AGEN/BSEN 303: Principles of Process Engineering
Spring 2022

General Information:

Lecture Time:	Tuesdays & Thursdays 12:30 – 1:45 pm
Lecture Location:	Until Further Notice: https://unl.zoom.us/j/92165942119
Instructor:	Prof. Heidi Diefes-Dux, Email through Canvas course
Teaching Assistant:	Kayla Ney, Email thru Canvas course
Office Hours:	TBD

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COVID-19 Information

The delivery mode for this course for the foreseeable future is web-conferencing, meaning class will be held via zoom during normally scheduled hours. The decision to conduct class remotely has been approved by the College of Agricultural Sciences and Natural Resources.

If we move to in-person delivery, an individual in this course has a documented need for face coverings to be required in this course. As a result, the College of Agricultural Sciences and Natural Resources has determined that face coverings will be required in this course. If you are unwilling to comply with this requirement, please visit with your advisor about possible alternative courses that you might take in lieu of this one.

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Catalog Description:

3 credit hours
Prerequisite: MA 221
Recommended Pre- or co-requisite: CIVE 310 or MECH 310 Fluid Mechanics or
CHME 332 Transport Processes

Introduction to performance parameters and characteristics of pumps, fans, presses, and solids handling, size reduction, separation and agitation equipment. Application of the various technologies studied with analysis of example systems.

Actual Description:

Conservation of mass analysis for food and agricultural applications. Systems approach for sizing and selecting pumps for Newtonian and non-Newtonian fluids for food and agricultural applications, sizing and selecting fans for food and agricultural applications, and designing thermal processes for food and agricultural products. Application of concepts and technologies with analysis in the context of sample authentic systems.

Learning Outcomes:

At the end of this course, you will be able to:

1. use the law of conservation of mass to find stream mass flow rates and compositions (ABET Outcome 1, 2)
2. size and selection a pump for a food and agricultural application (ABET Outcome 1, 2)
3. apply engineering principles to improve food safety via thermal processing (ABET Outcome 1, 2)
4. size and selection a fan for a food and agricultural application (ABET Outcome 1, 2)
5. consider ethical implications of process design decisions (ABET Outcome 4)
6. document engineering work and write a technical brief for a client in the food and agricultural processing sector (ABET Outcome 3)
7. demonstrate each of the five behaviors of an effective team member at least at the (CATME) Expected Behavior level (ABET Outcome 5)
8. employ the habits of mind of a reflective practitioner (ABET Outcome 7)

Specific learning objectives associated with these outcomes can be found in the Course Learning Objectives document.

ABET Outcomes:

Assignments from this course will be used to assess student attainment of the following ABET Outcomes:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
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
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Course Structure/Format:

My Teaching Philosophy

My teaching philosophy guides the design of this course. My philosophy is that you should:

- have authentic learning experiences that are immersive and lead to useful artifacts,
- be aware of expectations for learning and be assessed in manners that are consistent with those expectations,
- continue to develop your computational thinking and practical skills as well as your capacity for evidence-based decision-making and ethical judgements,
- continue to develop effective team behaviors and ability to use of team facilitation tools, and
- develop as life-long learnings and reflective practitioners.

Overall, my aim is to provide learning experiences that are valued and provide periods of "flow." Flow is a cognitive state wherein one is extremely focused and aware of actions, has a sense of active control, and loses self-awareness and track of time. This requires that learning experiences have concrete goals with manageable boundaries for achieving them, the demands fit within one's capabilities, there is timely feedback on performance and goal accomplishment, and distractions are minimized. To do achieve this, we will engage in engineering work that is as authentic as possible.

Course Design

For the duration of this course, you will assume the role of Associate Engineer working for Ag-Bee Consulting Group. Ag-Bee provides engineering expertise in rural communities to facilitate local small agriculture and food manufacturing businesses and start-ups.

This is a program that will provide you with training to consult in four critical areas:

- Conservation of Mass
- Fluid Flow (pipes, fittings, and pumps for Newtonian and non-Newtonian Fluids)
- Fan Selection (for a drying and aeration applications)
- Thermal Preservation

An inverted classroom model will be employed. In-keeping with conceiving the course as a consulting group, class time will be spent predominantly working on training problems and projects as well as on discussions. Traditional course lecture material is expected to be viewed outside of class and in preparation for using class time to get questions answered and engage in training and project work.

You will work in a team of three or four to develop engineering expertise and (Excel) tools that you can use on the job for Ag-Bee to perform consultations in these critical areas. You and your team members

(and all Ag-Bee Associates) will be valuable assets during your training. You will be encouraged to work collaboratively on training while demonstrating individual achievement (as per UNL academic integrity). Ultimately, you are responsible for demonstrating your knowledge, skills, and abilities on the exams.

There will be four training units, each about 3-4 weeks in duration. Each training unit has the following elements:

- Clearly stated learning objectives (LO) (see the Course Learning Objectives document)
- Opportunities to learn and practice applying relevant engineering science concepts (pre-class, in-class, and post-class content and problem-solving)
- Opportunities to individually reflect on learning
- An exam aligned to the LOs that is taken individually.

The course project will entail:

- An introduction to a team project which is a sample consulting context
- Intermediate team project milestones
- Final team project written report and team developed (Excel) tool

Required Materials:

There are no required materials that you need to purchase. For our course topics, any one book selection is just not possible and using one book to complete project work is not consistent with actual engineering practice. Rather, engineers seek out a variety of resources and vet them for their usefulness to the work at hand. Selected reading materials and other resources that align to the course learning objectives will be posted to Canvas. There may be times when these will not entirely meet your personal needs or style of learning or are insufficient for the particulars of the project you and your team will be working on. You will be responsible for seeking out additional materials as needed to complete work. Should you come across materials that you believe would be of value to the whole class, please share them with me!

Course Policies:

Attendance

You are expected to attend **all** course activities. You will be enacting the role of an Associate Engineer in a consulting group for the duration of this course. A high level of active participation will be required of you and your team in class to develop knowledge, skill, and abilities and complete project work. Therefore, full attendance at every class is vital to you and your team's success. Attendance will be taken in every class.

Unexcused Absences: **Two** unexcused absence will not directly impact your semester grade, but starting with the third absence, your semester grade will be reduced by 5% for each unexcused absence. Minor illnesses (e.g., cold, flu, migraines, positive COVID test with low-grade symptoms) will be treated as unexcused absences, but if health issues persist, please speak with me early and often. You are advised to reserve your unexcused absences for minor illnesses, as it is likely you will need them for such.

Excused Absences: There are only a few excusable reasons for missing course activities – major illness, injury, hospitalization, or military orders; university-sponsored activities; religious observation; and bereavement. Please follow the procedures for these types of absences as outlined on https://registrar.unl.edu/academic-standards/policies/class-attendance/ For those absences that are known well in advance of class time, you are required to (1) notify me ***at least ten (10) calendar days before*** your planned absence will occur; these absences will not be excused after they occur and (2) submit your assignments at their normal or arranged times; ***no extensions will be given without prior approval***.

Late Arrival / Early Departure: Arriving late and leaving early are disruptive to your colleagues and me. As with any professional position, it is your responsibility to arrive on time and stay until the end of class. I will start and stop on time. If something is impeding your ability to get to class on time, please let me know.

Assignments (e.g., Training, Projects)
Most assignments must be submitted via Canvas before class on the day that they are due. There may be some variation in due dates and times, so read assignment instructions carefully. Ten percent (10%) will be deducted from the assignment grade for each day that an assignment is late, starting immediately following the due date/time. Extended deadlines for extenuating circumstances may be given *only* with permission from the instructor.

Participation
You are expected to actively participate in class discussions and activities. Coming to class having completed pre-class activities (e.g., reading, videos, tasks, and reflections) ensures your ability to contribute to the discussions and in-class activities. The portion of the course grade allocated to participation is at the instructor's discretion. The instructor will notify you if you are not participating at an acceptable level.

Inclement Weather

In the event of inclement weather, class will be held during normally scheduled hours. Use the zoom link. provided. Assignment deadlines will not change. An email will be sent to the class if there are any deviations to this plan.

Special Policies

- **Computers:** You are expected to have access to computational tools during class for problem-solving and project work.
- **Problem Solving Method and Computational Tool Standards:** When solving computational problems, you are expected to employ the standards posted on Canvas (Modules: Ag-Bee Resources).

UNL Course Policies and Resources:

You are responsible for knowing the university policies and resources found on this page (https://go.unl.edu/coursepolicies):

- Academic Honesty Policy - In this course, the consequences of misconduct are a lowered or zero grade on the assignment, exam, or project in question or a lowered or F grade for the course. Those enabling acts of misconduct will be subject to the same consequences. All incidences of misconduct will be reporting to the university.
- University-wide Attendance Policy
- Services for Students with Disabilities
- Mental Health and Well-Being Resources
- Final Exam Schedule
- Fifteenth Week Policy
- Emergency Procedures
- Diversity & Inclusiveness
- Title IX Policy
- Other Relevant University-Wide Policies

Course Grading:

Grades on assignments will be issued using criterion-referenced rubrics that focus on achievement of learning objectives. Grades are earned as detailed in the tables below. Approximately 45% of the total grade is earned for work performed and submitted as a team. Failure to adequately engage in team activities may result in individual loss of credit on work that was submitted as a team.

Course Activities	Weight
Training (~13)	15%
Project	40%

Teamwork Assignments	10%
Exams (4)	35%

Grade	Overall Course Grade
A	Greater than or equal to 94%
A-	Greater than or equal to 90% and less than 94%
B+	Greater than or equal to 87% and less than 90%
B	Greater than or equal to 84% and less than 87%
B-	Greater than or equal to 80% and less than 84%
C+	Greater than or equal to 77% and less than 80%
C	Greater than or equal to 74% and less than 77%
C-	Greater than or equal to 70% and less than 74%
D	Greater than or equal to 60% and less than 70%
F	Less than 60%

Course Graded Components:

Training

Nearly every week there will be a training assignment. These will list the class readings and/or video content for the week, provide practice with applying concepts (e.g., computational problems), and engage you in other teamwork and project relevant learning activities. ***Computational work will not be graded in detail by the instructional team***. Rather you will evaluate your own work using a solution key while commenting on things you learned, missed, or need to work on. Your corrected and evaluated computational work will be reviewed by the instructor.

Each training sequence will consist of:

1. Training #.#A. This is the initial submission of your work on the training materials (see schedule). The instructor will assess non-computation components of the assignment and the application of the problem solving method and standards to the computational problem.
2. Release of solutions to computational problems.
3. Training #.#B. This is the final submission of your work on the training materials (see schedule). This is your review of your work with reflection concerning your abilities to demonstrate the learning objectives.

Each training is worth 10 points with the split between the A and B parts varying depending on the assignment.

Computational problems are all about individual practice. While you may receive assistance from your teammates and classmates, the work you submit must be your own. Be generous in helping your classmates understand methods and concepts, but do not outright share your work (e.g., papers or files). This would be a violation of the Student Code of Conduct.

Teamwork Assignments

We will be using the Comprehensive Assessment of Team Member Effectiveness (CATME) tool for rating the effectiveness of your project team members. The first CATME assignment will be the Team Formation survey. The results from this survey will be used to assign teams. Subsequent CATME assignments will be used to evaluate the effectiveness of your team members. CATME will provide you with anonymous feedback regarding your ability to demonstrate each of the five behaviors of an effective team member. Other Teamwork Assignments will be the development of a Code of Cooperation and potentially a revisit of this assignment as needed based on team performance.

Project

One team project will be assigned. Milestones will enable feedback on the course learning objectives. The final submission for each project will consist of a technical manual and associated computational tool(s) (Excel), and a demonstration given a sample client and context. CATME evaluations and my judgement of your effectiveness as a team member, as warranted, may be used to adjust your project grades.

Exams

Four written exams will be administered and taken individually. Each will be aligned to the learning objectives for a particular set of trainings.

Classroom Expectations:

WHAT I EXPECT FROM YOU

While much effort has gone into the design of this course, ultimately it is your responsibility to *learn*. I encourage you to: (1) identify your own goals and ways to determine the extent to which you are meeting these goals; (2) think critically and challenge yourself; (3) commit to the vision, mission, values, and ethics of our learning experience (see the Ag-Bee Consulting Commitment Document); (4) engage in deep reflection on your progress in achieving the learning objectives; (5) attend all classes, complete assignments on time, and come prepared for class; and (5) abide by UNL's policy on scholastic conduct.

WHAT I EXPECT FROM MYSELF

My goal is to create a safe and engaging environment for learning. My responsibility is to take into account student backgrounds, make learning visible and push on prior conceptions, provide opportunities for students to achieve learning goals, and facilitate lifelong learning habits of mind. This inherently involves active listening, being respectful and reliable, asking for and using course feedback, and being encouraging in our community of practice.

Emergency Preparedness:

Fire Alarm (or other evacuation): In the event of a fire alarm: Gather belongings (Purse, keys, cellphone, N-Card, etc.) and use the nearest exit to leave the building. Do not use the elevators. After exiting notify emergency personnel of the location of persons unable to exit the building. Do not return to building unless told to do so by emergency personnel.

Tornado Warning: When sirens sound, move to the lowest interior area of building or designated shelter. Stay away from windows and stay near an inside wall when possible.

Active Shooter:

- Evacuate: If there is a safe escape path, leave belongings behind, keep hands visible, and follow police officer instructions.
- Hide out: If evacuation is impossible, secure yourself in your space by turning out lights, closing blinds, and barricading doors if possible.
- Take action: As a last resort, and only when your life is in imminent danger, attempt to disrupt and/or incapacitate the active shooter.

Tentative Course Schedule:

Assignments and due dates may be subject to change.

Week	Class	Day	Date	Topic	Assessments
1	1	Tues	Jan 18	Course Overview; Conservation of Mass	CATME Team Formation
	2	Thurs	Jan 20	Conservation of Mass; Teaming	Training 1.1A
2	3	Tues	Jan 25	Conservation of Mass	Training 1.1B Training 1.2A
	4	Thurs	Jan 28	Conservation of Mass; Project Intro.	Training 1.2B
3	5	Tues	Feb 1	Conservation of Mass	Training 1.3A
	6	Thurs	Feb 3	Fluid Flow	Training 1.3B
4	7	Tues	Feb 8	EXAM 1; Fluid Flow	Training 2.1A Conservation of Mass Exam
	8	Thurs	Feb10	Fluid Flow	Training 2.1B
5	9	Tues	Feb 15	Fluid Flow & Pumps	Training 2.2A
	10	Thurs	Feb 17	Fluid Flow & Pumps	Training 2.2B
6	11	Tues	Feb 22	Fluid Flow & Pumps	Training 2.3A
	12	Thurs	Feb 24	Fluid Flow & Pumps	Training 2.3B Project M1
7	13	Tues	Mar 1	EXAM 2	Fluid Flow & Pumps Exam
	14	Thurs	Mar 3	Project Work	CATME Team Eval 1
8	15	Tues	Mar 8	Fans	Training 3.1A
	16	Thurs	Mar10	Fans	Training 3.1B
9		Tues	Mar 15	***SPRING BREAK***	
		Thurs	Mar 17	***SPRING BREAK***	
10	17	Tues	Mar 22	Fans	Training 3.2A
	18	Thurs	Mar 24	Fans	Training 3.2B
11	19	Tues	Mar 29	Fans	Training 3.3A
	20	Thurs	Mar 31	Fans	Training 3.3B Project M2
12	21	Tues	Apr 5	EXAM 3	Fans Exam
	22	Thurs	Apr 7	Project Work	CATME Team Eval 3
13	23	Tues	Apr 12	Thermal Preservation	Training 4.1A
	24	Thurs	Apr 14	Thermal Preservation	Training 4.1B
14	25	Tues	Apr 19	Thermal Preservation	Training 4.2A
	26	Thurs	Apr 21	Thermal Preservation	Training 4.2B
15	27	Tues	Apr 26	Thermal Preservation	Training 4.3A CATME Team Eval 4
	28	Thurs	Apr 28	Project Work	Training 4.3B
16	29	Tues	May 3	Project Work	Project M3
	30	Thurs	May 7	Wrap-Up	Project Final
		Fri	May 13	EXAM 4 10:00 a.m. to 12:00 p.m.	Thermal Preservation Exam

Prepared By: Heidi A Diefes-Dux, BSE, 01/10/22