students in the 2 courses used to assess outcome 4 for the past four academic years are shown below



Problems identified and recommended actions to be taken to address problems

1. At the course level

Problems Identified in the Various Courses	Recommended Actions Taken	Basis for Action
1. Students struggle with correlating engineering economic analysis methods with making a decision amongst many available alternatives. 2. The students' reports in the homework assignment highlighting ethical issues need further improvement.	1. Outcome 4 should be evaluated in all levels of the chemical engineering undergraduate curriculum. Currently this outcome is only measured in the sophomore and senior years. 2. Students should be given open-ended problems that consider the economic analysis for evaluation of alternatives along with societal, ethical and environmental concerns when discussing the overall impact of choosing an alternative.	During the 2019-2020 academic year, this outcome was only evaluated at the sophomore and senior levels. The following actions were implemented: Lectures on professionalism and ethics were given to the students during the semester followed by a homework assignment. The students did a project on economic analyses to determine which of the engineering alternatives would be suitable to pursue. The result of these actions was that the average for Outcome 4 was 76%, which exceeded the target average of 75%. This represented an increase from 2018-2019 where the average was 64%.

2. At Department Level

Going forward, the following are proposed for the 2020-2021 academic year:

1. It was decided by faculty that Instructors assess this outcome in the designated courses (CHEG 2003, 4043 and 4472) during the 2020-21 academic year and compare the results with the expected average of 75%.

Basis of Action:

The result of these actions was that the average for Outcome 4 was 76.04%, which exceeded the target average of 75%. This represented an increase from 2018-2019 where the average was 63.98%. However, the aggregate percentage of student meeting the expected average was 61.5% which is below the departmental set target of 70%. To address this shortcoming and improve upon the gains achieved so far, the actions described above were proposed.

6. Sample Assignments and Justification of suitability of assignment for measuring the outcome in:

CHEG 4043 Chemical Process Design and Analysis
CHEG 4472 Senior Design and Professionalism I

**OUTCOME “4” SPECIFIC ASSIGNMENTS USED TO
ASSESS THE OUTCOME IN**

CHEMICAL PROCESS DESIGN AND ANALYSIS

**OUTCOME “4” SPECIFIC ASSIGNMENTS USED TO
ASSESS THE OUTCOME IN**

SENIOR DESIGN AND PROFESSIONALISM I

CHEMICAL ENGINEERING DEPARTMENT
OUTCOMES SPECIFIC ASSIGNMENT COVER SHEET
CHEG 4472-P02 SENIOR DESIGN &
PROFESSIONALISM I
FALL 2019

Instructor: DR. LEALON L. MARTIN

Title of Assignment

Homework 3

Outcome Measured Using this Assignment

Outcome 4

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.

Check the ethical dimensions related to this assignment

Requires students to	
X	Recognize ethical and professional responsibilities in engineering situations involving global, and societal contexts
	Make informed judgements on ethical and professional responsibilities in engineering while considering the impact of engineering solutions in
X	global context
X	economic context
X	and societal context.

Brief justification of the suitability of assignment for the outcome

The assignment test the understanding of professional and ethical responsibilities as they relate to students' project.

CHEG 4472-P02: SENIOR DESIGN & PROFESSIONALISM I

FALL 2019

ASSIGNMENT STATEMENT/QUESTIONS

Senior Design & Professionalism I (Fall 2019): Home Work 3

You will be graded based on your understanding of professional and ethical responsibilities as they relate to your project. Clarity of presentation is essential if you are to avoid losing points.

1. Write a 2-page synopsis comparing the National Council of Examiners for Engineering and Surveying (NCEES) code of professional conduct with the American Institute of Chemical Engineers (AIChE) and National Society of Professional Engineers (NSPE) code of ethics.
2. Using the NSPE Code of Ethics, analyze the following case study. For the case study, justify your opinions by quoting relevant sections of the NSPE Code of Ethics that supports the opinion you make and why the opposite opinion may not be right.

Case Study

Facts:

Engineer A is a principal in a medium-sized engineering firm with expertise in mechanical and electrical engineering. Engineer A's firm is retained on a speculative basis by Engineer B, a local civil engineer, to assist City X in applying for a federal grant for certain wastewater treatment equipment upgrades for the city's wastewater treatment facility. The application is successful, City X obtains the grant, and Engineer B is retained to design the waste water equipment upgrades. In recognition of Engineer A's work in securing the grant, Engineer C, the chief city engineer, verbally promises to select Engineer A's firm on a future engineering project for City X.

Question:

Was it ethical for Engineer C to offer to select Engineer A's firm on a future engineering project for City X?

CHEMICAL ENGINEERING DEPARTMENT
SENIOR DESIGN & PROFESSIONALISM I CHEG 4472
GRADING SCHEME AND OUTCOME ASSESSMENT SHEET FOR FALL 2019

ABET OUTCOME 4: 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

Assignments that test competency in this area will include problems that test the student knowledge in the Professional Code of Ethics, ability to apply relevant aspects of the professional code of ethics when considering alternative decisions or solutions, ability to ethically evaluate the short and long term impact of engineering solutions on community and environment.

Name: _____

Title of Assignment: _____

Competency Area	Max for this Assignment	Your Score
4.1 An understanding of professional and ethical responsibility <i>This assignment tests the student knowledge in the Professional Code of Ethics, and ability to apply relevant aspects of the professional code of ethics when considering alternative decisions or solutions.</i>	100	
TOTAL	100	

CHEG 4472-P01: SENIOR DESIGN & PROFESSIONALISM I

FALL 2019

ASSIGNMENT STATEMENT/QUESTIONS

Senior Design & Professionalism I (Fall 2019): Home Work 4 Due: November 7, 2019

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- 1. Write a 2-page synopsis comparing the National Council of Examiners for Engineering and Surveying (NCEES) code of professional conduct with the American Institute of Chemical Engineers (AIChE) and National Society of Professional Engineers (NSPE) code of ethics.**
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Fact pattern:

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Question: Was it ethical for Engineer C to offer to select Engineer A's firm on a future engineering project for City X?

CHEMICAL ENGINEERING DEPARTMENT

SENIOR DESIGN & PROFESSIONALISM I CHEG 4472

GRADING SCHEME AND OUTCOME ASSESSMENT SHEET FOR FALL 2019

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Names:

Rizwan, Kinza

Livingston, Joshua

Ogogor, Collins

Johnson, Tominisha

Longe, Olumide

Title of Assignment: Engineering Ethics

Competency Area	Max for this Assignment	Your Score
4.1 An understanding of professional and ethical responsibility <i>This assignment tests the student knowledge in the Professional Code of Ethics, and ability to apply relevant aspects of the professional code of ethics when considering alternative decisions or solutions.</i>	100	85
TOTAL	100	85

Prairie View A&M University

Roy G. Perry College of Engineering
Department of Chemical Engineering



CHEG 4472 –P02

Senior Design and Professionalism I

Fall 2019

**Assignment #4—Ethics Assignment
Submitted By**

**Tominisha Johnson
Johsua Livingston
Olumide Longe
Collins Ogogor
Kinza Rizwan**

On Tuesday, November 7th, 2019

**To
Dr. Lealon L. Martin**

CHEG 4472 SENIOR DESIGN AND PROFESSIONALISM I FALL 2018

MINUTES OF GROUP MEETINGS

Meeting Date: Tuesday, November 5th, 2019 Meeting Time: 12:30 PM to 3:00 PM Meeting Location: C.L. Wilson Success Center

Members Present: Tominisha Johnson; Joshua Livingston; Olumide Longe*; Collins Ogogor; Kinza Rizwan

*Referred to as Olu in meeting minutes

Agenda for Meeting:

- Homework Assignment 4
 - Task identification and delegation
- Finalize the Block Flow Diagram
 - Discuss the process with Dr. Gyamerah
- Plan to move to next phase of the project- Material energy balances

Minutes:

The homework was completed with-in the first hour of the meeting using the sources provided (AIChE, NSBE etc)

We discussed how to proceed forward:

Finalized the Block flow diagram and performed the preliminary material balance on the overall system. The supplemental material with calculations is uploaded to group sharepoint.

CHEG 4472 SENIOR DESIGN AND PROFESSIONALISM I FALL 2018

TASK ASSIGNMENT & DELIVERABLES AT MEETINGS

Use this table to document task assigned and deliverables completed/submitted by each group member at each meeting. If deliverables are not completed, indicate the actions taken by the group on this individual

Meeting Date: Tuesday, November 5th, 2019 Meeting Time: 12:30 PM to 3:00 PM Meeting Location: C.L. Wilson Success Center

Name	Task Assigned	Deliverables Completed & Submitted
Tominisha Johnson	• Work on the powerpoint; Find more information about upstream processing	In progress
Joshua Livingston	• Complete material energy balance	In progress
Olumide Longe	• Work on powerpoint and help with material energy balance	In progress
Collins Ogogor	• Work on material energy balance and start ASPEN	In progress
Kinza Rizwan	• Work on Material Energy balance	In progress

CHEG 4472 SENIOR DESIGN AND PROFESSIONALISM I
FALL 2018
CLASS ATTENDANCE SHEET

This table documents attendance of students of the Senior Design & Professionalism class as indicated below and will be used to evaluate the sub outcome of ABET criterion f: Students understanding and demonstration of professional responsibilities.

Meeting Date: Tuesday, November 5th, 2019 Meeting Time: 12:30 PM to 3:00 PM Meeting Location: C.L. Wilson Success Center

Student Name	Project Title	On time	5 minutes late	Absent
Tominisha Johnson	Design of a Plant for production of Citric Acid cycle by Fermentation	X		
Joshua Livingston		X		
Olumide Longe		X		
Collins Ogogor		X		
Kinza Rizwan		X		

Design of plant for production of Citric Acid by fermentation

CHEG 4472-P01: SENIOR DESIGN & PROFESSIONALISM I

FALL 2019

ASSIGNMENT STATEMENT/QUESTIONS

Senior Design & Professionalism I (Fall 2019): Home Work 4 Due: November 7, 2019

You will be graded based on your understanding of professional and ethical responsibilities as they relate to your project. Clarity of presentation is essential if you are to avoid losing points.

- 1. Write a 2-page synopsis comparing the National Council of Examiners for Engineering and Surveying (NCEES) code of professional conduct with the American Institute of Chemical Engineers (AIChE) and National Society of Professional Engineers (NSPE) code of ethics.**
- 2. Using the NSPE Code of Ethics, analyze the following case study. For the case study, justify your opinions by quoting relevant sections of the NSPE Code of Ethics that supports the opinion you make and why the opposite opinion may not be right.**

Case Study

Fact pattern:

Engineer A is a principal in a medium-sized engineering firm with expertise in mechanical and electrical engineering. Engineer A's firm is retained on a speculative basis by Engineer B, a local civil engineer, to assist City X in applying for a federal grant for certain wastewater treatment equipment upgrades for the city's wastewater treatment facility. The application is successful, City X obtains the grant, and Engineer B is retained to design the waste water equipment upgrades. In recognition of Engineer A's work in securing the grant, Engineer C, the chief city engineer, verbally promises to select Engineer A's firm on a future engineering project for City X.

Question: Was it ethical for Engineer C to offer to select Engineer A's firm on a future engineering project for City X?

1. Essay (please look over and edit. Before editing. Scroll down. Open links. Look at code of ethics for each organization. Find similarities and differences. List anything I failed to mention in the essay.)

The Engineering profession has helped guide and shape the world and how it functions present day. It is due to the work of engineers that civilians are able to conduct and go about their day to day activities while consuming and manipulating the various products, structures, and devices that engineers help design and produce. Because of the pivotal role that the engineering field plays in modern society, it is paramount that engineers are held to the highest standard when it comes to not only the quality of product but also upon engineering practice as well. The code of ethics for the National Council of Examiners for Engineering and Surveying (NCEES), the American Institution of Chemical Engineers (AIChE) and the National Society of Professional Engineers (NSPE) all contain the standards and principles for engineering practice. This includes all the do's and don'ts along with professional obligations to society, business and engineering colleagues.

Each of these entities share in the fact that they license and accredit professional engineers to conduct research, projects, and ultimately engineering practice. However there are a few minor areas that they differ in when it comes to their individual code of ethics. In terms of detail, the NSPE contains the most information in their code of ethics for engineers, followed by the NCEES and AIChE respectively. Within the content, the NSPE and NCEES are the only ones who explicitly list out that engineers should not accept any form of financial compensation or bribe for any kind of project to be carried out and completed. The AIChE code of conduct however, uniquely states that engineers should build their professional reputations on the merits of their services. These details stood out in the fact that they stress the honesty of engineering practice in order to create a level playing field. Any engineer who would accept or give out pay to initiate or facilitate initiation of projects takes away from those who are eligible and capable due to their knowledge, credibility and background on the nature of the work to be done. The AIChE code of ethics also strongly urges that engineers continue their professional development throughout their careers and provide opportunities for the professional development of those under their supervision. The AIChE code of ethics is not as stringent and precise on the do's and

don'ts when it comes to regulations however it does hone in on the notion of continuous improvement throughout an engineer's professional career with the points that are stated. They also differ in the fact that they allow students to become members, familiarizing them with their code of ethics well before they enter the professional industry. More requirements that each code of ethics share in common is that they stress the protection of intellectual property, the practice of conducting work in an honest manner which involves speaking truthfully about the conduction of projects and those who lead them, along with maintaining a professional obligation to hold the safety of the public in the highest regard.

Engineering code of ethics do vary depending both on the nature of the organization and even the country in which engineers practice in. There are laws and regulations that tend to differ from state to state and nation to nation. Even though the code of ethics may differ in explicit detail amongst professional organizations such as NCEES, AIChE, and NSPE, they share the same overall message; Engineers must practice and conduct their work with the safety of both themselves and the public held first in mind at all times, to hold honesty in all their dealings both with their employer, clients, and colleagues, and to take on tasks only if they are competent and skilled in those areas.

Part II. Analyze Case Study using NPSE Code of Ethics

Before deciding whether the situation was ethical or unethical, it is important to understand two things. Firstly, we must understand clearly the sequence of events that unfolded. Next, we must identify which codes of the NSPE Code of Ethics were violated. Should any of the codes be violated, it serves as proof that the subjects of the case study acted unethically.

The first thing that occurs is that Engineer A is brought in to apply for a grant by Engineer B, who serves a local community. For simplicity, consider Engineer B (the local engineer) to operate in the City of Prairie View. Engineer A secures the grant for the wastewater treatment upgrades for City X. Then, the chief engineer of Prairie View, Engineer C, verbally promises to select Engineer A's company for a project in the future. The key details to note are: (1) Engineer B is native to the city of Prairie View and (2) Engineer C promises this to Engineer A solely because Engineer A is helping the City of Prairie View out.

The NSPE Code of Ethics is broken into two different parts, including the Rules of Practice and Professional Obligations. In the Rules of Practice, Engineers A and C are very close to breaking rule 4. This rule is generally titled, "Engineers shall act for each employer as faithful clients or trustees" (NSPE 2019). Under this heading, subsection c states that "Engineers should not solicit or accept financial or other valuable consideration, directly or indirectly, from outside agents in connection with the work for they are responsible" (NSPE 2019). Because Engineer A did not ask for his company to receive any favor from Engineer C, and because Rule 4c only applies to acceptance of offers, they have not violated Rule 4c. However, Rule 4d is where Engineer C gets in trouble. In this rule, it is stated that "Engineers in public service" should not "participate in decisions with respect to services solicited or provided by them or their organizations in private or public engineering practice" (NSPE 2019). Engineer C suggest that he will offer Engineer A's company a contract based off of the work they did for Prairie View. According to 4c, Engineer C does not have this power. Should Engineer A accept the offer, it could be a violation of Professional Obligations' Rule 5. While quid pro quo's are not explicitly named to be unethical by NSPE's Code of Ethics, Rule 5 does state that "Engineers shall not be influenced in their professional duties by conflicting interests"(NSPE 2019). Rule 5b says that "Engineers shall not accept commissions or allowances" (NSPE 2019). Since Engineer A is a principal in his company, he would be reaping the profits of this partnership with the City of Prairie View.

How?

In conclusion, Engineer C operated unethically because he broke Rule 4d of the Rules of Practice. Engineer A has not operated unethically. However, if his company accepts the offer from Engineer C, he has made an unethical move. He would have indirectly accepted a commission, which started when he brought federal money to Prairie View. It could get traced easily back to him, as a ploy to make money in the Prairie View area. Engineer B did not operate unethically; he called in Engineer A to help with the grant but had seemingly nothing to do with Engineer C's under-the-table offer to Engineer A.

*but
A is
providing
a
service,
not
a bribe*

*Engineer C's behavior may be unethical, but
not for the reasons articulated here under
Rule 4d.*

COMPARE NCEES code of professional conduct – Created in 1902

The National Council of Examiners for Engineering and Surveying (NCEES) was created in 1902 as a nonprofit organization dedicated to advancing professional licensure for engineers and surveyors. It develops, administers, and scores the examinations used for engineering and surveying licensure in the United States. The services that NCEES provides are engineering exams, surveying exams, exam prep materials, records program, credentials evaluations, CPC tracking, etc.

American Institute of Chemical Engineers (AIChE) code of ethics

The American Institute of Chemical Engineers (AIChE) was established in 1908 as a nonprofit organization providing leadership to the chemical engineering profession representing more than 60,000 members from more than 110 countries in industry, academia, and government. The American Institute of Chemical Engineering is the world's leading organization for chemical engineering professionals.

AIChE has a Code of Ethics to which every applicant attests by signing his or her membership application. Members of the American Institute of Chemical Engineers shall uphold and advance the integrity, honor and dignity of the engineering profession by: being honest and impartial and serving with fidelity their employers, their clients, and the public; striving to increase the competence and prestige of the engineering profession; and using their knowledge and skill for the enhancement of human welfare.

National Society of Professional Engineers (NSPE) code of ethics

The National Society of Professional Engineers was established in 1934 to create an inclusive, nontechnical organization dedicated to the interests of licensed professional engineers, regardless of practice area, that would protect engineers (and the public) from unqualified practitioners, build public recognition for the profession, and stand against unethical practices and inadequate compensation. The mission of this society is to foster licensed professional engineers in service to society.

In NSPE's Preamble of the Code of Ethics for Engineers, it states "members of this profession, engineers are expected to exhibit the highest standards of honesty and integrity." The section of Fundamental Canons gives the fulfillment of the engineer professional duties, shall: 1. Hold paramount the safety, health, and welfare of the public. 2. Perform services only in areas of their competence. 3. Issue public statements only in an objective and truthful manner. 4. Act for each employer or client as faithful agents or trustees. 5. Avoid deceptive acts. 6. Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

References:

“NCEES Model Rules of Professional Conduct.” *NCEES Model Rules of Professional Conduct*, National Council of Examiners for Engineering and Surveying, July 1990.

“AIChE Code of Ethics.” American Institute of Chemical Engineers, Nov. 2015.

“NSPE Code of Ethics for Engineers.” National Society of Professional Engineers, July 2019.

CHEG 4472-P01: SENIOR DESIGN & PROFESSIONALISM I

FALL 2019

ASSIGNMENT STATEMENT/QUESTIONS

Senior Design & Professionalism I (Fall 2019): Home Work 4 Due: November 7, 2019

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- 1. Write a 2-page synopsis comparing the National Council of Examiners for Engineering and Surveying (NCEES) code of professional conduct with the American Institute of Chemical Engineers (AIChE) and National Society of Professional Engineers (NSPE) code of ethics.**
- 2. Using the NSPE Code of Ethics, analyze the following case study. For the case study, justify your opinions by quoting relevant sections of the NSPE Code of Ethics that supports the opinion you make and why the opposite opinion may not be right.**

Case Study

Fact pattern:

Engineer A is a principal in a medium-sized engineering firm with expertise in mechanical and electrical engineering. Engineer A's firm is retained on a speculative basis by Engineer B, a local civil engineer, to assist City X in applying for a federal grant for certain wastewater treatment equipment upgrades for the city's wastewater treatment facility. The application is successful, City X obtains the grant, and Engineer B is retained to design the waste water equipment upgrades. In recognition of Engineer A's work in securing the grant, Engineer C, the chief city engineer, verbally promises to select Engineer A's firm on a future engineering project for City X.

Question: Was it ethical for Engineer C to offer to select Engineer A's firm on a future engineering project for City X?

CHEMICAL ENGINEERING DEPARTMENT
SENIOR DESIGN & PROFESSIONALISM I CHEG 4472
GRADING SCHEME AND OUTCOME ASSESSMENT SHEET FOR FALL 2019

ABET OUTCOME 4: 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

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Names:

Kellum, Charles

Noe, Sabrina

Effiong, Unyime

Flournoy, Kameron

Oluyadi, Temiloluwa

Title of Assignment: Engineering Ethics

Competency Area	Max for this Assignment	Your Score
4.1 An understanding of professional and ethical responsibility <i>This assignment tests the student knowledge in the Professional Code of Ethics, and ability to apply relevant aspects of the professional code of ethics when considering alternative decisions or solutions.</i>	100	70
TOTAL	100	70

Where is your analysis of the fact pattern?? Never mind 😊

1. Compare and Contrast of the National Council of Examiners for Engineering and Surveying (NCEES) Code of Professional Conduct from the American Institute of Chemical Engineering (AIChE) to the National Society of Professional Engineers (NSPE) Code of Ethics. ✓

The National Society of Professional Engineers (NSPE) Code of Ethics contains a preamble that is upheld for all professional engineers which contain a basis of honesty, integrity, fairness, and equity. To value the quality of life for all people and be dedicated to public health, safety, and welfare. Engineers must perform under this professional behavior and follow the ethical code of conduct. The preamble for the NCEES Code of Professional Conduct with AIChE upholds the same professional behaviors but mentions that these rules are binding to a licensed engineer or perform engineer or land serving service. ✓

The NCEES Code of Professional conduct uses three main points: licensee's obligation to society, licensee's obligation to employer and clients, and licensee's obligation to other licensees. NSPE Code of Ethics contains multiple main points such as engineers shall perform services only in the areas of their competence, engineers shall avoid deceptive acts and many more. NSPE Code of Ethics rule of engineers shall hold paramount the safety, health, and welfare of the public. With detailed bulletin points are the same rules under the licensee's obligation to society rule in the NCEES Code of Professional Conduct. ✓

The NCEES rules of conduct state that licensees shall express a professional opinion publicly only when it is founded upon adequate knowledge of the facts and

competent evaluation of the subject matter. But the NSPE Code of Ethics emphasizes more on that engineers avoid all conduct or practice that deceives the public by avoiding facts that are misrepresented or omitting of a material fact. For NCEES rules of professional conduct, the licensees of obligation to employer and clients rule contains many of the same rules contained in the NSPE Code of Ethics. For example, engineers shall not solicit or accept a contract from a governmental body in which a principal or officer of their organizations serves as a member.

One thing that differentiates the NSPE Code of Ethics from NCEES rules of professional conduct is the statement by NSPE Executive Committee. This statement provides an understanding of how to create order when there is a misunderstanding under some instances within the Supreme Court decision and entry of final judgment. The supreme court made it clear to engineers and firms that they may individually refuse to bid for engineering services. One important statement made is that the Supreme Court has nothing in their judgment that will prevent NSPE and its members from attempting to influence governmental action. The U.S District Court for the District of Columbia said the NSPE Code of Ethics prohibits competitive bidding, all policy statements, opinions, rulings or other guidelines interpreting the scope are rescinded as unlawfully interfering with the legal rights of engineers protected under the antitrust laws, and to provide price information to prospective clients. The NCEES Code of Professional conduct does not mention any Supreme Court involvement in the creation of this professional conduct or code of ethics.

2. Using the NSPE Code of Ethics, analyze the following case study. For the case study, justify your opinions by quoting relevant sections of the NSPE Code of Ethics that supports the opinion you make and why the opposing opinion may not be right.
- Question: Was it ethical for Engineer C to offer to select Engineer A's firm on a future engineering project for City X?

It was unethical for Engineer C to offer Engineer A the firm because accreditation for obtaining the wastewater treatment federal grant was presented to Engineer A, but the design of wastewater equipment upgrades was not recognized for Engineer B. As stated in NSPE Code of Ethics, "Engineers shall give credit for engineering work to those to whom credit is due and will recognize the proprietary interests of others". Some may argue that, since Engineer A was the principal engineer for this project, that the correct thing to do is to offer the firm a future contract.

I don't follow your logic here. Engineer B is employed by Engineer A. There is a weak connection between B's hiring and C's promise. It is not clear whether A's helping city X to obtain the grant is related to B's hiring.

On the other hand, C does not know whether A will be able to handle future projects from the city, therefore it is unethical for C to make such promises.

CHEG 4472-P01: SENIOR DESIGN & PROFESSIONALISM I

FALL 2019

ASSIGNMENT STATEMENT/QUESTIONS

Senior Design & Professionalism I (Fall 2019): Home Work 4 Due: November 7, 2019

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Question: Was it ethical for Engineer C to offer to select Engineer A's firm on a future engineering project for City X?

CHEMICAL ENGINEERING DEPARTMENT
SENIOR DESIGN & PROFESSIONALISM I CHEG 4472

GRADING SCHEME AND OUTCOME ASSESSMENT SHEET FOR FALL 2019

ABET OUTCOME 4: 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

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Names:

Adeyemi, Tope

Aliado, Michael A.

Anderson, Javon J.

Guillory, Cayla

Brooks Jr, Nigel P.

Title of Assignment: Engineering Ethics

Competency Area	Max for this Assignment	Your Score
4.1 An understanding of professional and ethical responsibility <i>This assignment tests the student knowledge in the Professional Code of Ethics, and ability to apply relevant aspects of the professional code of ethics when considering alternative decisions or solutions.</i>	100	85
TOTAL	100	85

857

Senior Design & Professionalism I
Homework # 4

Submitted by

Tope Saheed Ade
Michael Aliado
Nigel Brooks Jr.
Javon Anderson
Cayla Guillory

To
~~Dr. Leon Martin~~

Department of Chemical Engineering
Roy G. Perry College of Engineering
Prairie View A&M University

November 7, 2019

Comparison of the three codes of ethics

Having a strong understanding and appreciation for a code of ethics is critical to the success and longevity of an engineer's career. A devotion to such a code of ethics allows an engineer to ultimately shape and execute difficult decisions which affect the safety and wellbeing of those around him/her. Under stressful situations, economics can drive an engineer to take shortcuts and risks to ensure the completion of a project. Despite the concern for profitability and efficiency, an engineer's code of ethics must always have the safety of the general public at the forefront of each decision. Many professional engineering organizations stringently maintain and uphold their own ethics for each discipline of engineering that exists, and it is well understood that each engineer should meticulously adhere to these codes.

In this report, the codes of conduct and ethics from three engineering organizations will be compared. The three organizations in question are the National Council of Examiners for Engineering and Surveying (NCEES), the National Society of Professional Engineers (NSPE), and the American Institute of Chemical Engineers (AIChE). Upon examining the codes of conduct for all three organizations, they heavily emphasize that engineers have a direct responsibility for the health and safety of the public. For example, in the case that an engineer's judgement is overruled in circumstances that endanger life or property, it is the engineer's responsibility to notify their client, employer, or another authority of the risks that come with such a decision. [1] If an engineer does not voice valid concerns or deliberately approves something that is not properly regulated and may endanger the public welfare, severe consequences will be dealt notwithstanding the potential loss of life and property. Remaining silent on any decision-making process is an unacceptable behavior, as ordained by all three codes of ethics.

Another consideration found in all three organizational code of ethics is that it is unethical for an engineer to perform professional services outside of their area of competence. [2] Professional engineers must be properly trained and tested from an accredited institution for them to work. It is a commonly shared sentiment that no one would want an unlicensed doctor to perform a surgery on them, and it is the same for any professional. Engineers must be able to demonstrate that they are able to competently execute technical tasks before beginning work on a project. Similarly, engineers must demonstrate that they are able to maintain a high level of integrity regarding confidentiality. Unless required by law, engineers should not breach confidentiality with their clients/employers by revealing facts, data, or information obtained in a professional capacity without the prior consent of the client/employer. [3] Selling a client's trade secrets to a competitor for personal monetary profit is unethical and shows that such an individual is untrustworthy for future endeavors.

Comparatively, while the three organizations all have common facets found in their code of ethics, the main differences between them are that they are tailored to a specific audience. The NSPE code of ethics is targeted at engineers who have attained their professional engineer license (PE). A PE is the only engineer who can prepare, sign and seal, and submit engineering plans or drawings to a public authority for approval, or seal engineering work for other clients. [1] As a result, the NSPE code of ethics contains sections that are specific to that type of work. The NCEES code of professional conduct is similar to the NSPE code of ethics, though it also includes provisions specific to surveyors. The AIChE code of ethics is primarily tailored to chemical engineers and those who work in the chemical processing industry. While each organization's code of ethics and professional conduct address different audiences, all three maintain that engineers of all disciplines should conduct business and perform their work at the highest accordance to their respective ethical code.

PART B: Using the NSPE Code of Ethics, analyze the following case study. For the case study, justify your opinions by quoting relevant sections of the NSPE Code of Ethics that supports the opinion you make and why the opposite opinion may not be right.

In reviewing this case study, all conduct was ethical until engineer C. Being the chief city engineer, promised engineer A's firm a future engineering project. The promise of this offer is a violation of multiple codes of ethics laid out in the NSPE code of ethics handbook. The following are potential areas of unethical behavior and or actions.

Section 4c. states that, "Engineers shall not solicit or accept financial or other valuable consideration, directly or indirectly, from outside agents in connection with the work for which they are responsible." Engineer A's firm accepting an indirect offer for a future project in City X. Based on their connection in successfully receiving a grant for City X, it is a clear violation of NSPE rules.

No. How did A violate this rule? No offer or solicitation.

Under section 4e "Engineers shall not solicit or accept a contract from a governmental body on which a principal or officer of their organization serves as a member." [1] Engineer A accepting such an offer in this circumstance from the city engineer, while being retained by Engineer C violates NSPE rules of practice.

No. C has no employment or financial interest in A

Section 5b "Engineers shall not offer, give, solicit, or receive, either directly or indirectly, any contribution to influence the award of a contract by public authority, or which may be reasonably construed by the public as having the effect or intent of influencing the awarding of a contract. They shall not offer any gift or other valuable consideration in order to secure work." [1] The city engineer, a public official, is promising "to select Engineer A's firm on a future engineering project for City X" based on his work in securing a grant for City X. Should an offer be accepted by Engineer A's firm, such actions could be reasonably construed by the public as being biased, and is in violation of NSPE rules.

No. That's a stretch.

The real issue is whether A is ^{shown} competent to work on just any future project. This is determined through the bidding/proposal process, which C is attempting to circumvent

References

- [1] "Code of Ethics." Code of Ethics | National Society of Professional Engineers. July 2007.
Accessed November 2, 2019. <https://www.nspe.org/resources/ethics/code-ethics>.
- [2] "Rules of Professional Conduct." NCEES Model Rules of Professional Conduct. Accessed
November 2, 2019. <http://sites.bsye.wsu.edu/pitts/be120/handouts/codes/ncees.htm>
- [3] "Code of Ethics." AIChE. November 2, 2019. Accessed November 2, 2019.
<https://www.aiche.org/about/code-ethics>.

CHEG 4472-P01: SENIOR DESIGN & PROFESSIONALISM I

FALL 2019

ASSIGNMENT STATEMENT/QUESTIONS

Senior Design & Professionalism I (Fall 2019): Home Work 4 Due: November 7, 2019

You will be graded based on your understanding of professional and ethical responsibilities as they relate to your project. Clarity of presentation is essential if you are to avoid losing points.

- 1. Write a 2-page synopsis comparing the National Council of Examiners for Engineering and Surveying (NCEES) code of professional conduct with the American Institute of Chemical Engineers (AIChE) and National Society of Professional Engineers (NSPE) code of ethics.**
- 2. Using the NSPE Code of Ethics, analyze the following case study. For the case study, justify your opinions by quoting relevant sections of the NSPE Code of Ethics that supports the opinion you make and why the opposite opinion may not be right.**

Case Study

Fact pattern:

Engineer A is a principal in a medium-sized engineering firm with expertise in mechanical and electrical engineering. Engineer A's firm is retained on a speculative basis by Engineer B, a local civil engineer, to assist City X in applying for a federal grant for certain wastewater treatment equipment upgrades for the city's wastewater treatment facility. The application is successful, City X obtains the grant, and Engineer B is retained to design the waste water equipment upgrades. In recognition of Engineer A's work in securing the grant, Engineer C, the chief city engineer, verbally promises to select Engineer A's firm on a future engineering project for City X.

Question: Was it ethical for Engineer C to offer to select Engineer A's firm on a future engineering project for City X?

CHEMICAL ENGINEERING DEPARTMENT
SENIOR DESIGN & PROFESSIONALISM I CHEG 4472
GRADING SCHEME AND OUTCOME ASSESSMENT SHEET FOR FALL 2019

ABET OUTCOME 4: 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

Assignments that test competency in this area will include problems that test the student knowledge in the Professional Code of Ethics, ability to apply relevant aspects of the professional code of ethics when considering alternative decisions or solutions, ability to ethically evaluate the short and long term impact of engineering solutions on community and environment.

Names:

Bustos Escudero, Hector

Epperson, Angela

Clark, Randall L.

Drey, Michael J.

Duruzor, Chris

Title of Assignment: Engineering Ethics

Competency Area	Max for this Assignment	Your Score
4.1 An understanding of professional and ethical responsibility <i>This assignment tests the student knowledge in the Professional Code of Ethics, and ability to apply relevant aspects of the professional code of ethics when considering alternative decisions or solutions.</i>	100	85
TOTAL	100	85

85

**CHEG 4472-P02 SENIOR DESIGN AND PROFESSIONALISM I
FALL 2019
PROJECT ASSIGNMENT COVER SHEET**

GROUP NUMBER 2

ASSIGNMENT # 4

Assignment Title Ethics Assignment Due Date: November 7, 2019

No	Group Member Name Group Member Signature	Brief Description of Work Assigned to Member	% Completed by Member*	Your Score
1	Wesley Pustotus Escudera <i>HP</i>	Complete a portion of question 1	100%	
2	Ariada Ipperson <i>Rugda M. Epperson</i>	Critique report and add to question 2.	100%	
3	Ronell Clark <i>Ronell Clark</i>	Complete a portion of question 2	100%	
4	Michael Drey <i>M. Drey</i>	Complete a portion of question 1	100%	
5	Chris Dreyer <i>Chris Dreyer</i>	Complete a portion of question 2	100%	

*100% means the member completed his/her assigned work.

By signing this assignment cover sheet, I agree that the percentages stated in the % completed column reflect the contribution made by me and other members of the group.

CHEG 4472-P02 SENIOR DESIGN AND PROFESSIONALISM I FALL 2019

MINUTES OF GROUP MEETINGS

Meeting Date: 11/5/2019 Meeting Time: 10:00am
Meeting Location: C.L. Wilson

Members Present: Hector Bustos Escudero, Angela Epperson, Randall Clark, Michael Drey, Chris Duruzor

Agenda for Meeting (List all items to be discussed or discussed at the meeting)

- Complete and revise power-point to meet all requirements
- Review Gantt chart and update team members
- Start Material and Energy Balance for block flow diagram
- Schedule meeting with Dr. Martin to receive graded work back

Detailed Minutes: (should include name of speaker and summary of what he/she suggested)

- Angela Epperson
 - 30 Minutes
 - Suggested working on the final report and making corrections from the graded report.
- Randall Clark
 - 30 Minutes
 - Suggested finding a plant within the Galveston Bay area to visit to gain a better understanding of ethylbenzene and how an industrial process works.
- Michael Drey
 - 30 Minutes
 - Suggested completing the material and energy balance in addition to breaking each component down into smaller segments.
- Hector Bustos Escudero and Chris Duruzor:
 - 30 Minutes
 - Suggested starting the Aspen process before next week

**CHEG 4472-P02 SENIOR DESIGN AND PROFESSIONALISM I
FALL 2019**

TASK ASSIGNMENT & DELIVERABLES AT MEETINGS

Use this table to document task assigned and deliverables completed/submitted by each group member at each meeting. If deliverables are not completed, indicate the actions taken by the group on this individual

Meeting Date: 11/5/2019 Meeting Time: 10:00am
Meeting Location: C.L Wilson

Name	Task Assigned	Deliverables Completed & Submitted
Hector Bustos Escudero	Question 1	- Completed a portion of question one - Searched for differences within the organizations - Introduction
Angela Epperson	Question 2 & Critique	- Critique the entire report for any grammar mistakes - Add to question 2 if needed
Randall Clark	Question 2	Research the scenario and determine which codes were abused
Michael Drey	Question 1	- Completed a portion of question one - Searched for similarities within the organizations - Conclusion
Chris Duruzor	Question 2	Research the scenario and determine which codes were abused

Ethics Assignment

Ethics is a very important theme in the career of an engineer. One of the key concepts in ethics is that it helps guide an engineer on the topic of safety as well as quality. Engineers face challenges on a daily basis and sometimes those challenges involve making major decisions that can impact the safety of all those involved. However, the code of ethics is the guiding principle that makes sure no shortcuts are taken where safety is concerned. Many organizations have ethical codes for different types of engineering disciplines. It is of great importance that every engineer, whether being a student or working professional, to maintain a good understanding of these codes for the safety of everyone at the workplace. In this short paper, a synopsis will be made comparing the code of conduct from three of the most highly credited engineering organizations in the industry.

What is not "public well-being" or "safety" or "competence"?

Even though the three organizations have differences, there are still similar traits that the organizations share. One main characteristic/trait is their strong emphasis on engineers' top responsibility to provide the safest decisions for the public. For instance, the National Society of Professional Engineers (NSPE) code of ethics states that "if engineers' judgment is overruled under circumstances that endanger life or property, they shall notify their employer or client and such other authority as may be appropriate." [1] This is a very important code that these organizations have in common. However, it is very unethical and unacceptable for an engineer to remain silent if they are aware of a potentially harmful situation or circumstance. In addition to the expectation for the safest decisions, another common trait between these organizations is engineers' acceptance of responsibility for wrongful actions. For example, according to the American Institute for Chemical Engineers (AIChE) code of ethics, an engineer should "accept responsibility for their actions, seek and heed critical review of their work and offer objective criticism of the work of others." [2] In addition to learning from previous mistakes, taking responsibility in any given situation ensures that proper procedures are followed. Additionally, no one wants to risk termination as a result of someone else's incorrect actions. Another common characteristic is the promotion of competing fairly while offering a diversified opportunity. For example, the National Council of Examiners for Engineering and Surveying (NCEES) code of professional conduct states that an engineer's "professional reputation shall be built on the merit of their services, and they shall not compete unfairly with others." [3] It is never fair to treat anyone unequally, based on a person's sex, religion, race, color, creed, disability, age or

reference.

relationship when competing with others. There are clearly more traits that these organizations have in common. These are just three that play a significant role within the industry.

This section of the report discusses the differences in the ethical codes of the three organizations. The main difference in these codes is the targeted audience. The NSPE Code of Ethics targets engineers who have obtained the Professional Engineer (PE) license from the PE licensure exams. A licensed PE is the only engineer allowed to prepare, sign, and submit engineering plans and drawings to a public authority for approval, or to seal engineering work for public or private clients. [1] As a result, this code of ethics is designed mainly for that purpose. The NCEES Code of Professional Conduct is intended for both PEs and surveyors. This code of conduct is very similar to the NSPE Code of Ethics but adds provisions for the surveyors. Lastly, the AIChE Code of Ethics is specifically for chemical engineers no matter the expertise. This code of ethics can aid any engineer in their work environment. Despite the difference in audiences, all the ethics codes have the same objective of requiring engineers to be ethical in every aspect of their job.

Ethics is important not only for engineers but for society as well. Without ethics, a person has the freedom to lie, cheat, and take advantage of any given situation. Engineers are trusted by society to create brilliant and safe products within their profession while advancing and obtaining knowledge. It is an engineer's responsibility to abide by the ethical codes that are provided by the NCEES, AIChE, and NSPE code of ethics.

Part B: Ethical Case Study

Engineers are held to a higher standard than most professions. As a member of this profession, they are expected to demonstrate the utmost integrity, adhering to the highest principles of ethical conduct. For the case study in question, my group and I believe it did not reflect good ethics for Engineer C to make such an offer to Engineer A. By doing so Engineer C has violated more than one rule set down in the NSPE Code of Ethics. We will be providing the exact codes of ethics in question to justify and support our opinion.

Engineer C is in ethical violation of the NSPE Code of Ethics by selecting Engineer A's Engineering Firm for a future City X engineering project. Engineer C is in clear violation of the Professional Obligations section bullet-point four stating, "Engineers shall not disclose, without consent, confidential information concerning the business affairs or technical processes of any present or former client or employer, or public body on which they serve." [1] In further detail, he/she is violating subpoint b of bullet point four that also states, "Engineers shall not, without consent of all interested parties, promote or arrange for new employment or practice in connection with a specific project for which the engineer has gained particular and specialized knowledge." [1] Engineer C is in violation of these codes because he/she hasn't contacted all parties before notifying Engineer A of his intentions to employ Engineer A's Firm. Engineer C is also putting City X in danger, as Engineer A's Firm has expertise in Mechanical & Electrical engineering, not civil engineering. If Engineer A accepted the offer, the firm would be in infringement of section II.2.A of the NSPE Code of Ethics, "Engineers shall undertake assignments only when qualified by education or experience in the specific technical fields involved." [1] Engineer A could speculate for Engineer B to receive the grant because he/she was protected by section II.2.C of the NSPE Code of Ethics. "Engineers may accept an assignment and assume responsibility for coordination of an entire project and sign and seal the engineering documents for the entire project, provided that each technical segment is signed and sealed only by the qualified engineers who prepared the segment." [1] This clarifies that Engineer A may be permitted to do speculation jobs under Engineer B's supervision or cooperation. Some state statutes and policies governing the awarding of government contracts may also find Engineer C in violation of nepotism laws/policies and may take corrective action against Engineer C. Engineer C should notify his entire crew before attempting to hire Engineer A's firm and do the necessary research to determine if they are qualified for his projects.

How is this violated??

is there a specific project involved??

this is a weak connection

Yes!

yes!!

ok.

no mention of parties being related.

Works Cited

1. Code of Ethics. (2019, July). Retrieved from <https://www.nspe.org/resources/ethics/code-ethics>.
2. Code of Ethics. (2019, January 14). Retrieved from <https://www.aiche.org/about/code-ethics>.
3. NCEES Model Rules of Professional Conduct. (1990, July). Retrieved from <http://sites.bsyste.wsu.edu/pitts/be120/Handouts/codes/ncees.htm>.

CHEG 4472-P01: SENIOR DESIGN & PROFESSIONALISM I

FALL 2019

ASSIGNMENT STATEMENT/QUESTIONS

Senior Design & Professionalism I (Fall 2019): Home Work 4 Due: November 7, 2019

You will be graded based on your understanding of professional and ethical responsibilities as they relate to your project. Clarity of presentation is essential if you are to avoid losing points.

- 1. Write a 2-page synopsis comparing the National Council of Examiners for Engineering and Surveying (NCEES) code of professional conduct with the American Institute of Chemical Engineers (AIChE) and National Society of Professional Engineers (NSPE) code of ethics.**
- 2. Using the NSPE Code of Ethics, analyze the following case study. For the case study, justify your opinions by quoting relevant sections of the NSPE Code of Ethics that supports the opinion you make and why the opposite opinion may not be right.**

Case Study

Fact pattern:

Engineer A is a principal in a medium-sized engineering firm with expertise in mechanical and electrical engineering. Engineer A's firm is retained on a speculative basis by Engineer B, a local civil engineer, to assist City X in applying for a federal grant for certain wastewater treatment equipment upgrades for the city's wastewater treatment facility. The application is successful, City X obtains the grant, and Engineer B is retained to design the waste water equipment upgrades. In recognition of Engineer A's work in securing the grant, Engineer C, the chief city engineer, verbally promises to select Engineer A's firm on a future engineering project for City X.

Question: Was it ethical for Engineer C to offer to select Engineer A's firm on a future engineering project for City X?

CHEMICAL ENGINEERING DEPARTMENT

SENIOR DESIGN & PROFESSIONALISM I CHEG 4472

GRADING SCHEME AND OUTCOME ASSESSMENT SHEET FOR FALL 2019

ABET OUTCOME 4: 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

Assignments that test competency in this area will include problems that test the student knowledge in the Professional Code of Ethics, ability to apply relevant aspects of the professional code of ethics when considering alternative decisions or solutions, ability to ethically evaluate the short and long term impact of engineering solutions on community and environment.

Names:

Fearon, James R.

Francisco, Gutty K.

Hooks, Ryan R.

Hunter, Maya M.

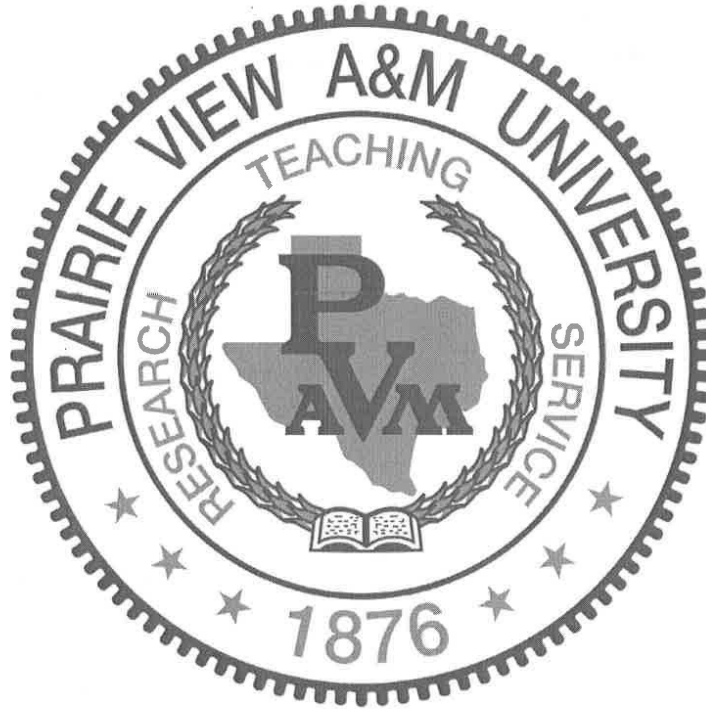
Jackson, Robert

Title of Assignment: Engineering Ethics

Competency Area	Max for this Assignment	Your Score
4.1 An understanding of professional and ethical responsibility <i>This assignment tests the student knowledge in the Professional Code of Ethics, and ability to apply relevant aspects of the professional code of ethics when considering alternative decisions or solutions.</i>	100	90
TOTAL	100	90

90

Ethics and Professionalism



Group 3

Fearon, James

Francisco, Guty K.

Hooks, Ryan R.

Hunter, Maya M.

Jackson II, Robert

Group 3

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Code of Ethics Synopsis

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Case Study

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References

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Code of Ethics Synopsis

The goal is to successfully compare three codes, the National Council of Examiners for Engineering and Surveying (NCEES) Code of Professional Conduct, the American Institute of Chemical Engineers (AIChE) and National Society of Professional Engineers (NSPE) code of ethics. An ethics code is implemented to act as a code of conduct for a professional organization, these are sometimes a list of rules or procedures that are enforced to maintain professionalism and order within the company. In most cases, breaking the code of ethics or violating the code of ethics may result in dismissal from the organization or another minor or major consequence.

The NSPE's Model Rule of Professional Conduct are for the purpose to "identify jurisdiction-state and licensing statute" [NCEES], while the AIChE Code of Conduct is a shorter and much simpler ethics code that enforces much simpler, day to day rules. Lastly, the NSPE Code of Ethics for Engineers is an in-depth breakdown of all rules and etiquette that professionals and engineers should know. All three of these documents highlight the importance of safety, health, welfare, integrity, dignity and honor but have either an emphasis on a certain point or a simple explanation of the rule. The same values are highlighted in all portions but also worded differently, the same principles are highlighted in all codes.

Safety is a top priority for engineers so the safety portion of the ethics code is usually the first big rule that will be outlined in all ethical codes. The AIChE Code of Ethics and the NSPE's Code of Ethics both state that in the process of carrying out duties as a professional engineer, engineers are to "hold paramount the safety, health and welfare of the public." [NSPE]. In order to make sure safety is a priority, the statement of being sure engineers are performing

g → !
“professional services only in areas of their competence” [AIChE] is outlined in all three articles. This makes sure that engineers are constructing, analyzing and supervising projects that are in the area of study which they specialize in. This ethical code ensures that a mechanical engineer will not have a major part in a chemical process for a project if they have never specialized in the exact area of that process. The NSPE states the same ethical code but is worded as “Engineers shall undertake assignments only when qualified by education or experience in the specific technical fields involved” [NSPE]. Lastly, the NCEES Model Rules shows the ethical code as “Licensees shall undertake assignments only when qualified by education or experience in the specific technical fields of engineering or land surveying involved” [NCEES].

The difference in all three is how much detail for each principle is presented. As stated, the AIChE Code of Ethics is a straight, to the point breakdown of the ethical codes while, the NCEES has three different sections and very detailed additions to the overall concept of the section. The NSPE Code of Ethics has a main principle that is followed by 5 to 6 very detailed oriented principles that have the overall main goal in mind. This code of ethics has fundamental law, a rule of practice section that highlights rules that all professional engineers should possess and an obligations section that touches on what a professional engineer should strive to be at all times.

The Code of Ethics are legal agreements that are typically signed by employees or members of an organization to be sure that the principles are being followed and shown in the everyday life of that engineer or participant. An ethical code will keep the safety, honesty, integrity and health of all employees at the highest standard from the moment it is founded, throughout the lifetime of the organization.

section II (rules of practice) 4.c. "Engineers shall not solicit or accept financial or other valuable consideration, directly or indirectly, from outside agents in connection with the work for which they are responsible." This furthermore proved that Engineer's C actions was unethical since Engineer A received consideration for the next project directly by helping to secure the grant for the current wastewater project. This should not only be the means to merit his firm in obtaining the next job not knowing if they would be the best fit for the future project. Here it is declared in section II. 4.e. "Engineers shall not solicit or accept a contract from a governmental body on which a principal or officer of their organization serves as a member." Once more, it is shown that Engineer A is a principal and the contract was offered from Engineer C which is the chief city engineer which makes the verbal offer also unethical." It also pointed out in section III. 6. a.

Not true.
Consideration is fine. The issue is that a promise was made.

C is not accepting a commission or requesting or proposing

"Engineers shall not request, propose, or accept a commission on a contingent basis under circumstances in which their judgment may be compromised." Correspondingly, Engineer's C judgement was certainly compromised since he did not have adequate facts as to what the future project would be whether it might be a mechanical or electrical engineering related project as was stated that Engineer's A firm had expertise in.

In conclusion, the dealings explained by the engineers is unethically proven by the arguments that are stated in the code of ethics.

not true. (No link) true.

Case Study

In this case study we see that Engineer A (a principle for an engineering firm) is retained on a speculative basis by Engineer B (a local engineer) to assist City X in applying and receiving a federal grant for a wastewater treatment project. The application was successful resulting in City X obtaining the grant and Engineer B being retained to design wastewater equipment for the wastewater treatment facility. In recognition of Engineer A's help in securing the grant, Engineer C (the chief city chief engineer) verbally promises to select Engineer A's firm on a future engineering project for City X. The question was posed, "was it ethical for Engineer C to offer to select Engineer A's firm on a future engineering project for City X?"

In our examination of this case study and applying the NSPE code of ethics that defines how an engineer shall operate. They should display the highest level of honesty, impartiality, integrity, equity regarding engineering fundamentals, rules of practice and professional obligation. Subsequently, it was determined that it was unethical for Engineer C to offer or make a promise to give the future engineering project to Engineer's A firm. This conclusion was made based on the following sections and codes from the NSPE code of ethics.

It is clearly unethical for Engineer C to promise a future job to Engineer A regarding a future project. Since there was not adequate information on the specifications of what that job would be. Whether it will fall under Engineer A's area of competence or not as mentioned in section I.2 (fundamental canons) "Perform services only in areas of their competence." In the NSPE code of ethics section I.6, it also further shows by stating that all engineers must "Conduct themselves honorably, responsibly, ethically and lawful so as to enhance the honor, reputation and usefulness of the profession." It could be seen that the engineer's actions especially from C's verbal statement it was detrimental to the image of the engineering profession. Also based on

References

1. National Society of Professional Engineers. "Code of Ethics for Engineers." July 2019.
2. National Council of Examiners for Engineering and Surveying . "*Model Rules of Professional Conduct*", July 1990.
3. American Institute of Chemical Engineers. "*AIChE Code of Ethics*", Nov. 2015.

**CHEG 4472-P02 SENIOR DESIGN AND PROFESSIONALISM I
FALL 2019**

MINUTES OF GROUP MEETINGS

Meeting Date: 11/5/19 Meeting Time: 7-9 PM Meeting Location: CL Wilson – Success Center

Members Present: Maya Hunter, Guty Francisco, Robert Jackson, Ryan Hooks, James Fearon

Agenda for Meeting (List all items to be discussed or discussed at the meeting)

1. Discuss Ethical Codes
2. Case Study Review and Discussion
3. Discuss Presentation and Literature Review Process
4. Begin ASPEN

Detailed Minutes: (should include name of speaker and summary of what he/she suggested)

1. Reviewed what each ethical code has in common versus the differences
 - a. Maya, Ryan and Guty read deeply into each code
 - b. Wrote out comparison for each code
 - c. Discussed importance of code of ethics
2. Case Study Review
 - a. Spent time figuring out what the case study really meant
 - b. James and Robert had deep discussion/disagreement about the direction of the case study
3. Discuss Presentation and Literature Review Process
 - a. Reviewed how group thought presentations went in class
 - b. Discussed Literature Review from review with Dr. Martin
4. Started ASPEN Process

Sample of Homework Assessment for Group Project

The Purpose of group assessment is

- 1. To allow the students to judge themselves and how students are cooperating within each other and work as a team**
- 2. To motivate the students in working in a teamwork to meet the demand of industry standard to work in a team.**
- 3. This will enhance the students in how to interact and to be one of the team players in a group of professionals.**
- 4. The group project will enhance the students' social and behavioral well-being and enhance collaboration in the real-world environment.**
- 5. Strengthen their ability for understanding the global economy, locally and nation's issues that are facing every nation on the Earth.**

Assignment for Economy Class CHEG 2003 (Group Work)

Due Date is - April 12-2021

Direction for this assignment

This assignment is for group work and each group will be contained of 5 students. Form a group of 5 students between each other. Please give me the names of each group in the class or Send me email at: shshakir@pvamu.edu .

The assignment is:

During last few weeks of the class we discussed the issue of interest rate and the role of interest rate in the assessment of projects and selection of engineering projects using the PW, FW and AW, and Capital Recovery, ROR. Further we discussed the impacts of interest rate on the personal as individual, national economy, and global economy. In this regard, I will ask you to discuss the impacts of interest rate in depth with your group and write a report and the report must contain the 1) aim of this research project, 2) economic analysis of an example of a project that shows these impacts on individual, national and global and 3) what are the social impacts of the project. Please, include the cash flow diagram of your project. Please include the references that you read about the subject

The requirements are:

- 1) Discuss the issue of Interest Rate
- 2) Discuss the impact of interest rate on Individual or Personal, National Economy and Global Economy.
- 3) Give an example of Economic Analysis of a project and discuss the social impacts of the project.
- 4) Evaluate each other as a group in the page that attached to e-course separately.
- 5) At the end of the project add a one page and every one of you explains what he has done in the project in a single paragraph.
- 6) Submit the project as a group together and on the First Page add the following 1) Title of the Project, 2) Each person participated on the project, 3) date 4) Your Department.
- 7) Please Format the project for 1.15" Spacing and Fully Justified from both side by 1" top is 1", at the bottom is 1" and left side is 1" and right side is 1". Give me the project on the due date in the class. Use the evaluation sheet that I provide for everyone on e-course to evaluate each person in the group and give the evaluation sheet to me separately in my hand also in the due date in the class.

Students Groups are:

Group1

Summary Class List						
Record Number	Student Name	Reg Status	Level	Credits	Grade Detail	
1	Aaron, Taylor M.	Add Course	Undergraduate	3.000		
2	Abram, Karen B.	Add Course	Undergraduate	3.000		
3	Ballou, Jarrod D.	Add Course	Undergraduate	3.000		
4	Bloomingberg, Tonisha J.	Add Course	Undergraduate	3.000		
5	Busari, Derin M.	Add Course	Undergraduate	3.000		

Group2

Summary Class List						
Record Number	Student Name	Reg Status	Level	Credits	Grade Detail	
6	Conner, Willie	Add Course	Undergraduate	3.000		
7	Coulibaly-Diakite, Zenab P.	Add Course	Undergraduate	3.000		
8	Fontenot, Amani J.	Add Course	Undergraduate	3.000		
9	Garza, Jason A.	Add Course	Undergraduate	3.000		
10	Guerrero, Edward	Add Course	Undergraduate	3.000		

Group 3

Summary Class List					
Record Number	Student Name	Reg Status	Level	Credits	Grade Detail
11	Hajo, Omar J.	Add Course	Undergraduate	3.000	
12	Hall, Zhaniriua L.	Add Course	Undergraduate	3.000	
13	Herrera, Leonardo	Add Course	Undergraduate	3.000	
14	Hollies, L.C.	Add Course	Undergraduate	3.000	
15	Jama, Mohamed A.	Add Course	Undergraduate	3.000	

Group 4

Summary Class List					
Record Number	Student Name	Reg Status	Level	Credits	Grade Detail
16	Johnson, Trevor D.	Add Course	Undergraduate	3.000	
17	Lacy, Tempest A.	Add Course	Undergraduate	3.000	
18	Lee, Malaika A.	Add Course	Undergraduate	3.000	
19	Lira, Anette	Add Course	Undergraduate	3.000	
20	Luis, Cesar A.	Add Course	Undergraduate	3.000	

Group 5

Summary Class List

Record Number	Student Name	Reg Status	Level	Credits	Grade Detail	
21	Mcgregor, Dominique D.	Add Course	Undergraduate	3.000		
22	Morgan, Easton G.	Add Course	Undergraduate	3.000		
23	Oboye, Oluwadamilol O.	Add Course	Undergraduate	3.000		
24	Phillips, Ethan S.	Add Course	Undergraduate	3.000		
25	Rodgers, Hunter J.	Add Course	Undergraduate	3.000		

Group 6**Summary Class List**

Record Number	Student Name	Reg Status	Level	Credits	Grade Detail	
26	Saldivar, Jose	Add Course	Undergraduate	3.000		
27	Scull, Darian K.	Add Course	Undergraduate	3.000		
28	Smith, Kelby C.	Add Course	Undergraduate	3.000		
29	Taylor, Zachary K.	Add Course	Undergraduate	3.000		
30	Waters, Isaiah J.	Add Course	Undergraduate	3.000		

Above Average

Engineering Economics Project
Hajo, Omar (Civil Engineering)
Hall, Zhaniriua (Electrical Engineering)
Herrera, Leonardo (Mechanical Engineering)
Hollies, L.C (Mechanical Engineering)
Professor Shakir
CHEG 2003
18, April 2021

8/10

9/3

Abstract

Purpose of Report

1. Discuss the issue of Interest Rate
2. Discuss the impact of interest rate on individual or personal, national economy and global economy by giving an example of interest rates.
3. Give an example of economic analysis of a project and discuss the social impacts of the project

Method

In order to complete this research, we split the work among each group member.

Significant Findings

1. The impact interest rates have on the world at large is nothing miniscule.

Conclusions

1. The increase and decrease of interest rate plays a major role in people, businesses, and the world at large on a day to day basis.

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Chapter 1

Interest Rates

1.1 Issue of Interest Rates

In this course we discussed interest rates and their effects on society. An interest rate is a portion of a loan that is charged as interest to the borrower, typically a percentage of the borrowed loan. The interest rate will develop as soon as the loan amount is given. The main issues that affect interest rates are your credit score, credit history, employment type, income, and payment frequency. These interest rate issues can cause an economic recession to end. When the federal government lowers the federal funds rate, borrowing money becomes cheaper, therefore encouraging people to start spending money again.

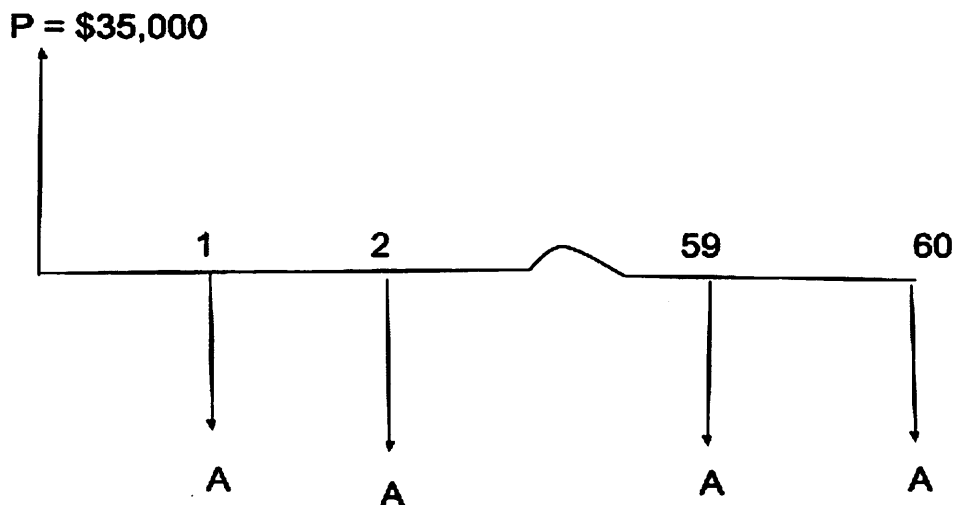
1.2 Impact of Interest Rates with Example

Many people may believe the impact of interest rate is minuscule, but in reality it could be very detrimental once you understand the essence of it. This passage will explain the impact it has on individuals, national economy, and global economy. Knowing where the change of interest rate comes from is important to get a proper understanding of how it causes a negative chain reaction. To start affecting people it begins with the federal reserve changing the percentage of interest people pay according to principal.com. The percentage of what an individual owes in interest affects us in ways some are not familiar with. In regards to an individual we all need necessities like cars, homes, furniture, and at a smaller scale we need cell phones. To make purchases like this initially each person has to pay the same price. The interest rate added to the initial value is what differs from person to person. What changes what I pay from what you pay is based on your credit score. Having a high credit score means the lender can trust that you have had experience with this type of situation before and you had no issues with missed payments or even paying it back in full. On the other side of the spectrum is having a low credit score which means you are not as responsible which means there's a risk of you not paying them back. When lenders see you have a poor credit score they increase the interest rate so they can assure they get their portion plus interest because there is a risk of them not being paid the full amount. Another reason why interest rate can impact an individual is because once they see the amount of APR (Annual percentage rate) the lender provides they stray away from pursuing the transaction. Not only does it affect someone directly but it affects the nation's economy at large. For the rate of interest to start affecting the nation's economy inflation and recession starts to play a huge role in this drastic change. The term inflation means the prices of goods and services increase as

time passes, which results in the economy showing a healthy status according to investopedia.com. A term that indicates interest rates increasing and decreasing is the federal funds rate. This term is when banks lend funds to one another, but the rate is inconsistent which causes a ripple effect to other lenders. It plays a role in trying to balance the percentage when interest rates rise more than 3% according to investopedia. The reason being is once interest rates start to increase the percentage of businesses and other major corporations borrowing money decreases. Once that happens inflation levels decrease drastically and results in a bad economy. As i was reading on investopedia they gave an example of when the economy dropped due to the inflation rate being 14%. This severe recession occurred in 1980-1981 when the federal reserve increased the interest rate to 19%. For the nation to actually be affected it takes an average of 12 months for them to see the change happen in their own lives rather than happening behind closed doors. While both an individual and nation gets affected by interest rates the world at large also gets a taste of this change. Being that the US is the world's largest economy according to investopedia this results in a ripple effect once America decides to increase their interest rate. Aftering reading the article Trevir Nath posted on investopedia there are valid points that make the ripple effect crystal clear. Interest rates coincide with the appreciation of currencies around the world. Major countries that are well developed look at America's currency to predict the status of our economic growth in the future. When America's currency holds a strong stance it sheds a positive light on the surrounding countries. This light can then be affected by a treasury bond. When the value of a treasury bond is increased or decreased this causes change in domestic countries interest rates. When interest rates spike, international investors put a yield to their money and can result in employment rates to drop drastically in our surrounding countries. The increase of America's interest rate causes the dollar to appreciate which tampers with the exchange rate and causes developing countries debts to reach an unmanageable amount. In conclusion, the increase and decrease of interest rate plays a major role in people, businesses, and the world at large on a day to day basis.

Example 1.1 Interest Rates

Suppose you want to buy a \$35,000 car and you would like to finance it over the span of 5 years. The bank offers you the loan at 6%. Another customer with a bad credit score wants to buy the same car but the bank offers them at a 15% interest rate. Compare the monthly payment and the total amount paid by the end of the 5 years.



$i = 6\%, 15\%$

$$A = P (A/P, i, n)$$

$$n = 60 \text{ months}$$

For $i = 6\%$

$$i = 6/12 = 0.5\%$$

$$A = \$35,000(A/P, 0.5\%, 60) = \$35,000(0.0193) = \$675.50/\text{month}$$

$$T \equiv \text{Total after 60 months} = \$675.50/\text{month}(60\text{month}) = \$40,530$$

For $i = 15\%$

$$i = 15/12 = 1.25\%$$

$$A = \$35,000(A/P, 1.25\%, 60) = \$35,000(0.0238) = \$833.00/\text{month}$$

$$T \equiv \text{Total after 60 months} = \$833.00/\text{month}(60\text{month}) = \$49,980$$

By comparing the two situations, we see that the 15% interest rate will have a difference of \$9,450 over the span of 5 years.

Chapter 2

Economic Analysis

2.1 Define and give examples of Economic Analysis

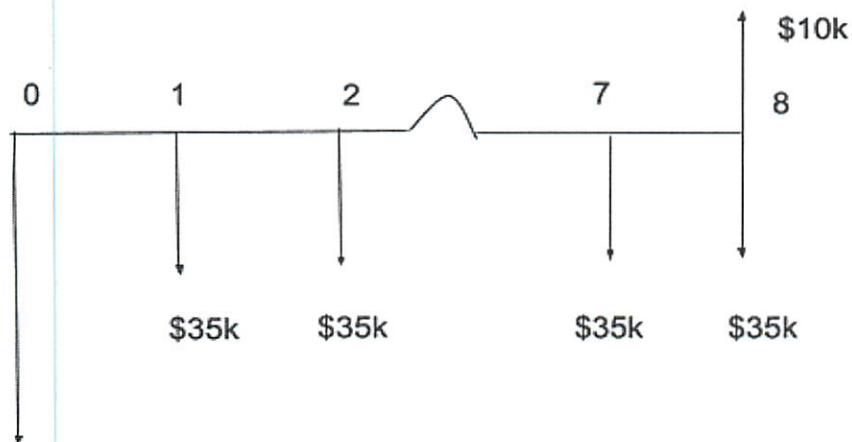
Economic analysis is the process of studying and evaluating economic systems. Its purpose is to produce a visual of how well or how poorly a project, company, or industry may be performing at a given time. There are two primary methods of conducting an analysis. The first of which is the cost/ benefit analysis. Where you directly compare the potential cost of something to its potential benefits. An example of this would be comparing the cost of hiring people to work in a manufacturing plant to the cost of automating the process by having robots do the job. The second of which is the cost/ effectiveness analysis. Where you directly compare the effectiveness of the project against the cost of the project. Staying with the example stated earlier. Here the cost of hiring people is still being compared to the cost of automating the process. However, you will also compare the effectiveness of both options to reach a final decision.

Example 2.1 Economic Analysis

A company in Texas would like to compare the cost of using machinery versus using labor as described in the table below. Assuming it takes 8 machines to replace 15 workers to produce at the same rate.

	Machinery	Labor
Quantity	8	15
Annual Salary	N/A	\$50000
Initial Cost	\$140,000	
Cost of Maintenance/Year	\$20,000	
Operating Cost	\$15,000	
Salvage value	\$10,000	
Life	8	

Use MARR value of 15%



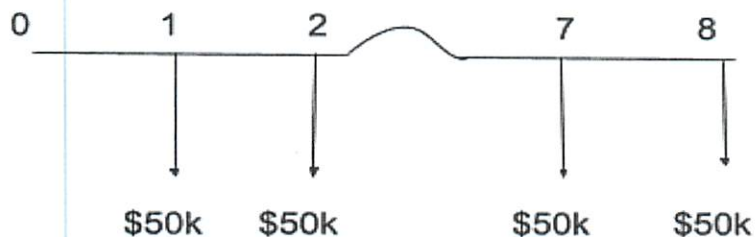
\$140k

Machinery

Total Cost per year/machine = \$20k + \$15k = \$35k

$PW = -\$140,000 - \$35,000(P/A, 15\%, 8) + \$10,000(P/F, 15\%, 8) = -\$293,776/\text{machine}$

$PW = -\$293,776/\text{machine}(8 \text{ machine}) = -\$2,350,208$



Labor

Total Labor Cost/worker = -\$50,000

$PW = -\$50,000(P/A, 15\%, 8) = -\$224,350/\text{worker}$

$PW = -\$224,350/\text{worker}(15 \text{ worker}) = -\$3,365,250$

2.2 Describe potential social impact of example given

The social impacts of the example given above illustrates the issue of people losing jobs if the company or industry chooses to automate its operation. Over the years we have seen thousands of jobs that were once being done by people in factories are now being done by machines.



Chapter 3

Contributions of the Group

3.1 Contributions of each Group Member

Leonardo Herrera - Made and solved both examples as shown in Section 1.2 and Section 2.1, showing the process with cash flow diagrams. Formatted the report including the Chapters, Table of Contents, List of Examples, and the Abstract.

Omar Hajo - My contribution to this project was to research and answer question 2. I provided a detailed passage and I did some minor editing to how the document looks.

Zhaniriua Hall - In this project, I contributed by researching and explaining the issues of interest rates as well as basic information about what an interest rate is. I also formatted the name page.

Lc Hollies - I contributed to the project by providing the reference and defining economic analysis in chapter 2 and explaining the potential social Impacts of the of the given example of the chapter.

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Average

Section 1

CHEG 2003 Group Project

Jose Saldivar, Darien Scull, Kelby Smith, Zachary Taylor, Isaiah Waters

7/10

April 8, 2021

Department of Chemical/Mechanical Engineering

When are different Entalpy Rates
applied to
and applying in the
examples

Aim of this Research Project

The aim of this project is to determine the impacts of interest rates on different parties (individual, national, global) and analyze them on a particular economic project.

Issues of interest rate

To understand the issue of interest rate, first you must know what interest rate is. Interest rate is the amount a banker charges for the usage of their resources. Interest rates are mostly applied lending and borrowing transactions. An example of interest rate is when a person takes out a loan for a set amount of money. In the loan agreement there will be an interest rate on the loan about 15 percent so you would have to pay back initial amount you borrowed and 15 percent of that. Some issues that come with interest rates are that as interest rates increase, the cost of borrowing becomes more expensive. Therefore, demand for lower-yield bonds will drop, causing their price to do the same. As interest rates decrease, it becomes easier to borrow money. As a result, many companies will issue new bonds to finance expansion. Negative interest rates have resulted in a direct decline in interest margins, and consequently, a decrease in profitability. Competition between the banks and the option for clients to hold liquidity in cash do not allow for the negative interest rates to be passed on to individual clients.

Effects of Interest Rates on Individuals

The Fed affects credit card rates

Most credit cards have variable interest rates, and they're tied to the prime rate or the rate that banks charge to their preferred customers with good credit. But the prime rate is based on the Fed's essential benchmark policy tool: the federal funds rate. In other words, when the Fed lowers or raises its benchmark interest rate, the prime rate typically falls or rises with it. But credit card borrowers will be hard-pressed to find an interest rate that's that low. In reality, credit card rates are much higher because companies charge the prime rate plus another margin that they determine themselves. Still, the average APR on variable credit cards has been on the decline. As of October, the average credit card APR 16.02 percent, according to Bankrate data (Toussaint, 2020).

The Fed affects savings and CD rates

If you are a saver, you'll likely have the opposite reaction of a credit card borrower. Savers benefit from rate hikes and take a hit when the Fed decides to cut them. That's because banks typically choose to lower the annual percentage yields (APYs) that they offer on their consumer products — such as savings accounts — when the Fed cuts interest rates (Toussaint, 2020).

Yields on certificates of deposit (CD) generally fall when the Fed cuts rates as well, but broader macroeconomic conditions also influence them, such as the 10-year Treasury yield. Yields have been on the decline at top-yielding institutions since the Fed's two emergency cuts. However, you can still find CDs and savings accounts offering yields well above the national average. With CDs, individuals should focus on the inflation-adjusted return rate, says Casey Mervine, vice president and a senior financial consultant at Charles Schwab. In the late 1970s, for instance, yields on CDs were in the double digits; however, inflation was also. That means consumers' actual earnings were much lower due to the erosion of their purchasing power.

Effects of Interest Rates on National Economy

When it comes to high interest rate dealing with National Economy, it has many ways it can be affected by it for example with interesting rate increasing it would cause an increase on cost of borrowing. Essentially, people are having to spend even more towards loans and credit card payments. With the interest rate continuing to rise, people are left with less disposable income for themselves, especially those who have taken on loan debt. This will eventually lead other areas of consumptions to fall as well for unemployment increasing, currency will appreciate by making exports less competitive with imports becoming cheaper.

As a result of higher interest rates, it will then begin to reduce the consumer spending and investments to be fall into Aggregate Demands (AD). If the Aggregate Demand were to get any lower it would lead to lower the economic growth negatively and will lead an increase to unemployment causing people to lose their jobs or their other sources of income and if this had

happened, firms would be left to produce fewer goods and will be demanding few workers with this situation.

With the effects of higher interest rates occurring, not all consumers be affected the same way. The ones that have a much higher mortgage would be most affected, an example by reducing inflation may be required for interest rates rising to a certain level that could form a hardship to the ones with a larger mortgage. But this however is different for those who have a savings if anything those people are better off since it also makes the monetary policy less effective as a Macro economic tool for the economy.

From the last decades now, we all have faced and lived with an entire generation who have essentially been a positive factor towards the economy and others have also lived in a period with very low and to almost nothing on interest rates. Even our older generation have suffered under what is called a double-digit interest rates around the 1970's and 80's and end up having it to grown accustomed to the low-rate environments that had happened for almost three whole decades being declined of interest rates.

Effects of Interest Rates on Global Economy

Interest rates are just the expense of utilizing another person's cash. Since national banks print cash, they can impact these rates by expanding or diminishing the sum that they charge different banks to get to cash. These progressions have gradually expanding influences across the whole economy as these greater expenses are given to organizations and afterward buyers.

Central banks can use said interest rates in order to control the economy in one of two ways, being: raising the rates (making money more expensive, shrinking the money supply, and encourages saving) and lowering the rates (makes money less expensive to borrow, expands money supply, and encourages consumers to spend money).

Financing costs fundamentally influence value costs through their impact over business and customer conduct. Raising financing costs urges organizations and customers to get less and spend less, which prompts less income and overall gain. Lower income and net gain lead to bring

down stock costs and conceivably lower value profit products. The inverse is genuine when loan fees are brought down, spending increments, and monetary execution improves.

Rising interest rates mean that a company's stock is not as valuable today, which would theoretically reduce the equity's valuation and the market price at the time of the interest rate hike.

Some sectors may benefit from higher interest rates and others suffer more than others. For example, the financial industry tends to receive a boost because they can charge more for lending money. Higher interest rates lead to an increase in mortgage rates and a potentially higher net interest margin for banks. But manufacturing companies may suffer as higher interest rates tend to lead to a stronger U.S. dollar and less competitive global prices.

Superpowers such as the United States, China, and Russia have huge influences on the global economy as the interest rates set in these countries tend to set a global standard as to what the current value of the dollar will be. Two good examples for this would be firstly, following World War II, the United States experienced very low interest rates which caused other countries to want to invest in the U.S., causing a "boom" in the economy on a global scale. On the other side, when the U.S. experienced an economic recession in 2008 due to rising interest rates, the global economy suffered as well due to a lot of money being previously invested into our economy.

Economic Analysis of a Project

Calculation of Present Worth

Consider the following project: an engineering firm is debating between using three different energy sources to power their plant. These power supply choices are electric, gas, and solar power. Their options include one that is more environmentally friendly than the others, which is solar power. Each of these comes with their own economic alternatives in which the company needs to decide the cheapest outcome. In this example, we will analyze the present worth of each project by examining the first cost, annual operating cost, and salvage value for a total period of 10 years. The specifics are in the table below.

	Electric Power	Gas Power	Solar Power
First Cost	-\$3000	-\$4500	-\$7000
Annual Operating Cost	-\$600	-\$400	-\$50
Salvage Value	+\$300	+\$450	+\$100
Life (years)	10	10	10

From this table, we can calculate the present worth of each alternative to determine the best option for the engineering firm, regarding expenses. We will assume a 10% interest per year. Below represents a cash flow table for each alternative.

Electric Power Cash Flow				
Year	First Cost	A.O.C.	Salvage	Cash Flow
0	-3000			-3000
1		-600		-3600
2		-600		-4200
3		-600		-4800
4		-600		-5400
5		-600		-6000
6		-600		-6600
7		-600		-7200
8		-600		-7800
9		-600		-8400
10		-600	300	-8700

Gas Power Cash Flow				
Year	First Cost	A.O.C.	Salvage	Cash Flow
0	-4500			-4500
1		-400		-4900
2		-400		-5300
3		-400		-5700
4		-400		-6100
5		-400		-6500
6		-400		-6900
7		-400		-7300
8		-400		-7700
9		-400		-8100
10		-400	450	-8050

Solar Power Cash Flow				
Year	First Cost	A.O.C.	Salvage	Cash Flow
0	-7000			-7000
1		-50		-7050
2		-50		-7100
3		-50		-7150
4		-50		-7200
5		-50		-7250
6		-50		-7300
7		-50		-7350
8		-50		-7400
9		-50		-7450
10		-50	100	-7400

Here are the present worth calculations for each alternative.

$$PW_{Elec.} = -3000 - 600(P/A, 10\%, 10) + 300(P/F, 10\%, 10) = -\$6,571.35$$

$$PW_{Gas} = -4500 - 400(P/A, 10\%, 10) + 450(P/F, 10\%, 10) = -\$6,784.53$$

$$PW_{Solar} = -7000 - 50(P/A, 10\%, 10) + 100(P/F, 10\%, 10) = -\$7,268.70$$

As you can see, the electric power option is the cheapest in which it has the minimum present worth cost.

Effects on Outside Factors

Previously in this report, we discussed examples regarding issues and impacts of interest rates on different parties and affairs. Now we will relate those to the hypothetical project.

As mentioned before, the best monetary option for this project is to choose the electric power system. However, the best environmental option would be to choose the solar power system. By neglecting the cheapest option and spending around \$700 more, the company can build more trust in the society by showing that they are willing to consider the environment. Socially speaking, people like to know about the good a company is contributing to be able to work with and trust them. Solar energy is relevant and readily accessible, so not implementing it

due to expense may be looked upon as short minded. A company can always make more money; therefore, people want to see the greater good being done in the businesses that have the power to do so.

Let's say the company chooses the solar power: when the engineering firm makes such a social impact on its community, it may inspire other businesses to do the same, consequently making them less reliant on utility companies to provide the useable energy. This can yield an impact on the national and global economy in which jobs in the utility area decrease in the United States, and potentially worldwide. As long as interest rates are reasonably low (how they are in the scenario), businesses can take this approach. Of course, this means that many individuals in the utility field can lose their practices/jobs as a result of low interest rates on power production. In order to keep this from happening, suppliers may increase the interest from 10 percent to make solar energy less feasible. Also of note, increased use of solar energy can create more jobs pertaining to solar power production. Therefore, when considering both outcomes there is a possibility of a net increase in jobs so long as the solar opportunities outweigh the loss of utility careers. Ultimately, whether the company chooses the electric or solar power, there are effects on the economy and the environment.

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Team Responsibilities

Jose Saldivar- Discuss the effect of interest rates on national economy

Darien Scull- Discuss the impact of interest rates on global economy

Kelby Smith- Discuss the issue of interest rate

Zachary Taylor- Discuss the impact of interest rates on individuals

Isaiah Waters- Analyze overall economic impacts of hypothetical project (social, individual, etc.)

Section 1

Engineering Economics Analysis

Project: Home Ownership

April 10, 2021

Malaika Lee (Mechanical Engineering)

Trevor Johnson (Electrical Engineering)

Cesar Luis (Mechanical Engineering)

Tempest Lacy (Computer Engineering)

Anette Lira (Mechanical Engineering)

6/10

Interest Rate

An interest rate can be defined as the amount a lender bills a borrower overtime in return of a given loan. This set amount is usually expressed as a percentage of the principal amount given and is also known to be calculated in annual terms. Interest rates can be applied as either a fixed or variable interest rate. A fixed interest rate is an “unchanging rate charged on a liability such as a loan or mortgage (Chen, 2021),” the rate remains the same throughout the entire set period of time. Contrary, a variable interest rate, also known as a floating rate, is a rate that constantly fluctuates overtime. It changes periodically due to an underlying benchmark or index that also changes occasionally (Heakal, 2020).

Interest rate levels are essentially a factor of the supply and demand of credit. Meaning, the increase in the demand of credit will result in an increase in interest rates; whereas, the decrease of the demand for credit will decrease interest rates. While on the other hand, an increase in the supply of credit will decrease the interest rate and a decrease will in return increase the interest rate. Overall, Interest rates play a vital role in the American economy; they essentially encourage individuals to borrow, lend, and spend; which in return stimulates the economy (Heakal, 2020).

The Impact

- Personal

Millions of Americans are affected by interest rates when it comes to essentials like home mortgage or car notes. Even student loan payments or other educational endeavors can make life more challenging whether you obtain the degree or not. Additionally, when interest rates rise, banking institutions increase the rates associated with loans and credit cards. Because the bank is paying more to borrow money, they pass this increase on to the consumer. This negatively impacts the consumer, especially those with low to average credit scores, in that the rising rates make it more difficult for the consumer to pay down debt (Peacock, 2019). With less money to live on due to an increase in interest rates, the consumer may have to scramble to pay their bills putting them in a financially awkward situation.

- **National**

On the other side of the spectrum, lower interest rates mean that people are more willing to borrow money to make big purchases, such as houses or cars. When consumers pay less in interest, this gives them more money to spend, which can create a ripple effect of increased spending throughout the economy (Seabury, 2020). Higher interest rates in a country increase the value of that country's currency relative to nations offering lower interest rates. Typically, higher interest rates increase the value of a country's currency and tend to attract foreign investment, increasing the demand for and value of the home country's currency. Contrarily, lower interest rates tend to be unattractive for foreign investment and decrease the currency's relative value (Lioudus, 2019).

- **Global**

Despite the ways in which the United States' interest rates negatively impact the global economy, rising interest rates do benefit foreign trade. The stronger dollar that will accompany the rate increase should boost US demand for products around the world, increasing corporate profits for domestic and foreign companies alike. The resulting profit spikes will lead to stock market rallies because fluctuations in the stock market reflect beliefs about whether industries grow or contract (Nath, 2019).

Engineering decision making process

1. **Recognize the problem-** One of the problems of owning a house can be a sufficient down payment. Make sure you have enough liquid capital saved up to put down on your new home. Also payment of interests.
2. **Define the goal or objective-** find the price under the market average price .
3. **Assemble relevant data-** Project data included
4. **Identify feasible alternatives-** pay cash and get a loan from the bank

5. **Select the criterion to determine the best alternative-** price range , house style , distribution of house (for example, 3 beds and 2 restrooms) and lot size.
6. **Construct a model:** Pictures included
7. **Predict each alternative's outcomes** - paying cash would affect your budget , that would bring financially unstable status. Paying loans would make the short term payment cheaper but with time and the interest in the long term its expensier.
8. **Choose the best alternative-** The best alternative is to pay out of loans since most people cannot afford to pay out of pocket. Taking out a loan makes it easier to afford in the short term so you can work to pay off over time rather than having to spend all of your money at once.
9. **Audit the result-** all data compiled supported the project as a go.

Years (Beginning year 2021)	Cost	Balance
0-10 (2021-2031)	\$300,000	\$222,453.59
10-20 (2031-2041)		\$123,422.21
20-30 (2041-2051)		\$0

$$M = P[r(1+r)^n / ((1+r)^n - 1)]$$

M = the total monthly mortgage payment

P = the principal loan amount—> \$300,000

r = your monthly interest rate—> 3% or .03

n = number of payments over the loan's lifetime. For example, a 30-year fixed mortgage would have 360 payments ($30 \times 12 = 360$).

$$M = 300,000(.03(1+.03)^n)$$

*How many
calculations?*

Economic Analysis of a Project

An industry has sub-parts. For example, if you look at the chemical industry, you will find sub-industries like Fertilizers, Pesticides, Paints etc. so, it is important to focus on the relevant industry. Without this, it will be impossible to draw an accurate industry analysis report. So, take up an industry and find out the sub-industries. Select the one which suits the company's purpose. This is one example of economic analysis. Social impacts of project: (1) economic impact, (2) cultural impact and (3) environmental impact. These are different types of social impact of economic analysis of a project. Economic analysis has to be done keeping in mind what impact it would have on the society, nature and economy of the country.

*What are these impacts?
Where are different interests
used and applications
on the loan program?*

Works Cited

Chen, James. "Inside the Variable Interest Rate." *Investopedia*, Investopedia, 9 Apr. 2021, www.investopedia.com/terms/v/variableinterestrate.asp.

Heakal, Reem. "What Are the Forces Behind Interest Rates and What Causes Them to Rise?" *Investopedia*, Investopedia, 28 Aug. 2020, www.investopedia.com/insights/forces-behind-interest-rates/.

Peacock, Alexis. "How Do Interest Rates Affect Your Finances?" *Lexington Law*, 10 Dec. 2019, www.lexingtonlaw.com/blog/finance/how-do-interest-rates-affect-your-finances.html.

Nath, Trevir. "How US Interest Rates Move the World Economy." *Investopedia*, Investopedia, 28 Aug. 2020, www.investopedia.com/articles/investing/092415/how-us-interest-rates-move-world-economy.asp#:~:text=Despite%20the%20ways%20in%20which,domestic%20and%20foreign%20companies%20alike.

Malaika lee

In the group project I created the groups groupme as a way of communicating. I researched and discussed interest rates as stated in bullet number one of the project. I set up and formatted the document and shared it to my group members so that we can each work on the same report remotely.

Trevor Johnson

In this project, I studied the effects of interest rates on the Personal, National, and Global economy. Using my resources, I was able to accurately describe the impact of interest rates on our modern world. In my paragraphs, I broke down the different positive and negative effects of raising and lowering interest rates and gave clear examples of how it impacts our lives.

Tempest Lacy

Above, I have studied the distribution of scarce resources. The economic analyses provided insight on how the market works and showed methods on how to predict the future market behavior in response to events, trends and cycles.

Anette Lira

In this project I mainly focused on the engineering making process and research for the best alternative and the outcome that these have. Based on this process we were able to make a decision that can produce the better impact in the future for our house ownership.

Cesar Luis

In this project I was able to conduct calculations of a mortgage during a period of 30 years which is also 360 monthly payments. During this period of time i was able to see how much money was going to the principal and how much money was just interest by calculating a 5 % interest rate.

Our group was able to discover that you could also give a higher payment each month in order to pay a little more money to the principal amount of \$300,000.

Below Average

Section 1

Eco Project

Dominique McGregor
Easton Morgan
Oluwadamilola Oboye
Ethan Phillips
Hunter Rodgers

is this person
worked with you or

4/10

04/12/2021

CHEG 2003

- 1) Interest rate is the percentage principle charged by a lender for the use of its money. The Federal Reserve manages interest rates to achieve ideal economic growth. Interest rates can change the prices of bonds. A bond is a certificate issued by the government or a public company promising to repay the money that was borrowed at a fixed rate of interest at a specified time. Altogether interest rates affect how you spend money. When the interest rates are high bank loans cost more, therefore people and businesses borrow less money. When demands fall companies sell less. When the rates are low, people and businesses borrow more which boost economic growth, but too low interest rates can cause inflation. The Federal Reserve manages the inflation and recession by controlling the interest rates.
- 2) This is for the individual and personal level as the cost of borrowing money will increase in line with the rise of interest rates means it is best to keep disposable spending in safe keeps or saved because while with rising interest rates the more expensive living can be, which can cause a slight halt in domestic spending so rising interest rates can heavily reduces customer spending in that area. As for a national level the state of America interest rates as it rises will cause borrowers to think twice in borrowing money as expenses become more expensive during high interest rates moment. Most have to move smart and think twice before borrowing money for any reason as the interest behind that money will most likely be hard to pay off but the opposite occurs in low interest rates. The lower the interest rates the more willing people are to borrow money to make a bigger purchase to take a bigger risk such as houses and cars for example. when a consumer spends they pay less in interest when interest rates are low. That make our businesses and small business ready to take advantage.
On a more heavier scale interest rates are the perfect reason why money moves .
Worldwide America is the largest economy so if the interest rates in America
move any certain way it will cause a ripple effect to the rest of the world. As we know historically rising interest rates have moved in combinations of and

appreciating dollar this will affect economy around the world and domestically in our own state in the sections of national personal and individual levels

3)

what is this

where are the examples
Using Interest Rates!

**SENIOR DESIGN AND PROFESSIONALISM I
FALL 2021**

HOMEWORK 4

TOPICS COVERED IN HOMEWORK 4

1. Ethics

CHEG 4472-P02: SENIOR DESIGN & PROFESSIONALISM I

FALL 2019

ASSIGNMENT STATEMENT/QUESTIONS

Senior Design & Professionalism I (Fall 2019): Home Work 4 Due: November 7, 2019

You will be graded based on your understanding of professional and ethical responsibilities as they relate to your project. Clarity of presentation is essential if you are to avoid losing points.

- 1. Write a 2-page synopsis comparing the National Council of Examiners for Engineering and Surveying (NCEES) code of professional conduct with the American Institute of Chemical Engineers (AIChE) and National Society of Professional Engineers (NSPE) code of ethics.**
- 2. Using the NSPE Code of Ethics, analyze the following case study. For the case study, justify your opinions by quoting relevant sections of the NSPE Code of Ethics that supports the opinion you make and why the opposite opinion may not be right.**

Case Study

Fact pattern:

Engineer A is a principal in a medium-sized engineering firm with expertise in mechanical and electrical engineering. Engineer A's firm is retained on a speculative basis by Engineer B, a local civil engineer, to assist City X in applying for a federal grant for certain wastewater treatment equipment upgrades for the city's wastewater treatment facility. The application is successful, City X obtains the grant, and Engineer B is retained to design the waste water equipment upgrades. In recognition of Engineer A's work in securing the grant, Engineer C, the chief city engineer, verbally promises to select Engineer A's firm on a future engineering project for City X.

Question: Was it ethical for Engineer C to offer to select Engineer A's firm on a future engineering project for City X?

CHEMICAL ENGINEERING DEPARTMENT
SENIOR DESIGN & PROFESSIONALISM I CHEG 4472
GRADING SCHEME AND OUTCOME ASSESSMENT SHEET FOR FALL 2019

ABET OUTCOME 4: 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

Assignments that test competency in this area will include problems that test the student knowledge in the Professional Code of Ethics, ability to apply relevant aspects of the professional code of ethics when considering alternative decisions or solutions, ability to ethically evaluate the short and long term impact of engineering solutions on community and environment.

Name: _____

Title of Assignment: _____

Competency Area	Max for this Assignment	Your Score
4.1 An understanding of professional and ethical responsibility <i>This assignment tests the student knowledge in the Professional Code of Ethics, and ability to apply relevant aspects of the professional code of ethics when considering alternative decisions or solutions.</i>	100	
TOTAL	100	

ABOVE AVERAGE

CHEG 4247-P01: SENIOR DESIGN & PROFESSIONALISM I FALL 2021

ASSIGNMENT STATEMENT/QUESTIONS

Senior Design & Professionalism I (Fall 2021): Home Work 4 Due: November 16, 2021

You will be graded based on your understanding of professional and ethical responsibilities as they relate to your project. Clarity of presentation is essential if you are to avoid losing points.

- 1. Write a 2-page synopsis comparing the National Council of Examiners for Engineering and Surveying (NCEES) code of professional conduct with the American Institute of Chemical Engineers (AIChE) and National Society of Professional Engineers (NSPE) code of ethics.**
- 2. Using the NSPE Code of Ethics, analyze the following case study. For the case study, justify your opinions by quoting relevant sections of the NSPE Code of Ethics that supports the opinion you make and why the opposite opinion may not be right.**

Case Study

Facts:

Engineer A is a principal in a medium-sized engineering firm with expertise in mechanical and electrical engineering. Engineer A's firm is retained on a speculative basis by Engineer B, a local civil engineer, to assist City X in applying for a federal grant for certain wastewater treatment equipment upgrades for the city's wastewater treatment facility. The application is successful, City X obtains the grant, and Engineer B is retained to design the waste water equipment upgrades. In recognition of Engineer A's work in securing the grant, Engineer C, the chief city engineer, verbally promises to select Engineer A's firm on a future engineering project for City X.

Question:

Was it ethical for Engineer C to offer to select Engineer A's firm on a future engineering project for City X?

1. Codes of Conduct Synopsis

The National Council of Examiners for Engineering and Surveying, or NCEES, has a code of professional conduct Which was revised in September 2021. The preamble states that these rules protect the health, safety, and wellbeing of the public in engineering professions. These rules shall be followed by every licensee and firm that is able to perform engineering or surveying services. This section contained three sections the first being Licensee's Obligation to the Public, next Licensee's Obligation to Employer and Clients, and last Licensee's Obligation to Other Licensee's.

The AIChE, the American Institute of Chemical Engineers, adopted a code of ethics that contained eleven rules its members must follow to achieve their goals. This code of conduct was approved by the board in November 2015. Their intro states that All members of the shall uphold integrity, honor, and dignity of the engineering profession. It then goes on the explain how the rules should be upheld by actions such as using their knowledge and skill for the enhancement of human welfare.

The NSPE, National Society of Professional Engineers, stated that their code of ethics. The Ethical review background states their standards were first drafted at the end of the nineteenth century. The current code of ethics was adopted in 1964 and has been revised to fit today's standards. It then goes on to the introduction, or preamble of the current code of ethics. This addresses member of the engineering profession. It states that engineering had a direct vital impact on the quality of life for all people, then states the standards an engineer shall act accordingly. This set of codes, like the NCEES, separated its code into three sections. The three sections were Fundamental Canons, which were some of the originals created in 1964, Rules of practice, and professional obligations.

The NCEES, AIChE, and the NSPE all start with the same rule, that being an engineer's responsibility for the protection of the public safety, health, and welfare when performing. Other regulations are written in these codes that they all share are:

- It is an engineer's responsibility to inform and advise their employer if they believe that their duties could possibly endanger the health, welfare, or safety of the public in the present or future.
- Only perform services that they are authorized to do. To give colleagues and coworkers credit for the engineering work they have done and recognize their interests, capabilities, and contributions.
- Always act in a professional matter for every employer, client, or contractor.
- Accept responsibility for professional activities, and seek and heed reviews of their work and offer objective criticism to others.

Along with those stated above, the codes of conduct for each of these organizations are similar in essence. They express ethical values that engineers should uphold. The professional codes of conduct not only help protect the public and the reputation of the profession but also help engineers avoid legal consequences. Following the codes lays the foundation for a minimal consequence in many situations that an engineer may face and allow him/her/them to obtain and build a positive reputation in the profession.

How are the codes different?

2. Ethics Case Study

It was not ethical for engineer C to offer to select Engineer A's firm on a future project for City X according to the NSPE Code of Ethics. Engineer A has expertise in mechanical and electrical engineering. According to NSPE Code of Ethics section 2, rule 2, part a, "Engineers shall undertake assignments only when qualified by education or experience in the specific technical fields involved." Engineer A is not qualified by education or experience to choose necessary treatment equipment. A better source would be An engineer with expertise in chemical engineering.

Reason 2 that the case study is not ethical is Engineer C verbally promised to select Engineer A's firm on a future engineering project for City X. According to NSPE Code of Ethics section 2, rule 5, part b, "Engineers shall not offer, give, solicit, or receive, either directly or indirectly, any contribution to influence the award of a contract by public authority, or which may be reasonably construed by the public as having the effect or intent of influencing the awarding of a contract. They shall not offer any gift or other valuable consideration to secure work. They shall not pay a commission, percentage, or brokerage fee to secure work, except to a bona fide employee or bona fide established commercial or marketing agencies retained by them." The correct way to choose an engineer for a project would be going through a bidding process. Each engineering firm would give estimates and plans for how they will carry out the project and the firm that best serves the project should be chosen.

Reason 3 that the case study is not ethical is because Engineer A's firm is retained on a speculative basis by Engineer B. Engineer B was chosen with no proof of work or reputability.

CHEMICAL ENGINEERING DEPARTMENT
SENIOR DESIGN & PROFESSIONALISM I CHEG 4247
GRADING SCHEME AND OUTCOME ASSESSMENT SHEET FOR FALL
2021

ABET OUTCOME 4: 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

Assignments that test competency in this area will include problems that test the student knowledge in the Professional Code of Ethics, ability to apply relevant aspects of the professional code of ethics when considering alternative decisions or solutions, ability to ethically evaluate the short and long term impact of engineering solutions on community and environment.

Name: _Shumpert Kirksey, Meredith Meyer, Cherish Vaughn, Garred Essissima

Title of Assignment: _Homework #4: Ethics and Professionalism

Due Date: November 16, 2021

Competency Area	Max for this Assignment	Your Score
4.1 An understanding of professional and ethical responsibility <i>This assignment tests the student knowledge in the Professional Code of Ethics, and ability to apply relevant aspects of the professional code of ethics when considering alternative decisions or solutions.</i>	100	
TOTAL	100	93

AVERAGE

CHEG 4247-P01: SENIOR DESIGN & PROFESSIONALISM I

FALL 2021

ASSIGNMENT STATEMENT/QUESTIONS

Senior Design & Professionalism I (Fall 2021): Home Work 4 Due: November 16, 2021

You will be graded based on your understanding of professional and ethical responsibilities as they relate to your project. Clarity of presentation is essential if you are to avoid losing points.

1. Write a 2-page synopsis comparing the National Council of Examiners for Engineering and Surveying (NCEES) code of professional conduct with the American Institute of Chemical Engineers (AIChE) and National Society of Professional Engineers (NSPE) code of ethics.
2. Using the NSPE Code of Ethics, analyze the following case study. For the case study, justify your opinions by quoting relevant sections of the NSPE Code of Ethics that supports the opinion you make and why the opposite opinion may not be right.

Case Study

Facts:

Engineer A is a principal in a medium-sized engineering firm with expertise in mechanical and electrical engineering. Engineer A's firm is retained on a speculative basis by Engineer B, a local civil engineer, to assist City X in applying for a federal grant for certain wastewater treatment equipment upgrades for the city's wastewater treatment facility. The application is successful, City X obtains the grant, and Engineer B is retained to design the waste water equipment upgrades. In recognition of Engineer A's work in securing the grant, Engineer C, the chief city engineer, verbally promises to select Engineer A's firm on a future engineering project for City X.

Question:

Was it ethical for Engineer C to offer to select Engineer A's firm on a future engineering project for City X?

CHEMICAL ENGINEERING DEPARTMENT
SENIOR DESIGN & PROFESSIONALISM I CHEG 4247
GRADING SCHEME AND OUTCOME ASSESSMENT SHEET FOR FALL 2021

ABET OUTCOME 4: 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

Assignments that test competency in this area will include problems that test the student knowledge in the Professional Code of Ethics, ability to apply relevant aspects of the professional code of ethics when considering alternative decisions or solutions, ability to ethically evaluate the short and long term impact of engineering solutions on community and environment.

Name: __Tyecia Franklin, Taylor Linton, Wasil Mahmood, Franck Nangomoko_____

Title of Assignment: _____

Due Date: November 16, 2021

Competency Area	Max for this Assignment	Your Score
4.1 An understanding of professional and ethical responsibility <i>This assignment tests the student knowledge in the Professional Code of Ethics, and ability to apply relevant aspects of the professional code of ethics when considering alternative decisions or solutions.</i>	100	
TOTAL	100	85

The AIChE code of ethics seems to be targeting the important aspects of developing your character as a chemical engineer. In the beginning of this document, the organization starts with stating that they "...shall uphold and advance the integrity, honor and dignity of the engineering profession..." which proves that they do not just want the ethics to be performed as if someone is just going with the flow. AIChE's code of ethics is based on personal development and safety of oneself and others. Although this code of conduct provides numerous ethics to follow as a chemical engineer, yet it does not thoroughly explain each point. Not being specific can lead to miscommunication between the employers and employees within the work environment.

Unlike the previous code of ethics for engineers, the National Society of Professional Engineers (NSPE) has written out the details about each ethic that should be performed. This code of ethics breaks down each section by the fundamental canons, rule of practices, and professional obligations. Beneath each ethical statement are at least two additional statements that are similar to the rule of practice or professional obligations. For example, the statement "2. Engineers shall perform services only in the areas of their competence" is a common ethics that organizations imply. In the NSPE code of ethics it provides additional ethical behaviors that pertain to the subject such as, "a. Engineers shall undertake assignments only when qualified by education or experience in the specific technical fields involved." Along with statement a, are two other ethical behaviors that carry on the behaviors of the second rule of practice.

The NCEES code stands for the National Council of Examiners for Engineering and Surveying. The purpose of the code is to convey the rules of professional conduct. These specific rules apply to all that hold a certificate of licensure to perform engineering services.

These rules are put in place to protect life, health, and property. It is imperative for licensees to adhere to the regulations and meet the standards of moral and ethical conduct. The NCEES is comprised of three sections, those sections are as follows: Licensee's obligation to society, Licensee's obligation to employer and clients and the Licensee's obligation to other licensees. Section one describes licensees' performance standards as it pertains to their community and all of society. They are obligated to hold themselves accountable for producing quality work that includes safety considerations. Section two involves the licensees quality of work that they provide to clients and employers. Section three describes licensees obligation to complete their own work honestly and provide other credit when it is necessary.

Overall, the code of conduct for AIChE, NSPE, and NCEES are all upholding their members to a high standard. Each of the above codes is unique to the specific group of people that it addresses. As stated the AIChE code of ethics specifically targets chemical engineers. The NSPE code of ethics targets all engineers. While the NCEES code of ethics can apply to anyone that holds a certificate of licensure to perform acts of engineering.

Very good!

Case Study

After taking an honest review of the case study, we concluded that it was unethical for Engineer C to select engineer A's firm on a future engineering project for city X. So, according to NSPE section (II.5.b), "engineers shall not offer, give, solicit, or receive, either directly or indirectly, any contribution to influence the award of a contract by public authority, or which may be reasonably construed by the public as having the effect or intent of influencing the awarding of a contract..." based on this, we can say that it will be unfair to other companies that are not only qualify but also supersede the requirements to receive the contract being offer to Engineer A's firm.

other actions?

BELOW AVERAGE

CHEG 4247-P01: SENIOR DESIGN & PROFESSIONALISM I

FALL 2021

ASSIGNMENT STATEMENT/QUESTIONS

Senior Design & Professionalism I (Fall 2021): Home Work 4 Due: November 16, 2021

You will be graded based on your understanding of professional and ethical responsibilities as they relate to your project. Clarity of presentation is essential if you are to avoid losing points.

- 1. Write a 2-page synopsis comparing the National Council of Examiners for Engineering and Surveying (NCEES) code of professional conduct with the American Institute of Chemical Engineers (AIChE) and National Society of Professional Engineers (NSPE) code of ethics.**
- 2. Using the NSPE Code of Ethics, analyze the following case study. For the case study, justify your opinions by quoting relevant sections of the NSPE Code of Ethics that supports the opinion you make and why the opposite opinion may not be right.**

Case Study

Facts:

Engineer A is a principal in a medium-sized engineering firm with expertise in mechanical and electrical engineering. Engineer A's firm is retained on a speculative basis by Engineer B, a local civil engineer, to assist City X in applying for a federal grant for certain wastewater treatment equipment upgrades for the city's wastewater treatment facility. The application is successful, City X obtains the grant, and Engineer B is retained to design the waste water equipment upgrades. In recognition of Engineer A's work in securing the grant, Engineer C, the chief city engineer, verbally promises to select Engineer A's firm on a future engineering project for City X.

Question:

Was it ethical for Engineer C to offer to select Engineer A's firm on a future engineering project for City X?

CHEMICAL ENGINEERING DEPARTMENT
SENIOR DESIGN & PROFESSIONALISM I CHEG 4247
GRADING SCHEME AND OUTCOME ASSESSMENT SHEET FOR FALL 2021

ABET OUTCOME 4: 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

Assignments that test competency in this area will include problems that test the student knowledge in the Professional Code of Ethics, ability to apply relevant aspects of the professional code of ethics when considering alternative decisions or solutions, ability to ethically evaluate the short and long term impact of engineering solutions on community and environment.

Name: _____

Title of Assignment: _____

Due Date: November 16, 2021

Competency Area	Max for this Assignment	Your Score
4.1 An understanding of professional and ethical responsibility <i>This assignment tests the student knowledge in the Professional Code of Ethics, and ability to apply relevant aspects of the professional code of ethics when considering alternative decisions or solutions.</i>	100	
TOTAL	100	70

Established in 1934, the National Society of Professional Engineers (NSPE) has always put the interests of professionally licensed engineers first with a central goal of protecting engineers from unlicensed entities and creating a safe inclusive environment for all engineers. Their code of ethics reflects these same ideals to ensure not only those engineers are conducting honest business, but they're also ensuring the safety of the public. Deception is frowned upon within the organization, which is very reasonable, when conducting a business, being as transparent as possible with your consumers is the most ethical you can do, lying or leaving important details out that people should know only creates ignorance to the truth of the matter and could put others at risk. If you're working with another company but you choose to leave important information about certain measurements of chemicals you're working with, you're creating a viral situation that could hurt someone if they don't handle the substances properly due to the information you gave them. The inclusive side of the code of ethics outlaws the criticism or down talking of another engineer to further yourself throughout a company. This is just common courtesy, because if you must rely on making someone who's supposed to be your colleague look bad in order to make yourself look good to boost your stock with a company or to get a job, you're obviously not doing your job right to begin with and deserve you be in the position you're already.

Not sure I understood this

Not the NCEES provides proper examination to grant engineers their license to be able to conduct work legally and properly in that field. Conflicts of interests are outlawed meaning giving someone an engineering license because you know them or just because their family is an extreme violation of ethics and it's grounds for termination and depending on if a accident were to occur based off of that type licensing, jail time. Conflicts of interest are also not allowed in

NSPE and AIChE which is common sense given that the goals of the three are to be honest with how engineers are supposed to operate. For AIChE the main focus of the code of ethics for chemical engineers is to ensure the absolute safety of the public. Given what chemical engineers work with, they work in a field that not only puts them a risk, but general citizens at risk everyday which is why their jobs must be executed to perfection. Chemical leaks or explosions can affect the breathing and water conditions for hundreds of citizens if it isn't contained, a reason why chemical engineers receive high praise for what they do.

After reading the Case Study, engineer C was not acting in an ethical manner for verbally agreeing to select engineer A's firm for a future project. The agreement is only on the basis of an IOU for engineer A securing the grant for engineer B's company which goes down as a conflict of interest. Something like that would require an interviewing process to review the list of candidates that's suitable for the project, so the best output of production can be optimized. Quality over quantity is always valued at with anything, especially in terms of work conducted by engineers, if we had our buddies working important projects for us instead of a highly trained and renowned professional, the result would probably be terrible.

Where are your citations?

Also, there are at least 3 sections for unethical behavior

ASSIGNMENTS FOR OUTCOME 4

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

CHEMICAL ENGINEERING DEPARTMENT
OUTCOMES SPECIFIC ASSIGNMENT COVER SHEET
PROCESS DESIGN AND ANALYSIS

FALL 2021

Instructor: Dr. Emmanuel A. Dada

Title of Assignment

Final Exam

Outcome Measured Using this Assignment

Outcome 4

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

Check the engineering design characteristics related to this assignment

X	Involves ability to recognize ethical and professional responsibilities in engineering
X	Involves making informed judgements on professional responsibilities in engineering.
X	Involves impact of engineering solutions in global , environmental, and societal contexts
X	Involves consideration of one or more of the following (Please check those involved in this assignment.)
X	Public health
X	Safety and welfare
X	Global factors
	Communicate with team members
X	Social factors
X	Environmental factors
X	Economic factors

Brief justification of why this assignment is suitable for this outcome

This assignment will help students on global solution to cost of plants in different countries with example of Denmark and USA in the assignment.

NOTE: WORK MUST BE INDEPENDENT (INDIVIDUAL).

Problem 1: You are the process engineer in a plant that needs to select equipment for one of their units operations. The after-tax hurdle rate is 12% per annum. From the below three alternative choices which one would you recommend?

Alternative	Equipment Life (Yr)	Capital Cost (\$Million)	Operating Cost (\$Million)
A	9	24	2.6
B	5	16	3.6
C	3	6	5.6

Hint: Use Equivalent Annual Operating Cost (EAOC) method

Problem 2: As a chemical engineer with Bestdeal Company, Houston, TX you were part of the team that carried out a good estimate for all the major equipment for the production of a plant for the new product to be on stream in 2021. The cost of the major equipment carried out in the year 2006 are: Reactors-\$400K; Distillation Units - \$600K; Separators- \$250K, others - \$150K. Assume that the current chemical engineering cost index (CECI) in 2021 is 610:

- (1) Calculate the current fixed capital cost for the plant using the estimating cost software in “Plant Design and Economics for Chemical Engineers”, 5th edition, by Peters, Timmerhaus and West. Show the details of your estimate by providing both the indirect and direct costs. (Hint: From your class text book, locate the CECI for the year 2006.)
- (2) Calculate the total capital investment in 2021 if the working capital is 20% of the fixed capital investment.
- (3) The plant has 10 years life and at the end of its life 15% of the original fixed capital investment is recovered as salvage value and 10% of the working capital is also recovered. Calculate (a) the NPV and (b) the payback period of the plant assume that the after-tax hurdle rate is 10% and the annual cash flow is \$1 million per year.
- (4) From question 3 above, calculate the discounted cash flow rate of return on investment for the plant.
- (5) If the plant is to be replicated in Denmark but with production capacity tripled due to a large demand, calculate the new fixed capital cost of the plant in euro (assume 1Euro = \$1.30). Note that each item of the major equipment is 50% relatively more expensive in Denmark compare to US; that is for example in 2006, a reactor that cost \$1.00 in US cost a euro equivalent of \$1.50 in Denmark. And

also one major 100 gpm pump equipment is to be added necessary to meet Denmark's market. The information on this particular equipment in 2006 are: Twice its capacity cost \$100K and triple its capacity cost \$125K. (Hint: Calculate the capacity exponent value that will help you to calculate the cost of the additional major equipment to meet Denmark's market. Then you update the cost of all the major equipment.)

INSERT SAMPLE COPY OF FINAL EXAM FOR OUTCOME 4

Final Exam Due Tuesday, December 7, 2021. Instructor: Dr. Emmanuel Dada

Name of Student: OLUNATAYOSI IDANU

NOTE: WORK MUST BE INDEPENDENT (INDIVIDUAL).

Problem 1: You are the process engineer in a plant that needs to select equipment for one of their units operations. The after-tax hurdle rate is 12% per annum. From the below three alternative choices which one would you recommend?

Alternative	Equipment Life (Yr)	Capital Cost (\$Million)	Operating Cost (\$Million)
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C	3	6	5.6

Hint: Use Equivalent Annual Operating Cost (EAOC) method

Problem 2: As a chemical engineer with Bestdeal Company, Houston, TX you were part of the team that carried out a good estimate for all the major equipment for the production of a plant for the new product to be on stream in 2021. The cost of the major equipment carried out in the year 2006 are: Reactors- \$400K; Distillation Units - \$600K; Separators- \$250K, others - \$150K. Assume that the current chemical engineering cost index (CECI) in 2021 is 610:

- (1) Calculate the current fixed capital cost for the plant using the estimating cost software in "Plant Design and Economics for Chemical Engineers", 5th edition, by Peters, Timmerhaus and West. Show the details of your estimate by providing both the indirect and direct costs. (Hint: From your class text book, locate the CECI for the year 2006.)
- (2) Calculate the total capital investment in 2021 if the working capital is 20% of the fixed capital investment.
- (3) The plant has 10 years life and at the end of its life 15% of the original fixed capital investment is recovered as salvage value and 10% of the working capital is also recovered. Calculate (a) the NPV and (b) the payback period of the plant assume that the after-tax hurdle rate is 10% and the annual cash flow is \$1 million per year.
- (4) From question 3 above, calculate the discounted cash flow rate of return on investment for the plant.
- (5) If the plant is to be replicated in Denmark but with production capacity tripled due to a large demand, calculate the new fixed capital cost of the plant in euro (assume 1Euro = \$1.30). Note that each item of the major equipment is 50% relatively more expensive in Denmark compare to US; that is for example in 2006, a reactor that cost \$1.00 in US cost a euro equivalent of \$1.50 in Denmark. And also one major 100 gpm pump equipment is to be added necessary to meet Denmark's market. The information on this particular equipment in 2006 are: Twice its capacity cost \$100K and triple its capacity cost \$125K. (Hint: Calculate the capacity exponent value that will help you to calculate the cost of the additional major equipment to meet Denmark's market. Then you update the cost of all the major equipment.)

29/30

P1) EADC WILL BE POSITIVE BECAUSE YOU ARE DEALING WITH COST. THE BEST ALTERNATIVE WILL BE THE ONE WITH THE SMALLEST EADC

$$EADC = (\text{CAPITAL INVESTMENT})(A/P, i, n) + \text{YEARLY OPERATING COST}$$

$$(A/P, i, n) = \frac{i(1+i)^n}{(1+i)^n - 1}$$

$$\text{ALTERNATIVE A} = 24,000,000 \frac{0.12(1.12)^9}{1.12^9 - 1} + 2,600,000 = 7,104,293$$

$$\text{ALTERNATIVE B} = 16,000,000 \frac{0.12(1.12)^5}{1.12^5 - 1} + 3,600,000 = 8,038,556$$

$$\text{ALTERNATIVE C} = 6,000,000 \frac{0.12(1.12)^3}{1.12^3 - 1} + 5,600,000 = 8,098,094$$

I WOULD RECOMMEND ALTERNATIVE A

10/10

P2.) CALCULATE THE CURRENT FIXED CAPITAL COST FOR THE PLANT
 (1) MAJOR EQUIPMENT COST IN 2006 = \$400K, \$600K, \$250K, \$150K = \$1.4 million

USING EQUATION OF TIME TO FIND COST IN 2021

$$C_2 = C_1 \left(\frac{I_2}{I_1} \right)^{\frac{2021 \text{ INDEX}}{2006 \text{ INDEX}}}$$

2021 COST 2006 COST

$$1.4 \left(\frac{610}{500} \right) = \$1,708m \approx \$1.710m$$

EQUIPMENT COST IN 2021

2021 COST INDEX = 610

2006 COST INDEX = 500

COST OF MAIN EQUIPMENT IN 2021

$$\text{REACTOR} : 400 \left(\frac{610}{500} \right) = \$488K$$

$$\text{DISTILLATION} : 600 \left(\frac{610}{500} \right) = \$732K$$

$$\text{SEPARATOR} : 250 \left(\frac{610}{500} \right) = \$305K$$

$$\text{OTHER} : 150 \left(\frac{610}{500} \right) = \$183K$$

* DIRECT COST

- ACCORDING TO PETER AND TIMMERHAUS SOFTWARE

• DELIVERY : 10% OF PURCHASED EQUIPMENT = $\$1.710m \times 0.10 = \$0.171m$

• SUBTOTAL OF DELIVERED EQUIPMENT = $\$1.710m + \$0.171m = \$1.881m$

• EQUIPMENT INSTALLATION 0.47 = $\$0.884m$

• INSTRUMENTATION AND CONTROL 0.36 = $\$0.677m$

• PIPING 0.68 = $\$1.279m$

• ELECTRICAL SYSTEM 0.11 = $\$0.207m$

• BUILDINGS 0.18 = $\$0.339m$

• YARD IMPROVEMENT 0.10 = $\$0.1881m$

• SERVICE FACILITIES 0.70 = $\$1.317m$

TOTAL DIRECT COST = $\$6.772m$

* INDIRECT COST

• ENGINEERING AND SUPERVISION 0.33 = $\$0.621m$

• CONSTRUCTION EXPENSES 0.41 = $\$0.771m$

• LEGAL EXPENSES 0.04 = $\$0.075m$

• CONTRACTOR'S FEE 0.22 = $\$0.414m$

• CONTINGENCY 0.44 = $\$0.828m$

TOTAL INDIRECT COST = $\$2.709m$

CURRENT FIXED COST = $\$6.772m + \$2.709m = \$9.481m$

(2) CALCULATE TOTAL CAPITAL INVESTMENT IN 2021 IF WORKING CAPITAL IS 20% OF FIXED CAPITAL INVESTMENT.

$$\text{TOTAL CAPITAL INVESTMENT} = \text{FIXED CAPITAL} + \text{WORKING CAPITAL}$$

$$\text{FIXED CAPITAL} = \$9.481\text{m}$$

$$\text{WORKING CAPITAL} = \$9.481 \times 0.20 = \$1.896\text{m}$$

$$\text{TCI} = \$9.481\text{m} + \$1.896\text{m} = \boxed{\$11.377\text{m}}$$



(3) CALCULATE THE NPV AND THE PAYBACK PERIOD OF THE PLANT ASSUME THAT THE AFTER-TAX HURDLE RATE IS 10% AND THE ANNUAL CASH FLOW IS \$1 million PER YEAR

$$\text{CASH FLOW (A)} = \$1\text{million}$$

$$\text{PLANT LIFE (n)} = 10 \text{ YEARS}$$

$$\text{SAVAGE} = 0.15 \times \$9.481\text{m} = \$1.422\text{m}$$

$$\text{WORKING CAPITAL (RECOVERED)} = 0.10 \times \$1.896 = \$0.190\text{m}$$

$$\text{NPV} = -\text{FCI} - \text{INC} \times (P/F, 0.1, 1) + A (P/A, 0.1, 10) (P/F, 0.1, 1) + (S + \text{WCR}) (P/F, 0.1, 10)$$

$$\left(\frac{1}{1+i}\right), \left(\frac{(1+i)^n - 1}{i(1+i)^n}\right), \quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow$$

$$\left(\frac{1}{(1+i)^0}\right), \quad \frac{1}{1.1} = 0.91, \quad \frac{(1.1)^{10} - 1}{0.1(1.1)^{10}} = 6.14, \quad 0.91, \quad \frac{1}{(1.1)^{10}} = 0.385$$

$$= -9.481 - 1.896 \times (0.91) + 1(6.14)(0.91) + (1.422 + 0.190)(0.385) = \boxed{-\$5.1\text{m}}$$

(5) PAYBACK PERIOD = $\frac{\text{TCI}}{A} = \frac{\$11.377\text{m}}{\$1\text{m}} = 11.377 \text{ YEARS}$ is 11.377 years? ✓

PBP IS GREATER THAN THE PLANT LIFE SO NO PROFIT IS MADE

(4) CALCULATE THE DISCOUNTED CASH FLOW RATE OF RETURN ON INVESTMENT FOR THE PLANT:

DCFRR = INTEREST OR DISCOUNT RATE FOR WHICH THE NPV OF THE PROJECT IS EQUAL TO ZERO

— USING GOAL SEEK, THE DISCOUNT RATE WOULD HAVE TO BE

$$0.0030 \approx 0.30\% \text{ FOR NPV TO BE ZERO}$$

OK

$$5.) C_a = K A_a^n \quad C_b = K A_b^n \quad \frac{C_a}{C_b} = \left(\frac{A_a}{A_b} \right)^n$$

$$\frac{C_a}{C_b} = \left(\frac{A_a}{A_b} \right)^n = \frac{100k}{125k} \left(\frac{200 \text{ gpm}}{300 \text{ gpm}} \right)^n \quad n = 0.55$$

$$K = \frac{C_b}{A_b^n} = \frac{125k}{300^{0.55}} = 5.426$$

$$\text{COST OF 100 gpm PUMP} = 5.426 (100)^{0.55} = \$68.31k \text{ — US PRICE}$$

* GIVEN COST OF EQUIPMENT IN US IN 2006:

$$\text{REACTOR} = \$400k$$

$$\text{DISTILLATION} = \$600k$$

$$\text{SEPARATOR} = \$250k$$

$$\text{OTHERS} = \$150k$$

$$\text{TOTAL} = \$1.4m$$

* COST OF EQUIPMENT IN DENMARK IN 2006 : 50% HIGHER THAN US IN 2006

$$\text{REACTOR} = \$600k$$

$$\text{DISTILLATION} = \$900k$$

$$\text{SEPARATOR} = \$375k$$

$$\text{OTHERS} = \$225k$$

$$\text{TOTAL} = \$2.1m$$

* PRICE OF 100 gpm PUMP IN DENMARK IN 2006 : 50% HIGHER THAN US IN 2006

$$\text{US PRICE FOR PUMP} = \$68.31k$$

$$\text{DENMARK PRICE FOR PUMP} = \$102.47k$$

* NOW TRIPLE THE CAPACITY OF PLANT IN DENMARK WITHOUT THE PUMP

$$C_a = C_b \left(\frac{A_a}{A_b} \right)^n$$

$$= \$2.1m \left(\frac{3}{1} \right)^{0.6}$$

$$= \$4.06m \text{ in DENMARK}$$

* $n = 0.6$ DUE TO THE FACT THAT THIS IS THE COMMON PLANT CAPACITY EXPONENTIAL VALUE

TRIPLE CAPACITY + PUMP PRICE IN DENMARK IN 2006 = PLANT PRICE IN 2006

$$\$4.06m + \$102.47k = \$4,162,470$$

PLANT PRICE IN 2021 IN DENMARK

$$C_2 = C_1 \left(\frac{I_2}{I_1} \right)$$

$$= \$4,162,470 \left(\frac{610}{500} \right) = \$5,078,213 \text{ in DENMARK}$$

* CONVERT TO EURO

$$\frac{€1}{\$1.30} = \frac{\$5,078,213}{x}$$

$$= €3,906,318$$

* DIRECT COST IN EURO

• DELIVERY : 10% OF PURCHASED EQUIPMENT = $€3,906,318 \times 0.1 = €390,632$

SUBTOTAL OF DELIVERED EQUIPMENT = $€3,906,318 + €390,632 = €4,296,950$

• EQUIPMENT INSTALLATION	0.47	= €2,019,567
• INSTRUMENTATION AND CONTROL	0.36	= €1,546,902
• PIPING	0.68	= €2,921,926
• ELECTRICAL SYSTEM	0.11	= €472,665
• BUILDINGS	0.18	= €773,451
• YARD IMPROVEMENT	0.10	= €429,695
• SERVICE FACILITIES	0.70	= €3,007,865

TOTAL DIRECT COST = €15,469,021

* INDIRECT COST IN EURO

• ENGINEERING AND SUPERVISION	0.33	= €1,417,994
• CONSTRUCTION EXPENSES	0.41	= €1,761,750
• LEGAL EXPENSES	0.04	= €171,878
• CONTRACTOR'S FEE	0.22	= €945,329
• CONTINGENCY	0.44	= €1,890,658

TOTAL INDIRECT COST = €6,187,609

• • NEW FIXED CAPITAL COST OF PLANT IN EURO

$$= €15,469,021 + €6,187,609$$
$$= €21,656,630$$

$$\begin{array}{r} 19 \\ \hline 20 \end{array}$$