

Course Outline

1. COURSE INFORMATION

Session Offered	Fall 2017												
Course Name	Chemical Engineering I: Mass Balances												
Course Code	PROCTECH 2CE3												
Date(s) and Time(s) of lectures	Wednesday 2:30 – 4:20 Friday 1:30 – 2:20												
Program Name	Automation Engineering Technology												
Calendar Description	Steady-State mass balances with possible recycle and reactions. Gas laws. Phase rule. Vapour-liquid equilibrium basics.												
Instructor(s)	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">C01: Kostas Apostolou</td> <td><i>E-Mail:</i> apostol@mcmaster.ca</td> </tr> <tr> <td></td> <td><i>Office Hours & Location:</i></td> </tr> <tr> <td>L01: Greg Matzke</td> <td><i>E-Mail:</i> gmatzke@mcmaster.ca</td> </tr> <tr> <td></td> <td><i>Office Hours & Location:</i> TBD</td> </tr> <tr> <td>L02-L04: Pouria Baghaei</td> <td><i>E-Mail:</i> baghaeip@mcmaster.ca</td> </tr> <tr> <td></td> <td><i>Office Hours & Location:</i> TBD</td> </tr> </table>	C01: Kostas Apostolou	<i>E-Mail:</i> apostol@mcmaster.ca		<i>Office Hours & Location:</i>	L01: Greg Matzke	<i>E-Mail:</i> gmatzke@mcmaster.ca		<i>Office Hours & Location:</i> TBD	L02-L04: Pouria Baghaei	<i>E-Mail:</i> baghaeip@mcmaster.ca		<i>Office Hours & Location:</i> TBD
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2. COURSE SPECIFICS

Course Description	Survey of Units and dimensions. Design and interpretation of flowcharts and degree of freedom analysis. Mass balance calculations on single and multi-unit processes with possible recycle, bypass, and chemical reactions. Constitutive equations for ideal and non-ideal gasses and gas mixtures. Compressibility charts. Introduction to vapour pressure. Vapour-liquid phase equilibrium for single-component.		
Instruction Type	Code	Type	Hours per term
	C	Classroom instruction	38
	L	Laboratory, workshop or fieldwork	30
	T	Tutorial	
	DE	Distance education	
	Total Hours		68
Resources	ISBN	Textbook Title & Edition	Author & Publisher
	ISBN: 978-0-470-61629-1	Elementary Principles of Chemical Processes, 4 th edition	R. Felder and R. Rousseau, John Wiley and Sons,
	Other Supplies	Source	
Prerequisite(s)	ENGTECH 1CH3, 1MC3, 1PH3 and registration in level II or above of Automation Engineering Technology		
Corequisite(s)	None		
Antirequisite(s)	None		
Course Specific Policies	The course includes a lecture component and a lab component. To pass the course: <ul style="list-style-type: none"> • A minimum of 50% for the lab component and • a minimum of 45% for the lecture component and • a minimum of 50% in the overall course grade are required.		

	<p>Exams: Absence from a test without an approved MSAF will result in a grade of zero for the test. If an approved MSAF is submitted, the weight of the missed test will be added to the final exam's weight. In case of multiple missed tests with approved MSAFs, the opportunity to write missed test(s) at an alternate date may be offered, at the discretion of the instructor.</p> <p>Practice Problems: Practice problems will not be graded. Final answers to assigned problems will be provided. Solutions to assigned problems may be posted.</p> <p>Lab Sessions: Lab coat and safety glasses must be worn in the labs at all times. No open-toe shoes will be allowed. Long pants are required. Backpacks are not allowed in the lab; please rent a locker.</p> <p>Absence from a lab without an approved MSAF form will result in a grade of zero for the lab.</p> <p>Students may have to complete a pre-lab quiz prior to attending certain labs. Details for number of labs and lab reports will be outlined during first week of labs.Lab</p>	
Departmental Policies	<p>Students must maintain a GPA of 3.5/12 to continue in the program.</p> <p>In order to achieve the required learning objectives, on average, B.Tech. students can expect to do at least 3 hours of "out-of-class" work for every scheduled hour in class. "Out-of-class" work includes reading, research, assignments and preparation for tests and examinations.</p> <p>Where group work is indicated in the course outline, such collaborative work is mandatory.</p> <p>The use of cell phones, iPods, laptops and other personal electronic devices are prohibited from the classroom during the class time, unless the instructor makes an explicit exception.</p> <p>Announcements made in class or placed on Avenue are considered to have been communicated to all students including those individuals that are not in class.</p> <p>Instructor has the right to submit work to software to identify plagiarism.</p>	
3. SUB TOPIC(S)		
Week 1	<u>Units, Process variables:</u> Units, unit conversions, significant figures, pressure, temperature and composition	Chapters 2,3
Week 2	<u>Material Balances:</u> General balance equation, Flow charts drawing, Degree_of freedom analysis	Section 4.1, 4.2
Week 3	<u>Material Balances:</u> Balances on single and multi-unit processes	Section 4.3, 4.4
Week 4	<u>Material Balances:</u> Recycle & bypass	Section 4.5
Week 5	<u>Material Balances:</u> Reaction stoichiometry, extent of reaction	Section 4.6
Mid-term Recess: Monday, October 9 to Sunday, October 15, 2017		
Week 6	Midterm1 <u>Material Balances:</u> Material balances with reactions	Section 4.7,4.8

Week 7	<u>Gasses:</u> Constitutive equations for ideal gases and mixtures	Section 5.1,5.2
Week 8	<u>Gasses:</u> Constitutive equations for non-ideal gases and mixtures	Section 5.3,5.4
Week 9	<u>Phase equilibrium:</u> Single Component Phase diagrams	Section 6.1
Week 10	<u>Phase equilibrium:</u> Vapour Pressure, Gibbs Phase law	Section 6.2
Week 11	Midterm 2 <u>Phase equilibrium:</u> Gas/Liquid systems with one condensable component	Section 6.3
Week 12	<u>Phase equilibrium:</u> Multi-component gas/liquid systems	Section 6.4
Classes end: Wednesday, December 6, 2017 Final examination period: Friday, December 8 to Thursday, December 21, 2017 All examinations MUST be written during the scheduled examination period.		
List of experiments		
Lab 1	<u>Basic Excel tools</u>	
Lab 2	<u>Fluid flow:</u> Measurement of pressure drops through pipe components	
Lab 3	<u>Shell and Tube heat exchanger:</u> Heat transfer measurement and characteristics	
Lab 4	<u>Evaporation:</u> Concentration of a sodium carbonate solution by evaporation	
Lab 5	<u>Distillation:</u> Operation of a pilot-scale distillation column at total reflux	
Lab 6	<u>Vapour Pressure:</u> Measurement of methanol's vapour pressure dependence on temperature	
Mid-term Recess: Monday, October 9 to Sunday, October 15, 2017		
Lab 7	<u>Two-Component System:</u> Phase diagram for two-component solid-liquid mixture	
Lab 8	<u>Residence Time in a CSTR:</u> Following transient concentration profile in a CSTR reactor	
Lab 9	<u>Absorption:</u> Determination of flooding conditions in a gas-liquid absorption column	
Lab 10	<u>Membrane Filtration:</u> Measurement of permeate flow rate and evaluation of membrane type	
Lab Schedule	Labs will be performed on a rotating basis. The actual lab schedule will be provided by the instructor.	
Note that this structure represents a plan and is subject to adjustment term by term. The instructor and the University reserve the right to modify elements of the course during the term. The University may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes.		
4. ASSESSMENT OF LEARNING *including dates*		Weight
In-class and on-line quizzes		10%
Mid-term tests		35%
Labs		25%
Final examination (tests cumulative knowledge)		30%
TOTAL		100%

Percentage grades will be converted to letter grades and grade points per the University calendar.

5. LEARNING OUTCOMES

1. Construct flowcharts for simple processes and interpret complex flowcharts.
2. Deconstruct complex flowcharts and perform Degree of Freedom Analysis.
3. Execute mass balance calculations on a plethora of processes with possible reactions.
4. Use constitutive equations for ideal and non-ideal gasses and mixtures.
5. Carry-out dew point, bubble point, saturation calculation for single and multi-component mixtures.
6. Identify industrial instrumentation equipment.
7. Use instruments for performing experimental procedures and measurements.
8. Critique on the validity of theoretical predictions on different experimental settings.

6. POLICIES

Anti-Discrimination

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible.

http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&Response.pdf

Academic Integrity

You are required to exhibit honestly and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, located at: <http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf>.

The following illustrates only three forms of academic dishonesty:

1. Plagiarism. E.g. the submission of work that is not own or for which other credit has been obtained
2. Improper collaboration in group work
3. Copying or using unauthorized aids in tests and examinations.

Requests for Relief for Missed Academic Term Work (Assignments, Mid-Terms, etc.)

The McMaster Student Absence Form is an on-line self-reporting tool for Undergraduate Students to report absences for:

- 1) Relief for missed academic work worth less than 25% of the final grade resulting from medical or personal situations lasting up to three calendar days:
 - Students may submit a maximum of one academic work missed request per term. It is the responsibility of the student to follow up with instructors immediately (within the 3 day period that is specified in the MSAF) regarding the nature of the accommodation. All work due in that time period however can be covered by one MSAF.
 - MSAF cannot be used to meet religious obligation or celebration of an important religious holiday, for that has already been completed or attempted or to apply for relief for any final examination or its equivalent.
- 2) For medical or personal situations lasting more than three calendar days, and/or for missed academic work worth 25% or more of the final grade, and/or for any request for relief in a term where the MSAF has not been used previously in that term:
 - Students must visit their Associate Dean's Office (Faculty Office) and provide supporting documentation.

E-Learning Policy

Consistent with the Bachelor of Technology's policy to utilize e-learning as a complement to traditional classroom instruction, students are expected to obtain appropriate passwords and accounts to access Avenue To Learn for this course. Materials will be posted by class for student download. It is expected that students will avail themselves of these materials prior to class. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail account, and program affiliation may become apparent to all other students in the course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about this disclosure please discuss this with the course instructor. Avenue can be accessed via <http://avenue.mcmaster.ca>.

Communications

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their @mcmaster.ca alias.
- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @mcmaster.ca alias.
- Check the McMaster/Avenue email and course websites on a regular basis during the term.

Turnitin (Optional)

This course will be using a web-based service (Turnitin.com) to reveal plagiarism. Students submit their assignment/work electronically to Turnitin.com where it is checked against the internet, published works and Turnitin's database for similar or identical work. If Turnitin finds similar or identical work that has not been properly cited, a report is sent to the instructor showing the student's work and the original source. The instructor reviews what Turnitin has found and then determines if he/she thinks there is a problem with the work. Students who do not wish to submit their work to Turnitin.com must still submit a copy to the instructor. No penalty will be assigned to a student who does not submit work to Turnitin.com. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, etc.). To see the Turnitin.com Policy, please go to <http://www.mcmaster.ca/academicintegrity/turnitin/students/>

Protection of Privacy Act (FIPPA)

The Freedom of Information and Protection of Privacy Act (FIPPA) applies to universities. Instructors should take care to protect student names, student numbers, grades and all other personal information at all times. For example, the submission and return of assignments and posting of grades must be done in a manner that ensures confidentiality.

<http://www.mcmaster.ca/univsec/fippa/fippa.cfm>

Academic Accommodation of Students with Disabilities Policy

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca. For further information consult McMaster's policy for Academic Accommodation of Students with Disabilities

<http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicAccommodation-StudentsWithDisabilities.pdf>

Students must forward a copy of the SAS accommodation to the instructor of each course and to the Program Administrator of the B.Tech. Program immediately upon receipt. If a student with a disability chooses NOT to take advantage of a SAS accommodation and chooses to sit for a regular exam, a petition for relief may not be filed after the examination is complete. <http://sas.mcmaster.ca>

Student Code of Conduct

The Student Code of Conduct (SCC) exists to promote the safety and security of all the students in the McMaster community and to encourage respect for others, their property and the laws of the land. McMaster University is a community which values mutual respect for the rights, responsibilities, dignity and well-being of others. The purpose of the Student Code of Conduct is to outline accepted standards of behavior that are harmonious with the goals and the well-being of the University community, and to define the procedures to be followed when students fail to meet the accepted standards of behavior. All students have the responsibility to familiarize themselves with the University regulations and the conduct expected of them while studying at McMaster University.

<http://judicialaffairs.mcmaster.ca/pdf/SCC.pdf> and <http://www.mcmaster.ca/policy/Students-AcademicStudies/StudentCode.pdf>