

Course Outline

1. COURSE INFORMATION

Session Offered	Winter 2012	
Course Name	Chemical Engineering II	
Course Code	PROC TECH 2EC3	
Program Name	Process Automation Technology	
Calendar Description	This course examines both the unit processes and engineering principles applicable to a number of industrial processes. Also, Process Instrumentation Diagrams (P and ID) will be interpreted.	
Instructor(s)	Kostas Apostolou	Phone: 905-525-9140 x:20288 E-Mail: apostol@mcmaster.ca

2. COURSE SPECIFICS

Course Description	This course first solidifies the knowledge on multiphase systems through analysis of liquid-vapor, solid-liquid, and liquid-liquid equilibrium. Energy balances are then examined for open and closed systems. Energy balance calculations with thermodynamics tables, specific heats, and phase changes are performed. Energy and mass balances with reactions close the treatment of energy balances. The final portion of the course is devoted on unit operation design with distillation and evaporation as examples.		
Instruction Type	Code	Type	Hours per term
	C	Classroom instruction	37
	L	Laboratory, workshop or fieldwork	30
	T	Tutorial	
	DE	Distance education	
	Total Hours		67
Resources	ISBN	Textbook Title & Edition	Author & Publisher
	978-0-471-68757-3	Elementary Principles of Chemical Processes, 3 rd edition, 2005	R. Felder and R. Rousseau, John Wiley and Sons
	Other Supplies	Source	
Prerequisite(s)	ENG TECH 1MT3, PROC TECH 2CE3		
Corequisite(s)	N/A		
Antirequisite(s)	N/A		
Course Specific Policies	<p>Assignments: Problems will be assigned, but will not be graded. Solutions of assigned problems will be posted. In class quizzes, based on the assigned problems, will be used as the assessment tool for the fundamental aspects of the taught material.</p> <p>Lab Sessions: Lab coat and safety glasses are required. No open-toe shoes will be allowed.</p>		

	<p>Absence from a lab without prior permission or a suitable and acceptable explanation will result in a grade of zero for the lab. Absence from two or more labs without acceptable explanation will result in a grade of F for the class.</p> <p>Students may have to complete a pre-lab quiz prior to attending certain labs.</p> <p>Lab reports:</p> <p>Lab reports are due one week from the day of performing the corresponding experiment. Reports submitted after this deadline will be penalized by 5% per calendar day. All lab reports must be submitted electronically.</p> <p>Further lab policies and rotation will be discussed during first lab session.</p>	
Departmental Policies	<p>Students must maintain a GPA of 3.5 on a 12 point scale 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>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 not in class.</p>	
3. SUB TOPIC(S)		
Week 1	Gas-Liquid systems with one condensable component; dew point; bubble point; equilibrium calculations	Ch 6.3
Week 2	Multi-component Gas/Liquid systems	Ch 6.4
Week 3	Solution of solids in liquids; Solubility; Crystallization	Ch 6.5
Week 4	Two liquid phases; Ternary diagram; Liquid/liquid extraction; Adsorption	Ch 6.6
Week 5	Energy Balance: Energy and first law of thermodynamics	Ch 7.0-7.2
Week 6	Open and closed system energy balance	Ch 7.3-7.4
Week 7	Energy balances on non-reactive systems: Steam Tables	Ch 7.5-7.7
	<i>Reading Week – No classes</i>	
Week 8	Energy balances on non-reactive systems: Specific Heats	Ch 8.0-8.3
Week 9	Energy balances on non-reactive systems: Phase Change	Ch 8.4
Week 10	Energy balances with reactions: Heat of formation and heat of reaction calculations	Ch 9.0-9.4
Week 11	Energy balances with reactions: Examples	Ch 9.5
Week 12	Unit operations: Distillation	Ext. Source
Week 13	Unit operations: Evaporation	Ext. Source
Final Examination	Saturday April 7, 2012 to Wednesday April 25, 2012	
Proposed list of experiments		
Lab 1	Evaporator: Steam Economy	
Lab 2	Fluid flow: Pressure drop	
Lab 3	Distillation: Finite Reflux	
Lab 4	Absorption: CO ₂ Absorption	
Lab 5	CSTR: Reactors in Series	
Lab 6	Filter Press	
Lab 7	Phosphate Precipitation	
Lab 8	Membrane Filtration	

Lab 9	Metal Precipitation
Lab 10	Instrumentation
Lab schedule	Some of the labs will be performed on a rotating basis. The actual lab schedule will be provided by the instructor
<p>Note 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.</p>	
4. ASSESSMENT OF LEARNING	
	Weight
Assignments/Quizzes	15%
Term Test 1	15%
Term Test 2	15%
Labs	25%
Final Examination	30%
TOTAL	100%
<p>Course results determined on a percentage scale will be converted to an official letter grade, as indicated in the Undergraduate Calendar. The results of all courses attempted will appear on your transcript as letter grades.</p>	
5. LEARNING OUTCOMES	
1. Execute mass balance calculations on vapour/liquid, solid/liquid and liquid/liquid systems	
2. Implement the multiphase equilibrium principles in calculations for liquid/liquid extraction, drying, crystallization, and other unit operations	
3. Apply the concept of conservation of energy in formulation of energy balances for open and closed systems	
4. Implement use of thermodynamic tables in energy balance calculations with possible phase change	
5. Integrate energy balances with reaction principles and mass balances to perform calculations on processes with reactions	
6. Perform preliminary design calculations for distillation columns and evaporators	
7. Use instruments for performing experimental procedures and measurements.	
8. Critique on the validity of theoretical predictions on different experimental settings.	
9. Construct and read P&ID diagrams	
6. POLICIES	
Anti-Discrimination	
<p>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/Anti-Discrimination%20policy.pdf</p>	
Academic Integrity	
<p>Attention is drawn to the Statement on Academic Ethics and the Senate Resolutions on Academic Dishonesty as found in the Senate Policy Statements distributed at registration and available in the Senate Office. Any student who infringes one of these resolutions will be treated according to the published policy.</p> <p>Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and 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.</p> <p>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, specifically Appendix</p>	

3, located at: <http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf>

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

The McMaster Student Absence Form is a self reporting tool for **Undergraduate Students** to report absences that last up to 5 days and provides the ability to request accommodation for any missed academic work. Please note this tool cannot be used during any final examination period.

You may submit a maximum of 1 Academic Work Missed requests per term. It is YOUR responsibility to follow up with your Instructor immediately regarding the nature of the accommodation.

If you are absent more than 5 days or exceed 1 request per term you MUST visit your Associate Dean's Office (Faculty Office). You may be required to provide supporting documentation.

This form should be filled out immediately when you are about to return to class after your absence.
<http://www.mcmaster.ca/msaf/>

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. 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 will be expected to submit their work electronically to Turnitin.com and in hard copy so that it can be checked for academic dishonesty. 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/>

Protection of Privacy Act (FIPPA)

The Freedom of Privacy 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

Student Accessibility Services (SAS) is committed to the continuous improvement of accessibility for students with disabilities. Students are encouraged to contact SAS as early as possible before each term starts to become familiar with the services offered and to confirm their accommodations.

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>