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Fall 2019

CHE 495-003: Chemical Engineering Lab I

Robert Barat

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MEMORANDUM

To: ChE 495-001, 003 Sections From: Prof. Robert Barat Date: September 2019 Re: Introduction (v. 1)

Pre-requisite Courses:

ChE 370 (Heat & Mass Transfer), Eng 352 (Technical Writing), Math 225A (Survey of Probability & Statistics for ChEs)

Class Meetings:

Section 001: Mondays, Thursdays 9:15-11:20 AM Section 003: Tuesdays, Thursdays 1-3:05 PM

Attendance is Mandatory! If you need to miss class, let me know in advance if you can. Make sure your group knows in advance of your absence, if you can. Always meet in basement lab first for announcements and any short lectures before proceeding to experiments. Attendance will not be taken, but professional behavior is expected!

Instructor Information:

Office Hours: Mon, Tues 4-5:30 PM Available other times – find me or stop by.

Office Location: 374 Tiernan Hall

Office Phone: (973) 596-5605 Fax: (973) 596-8436

Email (preferred contact mode): barat@njit.edu

Teaching Assistant: TBA Note that the instructor grades all student work. The TA only assists during lab classes, as needed.

Course Requirements and Grading:

Four experiments will be assigned to each group. All reports and presentations are to be group efforts and submissions. Submitted reports should be hardcopy. Electronic submissions are allowed only with permission of the instructor.

•	Industrial Memo	25 %
•	Oral presentation (PPT - peers)	25 %
•	Scholarly paper	25 %
•	Oral presentation (PPT - management)	25 %

NOTE: Draft written reports (Industrial Memo, Scholarly Paper - due after experiment is completed (see schedule). These will be returned with comments and a draft grade. Final drafts are due 1 week after return. This policy will be enforced. There are no graded "first drafts" of PPT slides for the Oral presentations, but you're encouraged to show drafts to the instructor for helpful comments.

Groups:

Determined 1st class; 3 students per group. Rotating group leader - Self-policing (PROFESSIONAL CONDUCT EXPECTED!) Peer & Self Evaluations done after

Experiments 1 and 2, and again after Experiments 3 and 4. Results will impact individual final course grades! So take your group responsibilities seriously.

Canvas Site: http://canvas.njit.edu --- Please check this site and your email often (at least once a day). Practice problems will be posted, as well as HW and test solutions, group projects, some in-class work, and useful memos.

Math Solver: You must have access to and know how to use one math solver software package. Examples include *Polymath, Maple, Matlab, Mathcad,* and *Mathematica*.

Polymath is available on dep't PCs in 411 Tiernan, as is the **license** info for program download onto your laptop. Three podcasts (Algebraic Equations, ODE's, Regressions) are available in the Media Gallery of the course *Canvas* site to help you learn *Polymath*, if you choose to use it.

Lab Manual:

Laboratory Manual for ChE 495 – Fall 2019 --- available on *Canvas* site in 2 parts: → Introduction → Experiments

Safety Lecture:

A <u>mandatory</u> lab safety lecture by Mr. Yetman will be provided immediately after the course introduction on the first class meeting. Attendance will be taken.

Information Literacy Lecture:

A <u>mandatory</u> Information Literacy lecture provided by the NJIT Library staff will be scheduled during one class period. <u>Attendance</u> taken. See Master Schedule.

Policy on Integrity: Professional behavior is expected at all times in this course.

- Every student expected to his/her fair share of the work load within the group
- Safety-conscious behavior in the labs is required at all times
- Use of data and/or reports not your own, unless instructor-authorized, is prohibited
- Submission/completion of work in a timely manner is expected
- If you use *Polymath*, you will follow the license guidelines no commercial use.

Specific goals (Learning Attributes) for the course:

- **a.** Students will be able to:
 - 1. Operate fluid flow applications (pipe flow, packed tower), and collect quality data, including pressure drops
 - 2. Operate heat exchangers (transient, steady state), and collect quality data, including fluid stream temperatures
 - 3. Analyze data, and apply appropriate theoretical models in fluid flow and heat transfer
 - 4. Plan an experiment and take enough data to get meaningful results

- 5. Handle their data ethically and correctly, and appreciate the dynamic between data and models
- 6. Present their results critically, and draw useful conclusions
- 7. Present their results using quality plots and tables that reveal key relationships
- 8. Analyze audiences and tailor their reporting for optimal communication
- 9. Report their data and analyses consistent with the assigned reporting structure
- **b.** This course explicitly addresses the following ABET student outcomes: 1, 2, 3, 4, 6
 - 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
 - 6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

		MASTER SCHEE	LULE CHE 495	6-001 FALL 2019)				
Date	Group 1	Group 2	Group 3	Group 4	Group 5		ChE 495-001	Fall	Class Meetings MR 9:15-11:20 AM
5-Sep		Course Introduct	ion & Mandatory	Safety Lecture	room 411 Tierna	l n	VERSION 1	2019	MR 9:15-11:20 AM
9-Sep			Planning Sess	ion (all groups)			4 Assignment	is:	
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12-Sep	IFF (exp)	PT #2 (exp)	CHT #1 (exp)	CHT #2 (exp)	THT (exp)		two fluid flow	(packed tower,	pipe now)
16-Sep	IFF	PT #2	CHT #1	CHT #2	THT				
19-Sep	IFF	PT #2	CHT #1	CHT #2	THT		Available Exp	eriments:	
23-Sep	IFF	PT #2	CHT #1	CHT #2	THT		IFF (B-7) - In	compressible F	luid Flow In Pipes
26 Can	IFF (max)	DT #2 (no)	CHT #1 (rev)	CUT #2 (nov)	TUT (max)		CFF (B-7) - C	ompressible Flu	id Flow in Pipes
26-Sep	IFF (rev)	PT #2 (rev)	CHI #1 (rev)	CHT #2 (rev)	THT (rev)			 Packed Tower Packed Tower 	
30-Sep		1	Scholarly Paper	(first drafts) due		1	CHT #1 /B-7)	- Continuous l	Heat Transfer #1
3-Oct			Planning Sess	ion (all groups)					Heat Transfer #2
7-Oct	CHT #2 (exp)	CHT #1 (exp)	PT #2 (exp)	IFF (exp)	CFF (exp)		CHT #3 (311)		Heat Transfer #3
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10-Oct	CHT #2	CHT #1	PT #2	IFF	CFF		1		
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17-Oct	CHT #2	CHT #1	PT #2	IFF	CFF			Exp. 1 Exp. 2	Industrial Memo Oral Presentation (PPT-p
21-Oct	CHT #2 (rev)	CHT #1 (rev)	PT #2 (rev)	IFF (rev)	CFF (rev)			Exp. 3 Exp. 4	Scholarly paper Oral Presentation
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24-Oct		Oral Pres	entations (PPT - p	eer audience) - lo	cation TBA	ı	"Einal Evam"	Oral Presentat	tion (PPT-management
28-Oct	Information Literacy - lecture by NJIT Library Staff - room 411 Tiernan Mandatory attendance							(based on Exp	
31-Oct			Planning Sess	ion (all groups)					
31-Oct			Planning Sess	ion (all groups)					
31-Oct 4-Nov	PT #2 (exp)	CFF (exp)	Planning Sess CHT #2 (exp)	THT (exp)	CHT #1 (exp)				
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4-Nov 7-Nov 11-Nov 14-Nov 18-Nov 21-Nov	PT #2 PT #2 PT #2 PT #2 PT #2	CFF CFF CFF CFF (rev)	CHT #2 (exp) CHT #2 CHT #2 (rev) Added Review Se	THT (exp) THT THT THT THT(rev) Desion (all groups	CHT #1 CHT #1 CHT #1 CHT #1 CHT #1 CHT #1 (rev)		(either in Ch Planning sess Study appara Consult with	E lab or compu sion (ENTIRE gr tus, make sche instructor, set data and calcu	ter room) roup, mandatory): matic, study manual up data sheets
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4-Nov 7-Nov 11-Nov 14-Nov 21-Nov 25-Nov	PT #2 PT #2 PT #2 PT #2 PT #2 (rev)	CFF CFF CFF (rev) Session (Exp. #4)	CHT #2 (exp) CHT #2 CHT #2 CHT #2 CHT #2 CHT #2 (rev) Added Review Scale - all groups! Indirections	THT (exp) THT THT THT (rev) ession (all groups ustrial Memo - Ex	CHT #1 CHT #1 CHT #1 CHT #1 (rev) periment #3 (first	drafts) due	(either in Ch Planning sess Study appara Consult with rev = review	E lab or compu sion (ENTIRE gr tus, make sche instructor, set data and calcu	ter room) roup, mandatory): matic, study manual
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		MASTER SCHEE	DLULE CHE 495	-003 FALL 2019	9			1			
Date	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	ChE 495-003	Fall 2019	Class Meetings TR 1-3:05 PM
3-Sep			Course introduct	ion & Mandatory		room 411 Herna	<u>n</u>		VERSION 1		
5-Sep	Planning Session (all groups)								4 Assignments: two heat transfer		
10-Sep	IFF (exp)	PT #2 (exp)	CHT #1 (exp)	CHT #2 (exp)	THT (exp)	CFF (exp)	CHT #3 (exp)	PT #1 (exp)	two fluid flow	(packed tower	, pipe flow)
12-Sep	IFF	PT #2	CHT #1	CHT #2	ТНТ	CFF	CHT #3	PT #1			
17-Sep	IFF	PT #2	CHT #1	CHT #2	THT	CFF	CHT #3	PT #1	Available Exp	eriments:	
19-Sep	IFF	PT #2	CHT #1	CHT #2	THT	CFF	CHT #3	PT #1	IFF (B-7) - In	compressible	Fluid Flow In Pipes
24-Sep	IFF (rev)	PT #2 (rev)	CHT #1 (rev)	CHT #2 (rev)	THT (rev)	CFF (rev)	CHT #3 (rev)	PT #1 (rev)	CFF (B-7) - C		luid Flow in Pipes
	iii (iev)	F1 #2 (16V)	CIII #1 (IEV)			CIT (TeV)	CIII #3 (IeV)	ri #1 (lev)		- Packed Towe	
26-Sep				Scholarly Paper	(first drafts) due				CHT #1 (B-7)	- Continuous	Heat Transfer #1
1-Oct				Planning Sess	ion (all groups)				CHT #2 (B-7)) - Continuous	Heat Transfer #2
3-Oct	CHT #2 (exp)	CHT #1 (exp)	PT #2 (exp)	IFF (exp)	CFF (exp)	THT (exp)	PT #1 (exp)	CHT #3 (exp)) - Continuous Transient Heat	Heat Transfer #3 Transfer
8-Oct	CHT #2	CHT #1	PT #2	IFF	CFF	THT	PT #1	CHT #3			
10-Oct	CHT #2	CHT #1	PT #2	IFF	CFF	THT	PT #1	CHT #3			
									Reporting	Exp. 1	Industrial Memo
15-Oct	CHT #2	CHT #1	PT #2	IFF	CFF	THT	PT #1	CHT #3	format:	Exp. 2 Exp. 3	Oral Presentation (PPT-pe Scholarly paper
17-Oct	CHT #2 (rev)	CHT #1 (rev)	PT #2 (rev)	IFF (rev)	CFF (rev)	THT (rev)	PT #1 (rev)	CHT #3 (rev)		Exp. 4	Oral Presentation
22-Oct			Oral Prese	entations (PPT - p	l eer audience) - Ic	cation TBA	ı	1			(PPT - Management - Pro
24-Oct		Information	Literacy - lecture	by N IIT Library S	taff - room 411 Ti	ernan Mandato	ry attendance		"Final Exam"	Oral Presenta (based on Ex	ntion (PPT-management)
		imormation	Literacy - lecture			ernan wandate	y attendance			(based on Ex	p)
29-Oct				Planning Sess	ion (all groups)	1	1	T			
31-Oct	PT #1 (exp)	CFF (exp)	CHT #3 (exp)	THT (exp)	CHT #1 (exp)	PT #2 (exp)	CHT #2 (exp)	IFF (exp)			
5-Nov	PT #1	CFF	CHT #3	THT	CHT #1	PT #2	CHT #2	IFF			
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7-Nov	PT #1	CFF	CHT #3	THT	CHT #1	PT #2	CHT #2	IFF		E lab or comp	
12-Nov	PT #1	CFF	CHT #3	THT	CHT #1	PT #2	CHT #2	IFF			group, mandatory): ematic, study manual
14-Nov	PT #1 (rev)	CFF (rev)	CHT #2 (rev)	THT (rev)	CHT #1 (rev)	PT #2 (rev)	CHT #2 (rev)	IFF (rev)			t up data sheets
19-Nov		L	L	Added Review Se	ession (all groups	5)		<u> </u>			ulations with instructor -
21-Nov		Planning S	Session (Exp. #4)	- all groups! Indu	ustrial Memo - Ex	periment #3 (first	drafts) due		MANDATORY		
26-Nov	CHT #1 (exp)	CHT #2 (exp)	IFF (exp)	PT #2 (exp)	PT #1 (exp)	CHT #3 (exp)	CFF (exp)	THT (exp)			
3-Dec	CHT #1	CHT #2	IFF	PT #2	PT #1	CHT #3	CFF	THT			
5-Dec	CHT #1	CHT #2	IFF	PT #2	PT #1	CHT #3	CFF	THT			
10-Dec	CHT #1	CHT #2	IFF	PT #2	PT #1	CHT #3	CFF	THT			
	C111 #1	CIII #2						1111			
TBA			Keview sess	ions (make apı	pointments wi	tn instructor)					
TBA		1st Draft (PP	T to Management				ndent app't	•			
	1	1	Prentation not	allowed w/o prior	CalC & Slide revie	w by instructor	1		-		+