CHEG 3128: Chemical Engineering Junior Laboratory

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Class Times and Location MW 3:00-5:00pm, EII-114

Course Materials and Course Notifications: http://cbe.engr.uconn.edu/cheglabs/ and Husky CT – https://lms.uconn.edu

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Office Hours: TBD

Course Description: Hands-on laboratory investigations probing the impacts of heat and mass transfer, kinetics and thermodynamics on the behavior of physical and engineered systems. There is also an emphasis on student teamwork, design and construction of experimental apparatus, as well as written and oral communication.

ABET Objectives: In this course, student progress towards the following ABET Engineering Objectives will be assessed:

(a) An ability to apply knowledge of math, science, and engineering
(b) An ability to design and conduct experiments, as well as to analyze and interpret data
(d) An ability to function on multi-disciplinary teams
(e) An ability to identify, formulate, and solve engineering problems.
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Student Outcomes: By the end of CHEG 3128, students will be able to:

1) Show an ability to use mathematical constructs by quantitatively describing the chemical phenomena occurring in a cylindrical mixing vessel. (ABET a, b, d, e, k)
2) Build 3-dimensional parts and assemblies using Solidworks (ABET k)
3) Show an understanding of physical systems by applying heat/mass balance equations (ABET a, e)
4) Demonstrate an understanding of the role of kinetics and thermodynamics in the behavior of unconventional (electro)chemical systems through application and extension of fundamental concepts and equations. (ABET a, b, d, e)
5) Demonstrate the ability to design a chemical system by building a home-made electrochemical cell to power a toy car. ABET (d, e, k)

Coursework and Points

During the semester, students will be challenged with two ongoing labs – one investigating mixing in a CSTR and one investigating the fundamentals and application of primary batteries – and one small lab focused on heat or mass transfer. During the course of the semester, students will evaluate their teammate's performance. In addition, each student's overall

performance in the class will be assessed by faculty. The total number of points that will be available to earn during the semester are given below.

Item	Points (ea)	Qty	Net
CSTR Lab Assignments	100	2	200
Battery Lab Assignments	100	3	300
Heat/Mass Lab Assignment	100	1	100
Prelab Quizzes	25	6	150
Peer Assessments	25	3	75
Faculty Assessment	75	1	75
			Total: 900

Performance Table

	Expectations		
	Outstanding	**Acceptable**	**Unacceptable**
Student Outcome	**9/10**	**7/10**	**5/10**
1. Show an ability to use mathematical constructs by quantitatively describing the chemical phenomena occurring in a cylindrical mixing vessel. (ABET a, b, d, e, k)	Students show a clear understanding of acid dissociation chemistry and ideal CSTR behavior. Can use math tools to analyze data and diagnose root causes for poor mixing	Students are able to apply in-class derived equations to analyze data, but have limited ability to extend the discussion	Students do not show understanding of chemical phenomena or underlying mathematical concepts
2. Build 3-dimensional parts and assemblies using Solidworks (ABET k)	Students are able to build and join together complex geometries to design full parts and assemblies	Students can build simple geometries, and perhaps mate them, but complex skills are lacking	Students fail to build components an assemblies
3. Show an understanding of physical systems by appling heat/mass balance equations (ABET a, e)	Students are able to translate lessons learned in previous courses to analyze real-world heat/mass transfer phenomena	Students are able to apply simple equations to experimental data	Students are unable to relate mass/heat transfer equations to experimental data
4. Demonstrate an understanding of the role of kinetics and thermodynamics in the behavior of unconventional (electro)chemical systems through application and extension of fundamental concepts and equations. (ABET a, b, d, e)	Students are able to use thermodynamic and kinetic principles to quantify their impact on electrochemical voltage and current-voltage behavior	Students are able to qualitatively understand why voltage changes when the electrolyte changes or a load is applied	Students are unable to show understanding of the influence of the system on the open-circuit voltage or why the cell voltage decreases as a lower load is applied across the cell
5. Demonstrate the ability to design a chemical system by building a home-made electrochemical cell to power a toy car. ABET (d, e, k)	The students are able to determine the power needs of the car and build a battery that can run the car	Students are able to design a battery that functions well, but not on that is able to run the car	The students are unable to build a battery that functions well or is able to operate the car

Project Groups

The average group size will be approximately four (4) students. Project groups will be pseudo-assigned. In short, students will be given the opportunity to pair up and pairs will be randomly matched together. Every student is required to participate in a tangible capacity in every lab. Task organization is the responsibility of the team.

Laboratory Schedule, Assignments and Deadlines

The tentative Laboratory Schedule follows on the next page, and will be updated as needed on Husky CT. Each lab will have a formal deliverable with a deadline. The tentative deadline schedule is also follows. Because of scheduling and equipment limitations, teams will be turning in assignments at different times than their peers. Late assignments will be accepted; however, with a severe penalty. For each calendar day that an assignment is late, the team will forfeit 10% of the achievable points.

Junior Laboratory Schedule, Spring 2017

Day	Date	1-2	3-4	7-8	9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24
M	16-Jan	No Class: Martin Luther King Jr. Day										
W	18-Jan	Course Intro and Safety Training										
M	23-Jan	Mustain CSTR 1										Fisler H/M
W	25-Jan	Fisler Solidworks			Mustain Battery 1							
M	30-Jan								Mustain CSTR 1		Fisler H/M	
W	1-Feb	Mustain Battery 1							Fisler Solidworks			
M	6-Feb				Mustain CSTR 1		Fisler H/M					
W	8-Feb				Fisler Solidworks				Mustain Battery 1			
M	13-Feb		Fisler H/M				Mustain CSTR 1					
W	15-Feb			Mustain CSTR 1			Fisler Solidworks					
M	20-Feb			Fisler Solidworks								
W	22-Feb										Mustain CSTR 1	
M	27-Feb	Mustain CSTR 2		Fisler H/M							Fisler Solidworks	
W	1-Mar				Mustain Battery 2				Fisler CSTR 2			
M	6-Mar	Mustain Battery 2						Fisler H/M				
W	8-Mar				Fisler CSTR 2				Mustain Battery 2			
M	13-Mar	No Class: Spring Break										
W	15-Mar											
M	20-Mar						Mustain CSTR 2		Fisler H/M			
W	22-Mar			Mustain CSTR 2						Fisler H/M		
M	27-Mar	Fisler H/M			Mustain Battery 3						Fisler CSTR 2	
W	29-Mar	Mustain Battery 3										
M	3-Apr				Fisler H/M				Mustain Battery 3			
W	5-Apr					Fisler H/M						
M	10-Apr											
W	12-Apr											
M	17-Apr											
W	19-Apr											
M	24-Apr			Mustain Battery 4								
W	26-Apr	Mustain Battery 4							Mustain Battery 4			
	Finals	TBD										

Due Date Schedule - Prelabs and Assignments												
Day	Date	1-2	3-4	7-8	9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24
M	16-Jan	No Class: Martin Luther King Jr. Day										
W	18-Jan	Course Intro and Safety Training										
M	23-Jan	CSTR 1 in-class prelab										H/M Prelab
W	25-Jan				Battery 1 in-class prelab quiz							
M	30-Jan								CSTR 1 in-class prelab		H/M Prelab	Heat/Mass
W	1-Feb	Battery 1 in-class prelab quiz										
M	6-Feb				CSTR 1 in-class prelab		H/M Prelab				Heat/Mass	
W	8-Feb								Battery 1 in-class prelab quiz			
M	13-Feb	CSTR 1 Assignment					CSTR 1 in-class prelab					
			H/M Prelab				Heat/Mass					
W	15-Feb			CSTR 1 in-class prelab quiz								
M	20-Feb		Heat/Mass						CSTR 1 Assignment			
W	22-Feb	CSTR 2 Prelab									CSTR 1 in-class prelab	
M	27-Feb			H/M Prelab	CSTR 1 Assignment				CSTR 2 Prelab			
W	1-Mar				Battery 1 Assignment							
					Battery 2 in-class prelab quiz							
					CSTR 2 Prelab							
M	6-Mar	Battery 1 Assignment					CSTR 1 Assignment					
								H/M Prelab				
W	8-Mar			CSTR 1 Assignment			CSTR 2 Prelab		Battery 1 Assignment			
				CSTR 2 Prelab					Battery 2 in-class prelab quiz			
M	13-Mar	No Class: Spring Break										
W	15-Mar											
M	20-Mar	CSTR 2 Assignment						Heat/Mass	H/M Prelab	H/M Prelab	CSTR 1 Assignment	
											CSTR 2 Prelab	
W	22-Mar			Heat/Mass								
M	27-Mar	H/M Prelab			Battery 2 Assignment				Heat/Mass	Heat/Mass		
					Battery 3 in-class Prelab Quiz							
W	29-Mar	Battery 2 Assignment							CSTR 2 Assignment			
		Battery 3 in-class Prelab Quiz										
M	3-Apr	Heat/Mass			CSTR 2 Assignment				Battery 2 Assignment			
					H/M Prelab				Battery 3 in-class Prelab Quiz			
W	5-Apr			CSTR 2 Assignment		H/M Prelab	CSTR 2 Assignment					
M	10-Apr				Heat/Mass						CSTR 2 Assignment	
W	12-Apr					Heat/Mass						
M	17-Apr											
W	19-Apr											
M	24-Apr			Battery 3 Assignment								
W	26-Apr	Battery 3 Assignment							Battery 3 Assignment			
Finals		TBD										

Prelab Assignments

Every laboratory activity will have a pre-lab assignment. All of these assignments are to be completed by individuals, not teams. There are two types of assignments that will be given. The first type typically assigns reading of background information; then, an in-class quiz will be used to determine student understanding of the reading. The second type of assignment will be more like a traditional homework assignment that will be turned in at a prescribed time before the laboratory period.

Peer and Self Assessment

During the course of the semester, team members will be asked to assess their individual performance to date as well as the individual performance of their team members. A standard evaluation form will be generated by the instructors for this purpose and assessment will be anonymous.

Cheating

Cheating is always a difficult thing to describe, but when you see it, you know what it looks like. We do not want to discourage students from working together or from discussing difficult problems with one another. However, it should be obvious that due to our rotation of the labs there will be students who complete laboratory assignments before other students even see them. Students should not be giving critical hints or answers to problems. There are also some individual tasks in this class, such as the pre-lab quizzes. These individual tasks should not require any communication among students. These are just simple examples. But if you have a question about honesty, please just ask us and we will work with you.

Class Time and Attendance

Attendance will not be formally taken. However, following completion of their first lab, students are encouraged to come to class to build, ask questions, etc., but they are not required to attend every class period. There will be plenty of building, methods development, device testing, writing, etc. that will need to be done and during the in-class time students will have access to the faculty and TA's to help answer questions and troubleshoot.

Other Policies

Student Conduct: http://community.uconn.edu/the-student-code-pdf/. Students are responsible for adherence to the University of Connecticut student code of conduct. Perhaps the most important policy to pay attention to is the section on Student Academic Misconduct. "Academic misconduct is dishonest or unethical academic behavior that includes, but is not limited, to misrepresenting mastery in an academic area (e.g., cheating), intentionally or knowingly failing to properly credit information, research or ideas to their rightful originators or representing such information, research or ideas as your own (e.g., plagiarism)."

Students with disabilities. The Center for Students with Disabilities (CSD) at UConn provides accommodations and services for qualified students with disabilities. If you have a documented disability for which you wish to request academic accommodations and have not contacted the CSD, please do so as soon as possible. The CSD is located in Wilbur Cross, Room 204 and can be reached at (860) 486-2020 or at csd@uconn.edu. Detailed information regarding the accommodations process is also available on their website at www.csd.uconn.edu.