ENGINEERING
McMaster-Mohawk
Bachelor of Technology
Partnership

McMaster University

Course Outline

1. COURSE INFORMATION

Session Offered	Fall 2021	
Course Name	**Chemistry**	
Course Code	**ENGTECH 1CH3**	
Date(s) and Time(s) of lectures	Depends on section	
Program Name	Automotive & Vehicle Technology, Biotechnology, Process Automation	
Calendar Description	This course is designed to give students a working knowledge of the most important chemical principles as the foundation for study of more advanced topics such as chemical analysis, inorganic and applied chemistry. The course covers basic chemical laboratory procedures. Course topics include chemical formulae and equations, chemical stoichiometry, nomenclature, acids and bases, gases, chemical equilibrium, thermochemistry and thermodynamics, redox reactions.	
Instructor(s)	**Dr. Bogdanova** **C01** (Mon-6:30pm-8:20pm) **L01/L02**(Tue-1:30pm-4:20pm) **L05/L06** (Wed 10:30am-1:20pm) **L11/L12** (Fri-12:30pm-3:20pm) **L13/L14** (Fri 3:30pm-6:20pm) **T02-TUT** (Tue 4:30pm-6:20pm) **T04-TUT** (Wed 8:30am-10:20am) **T06-TUT** (Mon 4:30pm-6:20pm)	E-Mail: Office Hours & Location: E-mail: bogdanz@mcmaster.ca Office Hours: by arrangements

	Ms. Ladanyi **C02** (Thur-4:30pm-6:20pm) **L07/L08** (Wed-1:30pm-4:20pm) **T01-TUT** (Tue 2:30pm-4:20pm) **T03-TUT** (Fri 4:30pm-6:20pm) **T05-TUT** (Mon 6:30pm-8:20pm)	E-mail: ladanyi@mcmaster.ca Office Hours: by arrangements
	Dr. Cristofoli **L03/L04** (Tue 4:30pm-7:20pm)	E-Mail: cristofw@mcmaster.ca: Office Hours: by arrangements
	Mr. Nihar **L09/L10** (Fri 8:30am-11:20am)	E-mail: nishaar@mcmaster.ca Office Hours: by arrangements

2. COURSE SPECIFICS

Course Description

Instruction Type

Code	Type	Hours per term
C	Classroom instruction	24
L	Laboratory - virtual	18
T	Tutorial	24
	Total Hours	66

Resources
IT IS MANDATORY TO BUY THE BOOK AS IT COMES WITH LABS ACCESS

ISBN	Textbook Title & Edition	Author & Publisher
ISBN: 1264243650	**Chemistry - 14th Edition**	Raymond Chang and Jason Overby McGraw Hill Education

Prerequisite(s): Registration in B. Tech I

Corequisite(s)	
Antirequisite(s)	
Course Specific Policies	**1. Attendance and Participation** - regular attendance and active participation in all classroom sessions are essential for success in this course. **2.** All marks will be posted on Avenue. It is your responsibility to report any discrepancies to your instructor ASAP (before the last day of the semester). No errors will be corrected unless reported until this time. **3. Assignments and Tests - Absences and Re-writes.** All assignments and tests must be written online and must be submitted by the stated deadlines. Late quizzes and assignments will not be accepted. There are no re-writes on Assignments and Tests under any circumstance. If you miss an assignment or test because of an emergency, you must contact the professor no later than the next two business days and send MSAF. After receiving your MSAF, the weight of the missing assignment and test will be added to the final exam. Students who fail to send MSAF will be considered "absentees" and will be assigned a grade of zero for the task. Students who fail a test will not be permitted to rewrite the test under any circumstance. Students with special needs must follow inform the professor through McMaster Disability Services of their requirements at least five days prior to the test date so that alternative arrangements can be made. **4. Labs.** A three-hour virtual lab will be performed **every other week**. Students are expected to complete all 6 virtual labs and to submit 5 lab reports (one per experiment, excluding the first Introduction lab). If you miss a lab because of an emergency or sickness, you must contact the instructor on the same day (ASAP). You must submit a MSAF and make alternate arrangements to do the lab. Failure to do so will automatically result in a grade of 0 for the missed experiment. Students are expected to be ready at least 5 minutes before the scheduled start time of the lab as they will have exactly 2 hours and 30 minutes available to complete the experiment. Reports are due right after completion of the laboratory work. Students who fail to complete the reports will not be permitted to rewrite them under any circumstance.
Departmental Policies	Students must maintain a GPA of 3.5/12 to continue in the program. 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. Where group work is indicated in the course outline, such collaborative work is mandatory. 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. 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. Instructor has the right to submit work to software to identify plagiarism.	
3. SUB TOPIC(S)		
Week 1	**Atoms, Moles, and Molecules** Matter and property of matter, mixtures and pure substances, physical and chemical properties, the mass-volume-density relationship, equivalencies and unit factors, factor-label method, atomic theory, the Laws of Definite and Multiple Proportions, the Law of Conservation of Mass, atomic mass units, Avogadro's Number, molar mass, diatomic molecules, and percentage composition by mass.	Module 1 Text – Chapters 1,2,3
Week 2	**Atoms, Moles, and Molecules (2)** Mater and property of matter, mixtures and pure substances, physical and chemical properties, the mass-volume-density relationship, equivalencies and unit factors, factor-label method, atomic theory, the Laws of Definite and Multiple Proportions, the Law of Conservation of Mass, atomic mass units, Avogadro's Number, molar mass, diatomic molecules, and percentage composition by mass.	Module 1 Text – Chapters 1,2,3
Week 3	**Reactions and Equations (1)** Chemical reactions and chemical equations, balancing chemical equations, stoichiometry and stoichiometric coefficients, the mole method, stoichiometric calculations, limiting and excess reagents, and yields (theoretical, actual, and percentage).	Module 2 Text – Chapter 3
Week 4	**Reactions and Equations (2)**	Module 2 Text – Chapter 3

	Chemical reactions and chemical equations, balancing chemical equations, stoichiometry and stoichiometric coefficients, the mole method, stoichiometric calculations, limiting and excess reagents, and yields (theoretical, actual, and percentage).	
Week 5	**Nomenclature** Naming ionic compounds, molecular compounds, binary acids, and oxoacids by using different systems in current use and naming hydrates. **MIDTERM 1**	Module 3 Text – Chapters 2,4
Week 6	Midterm Recess: Monday, October 12 to Sunday, October 18, 2020	
Week 7	**Aqueous Solutions (1)** Solution composition, electrolytes, solubility and solubility rules, molecular, ionic and net-ionic equations, concentration (% w/v, % w/w, g/L, ppm, ppb, M), dilution and the Dilution Law, and stoichiometric calculations.	Module 4 Text – Chapter 4,12
Week 8	**Aqueous Solutions (2)** Solution composition, electrolytes, solubility and solubility rules, molecular, ionic and net-ionic equations, concentration (% w/v, % w/w, g/L, ppm, ppb, M), dilution and the Dilution Law, and stoichiometric calculations	Module 4 Text – Chapter 4,12
Week 9	**Acids and Bases in Aqueous Media** Arrhenius acids and bases, Brønsted acids and bases, strong and weak acids and bases, acid-base titrations and stoichiometry, standard solutions, indicators, pH/pOH calculations, and the pH scale.	Module 5 Text – Chapters 4,15
Week 10	**Gases** Topics covered include pressure and atmospheric pressure, temperature scales, Boyle's Law, Charles's Law, Gay-Lussac's Law, Avogadro's Law, the Combined Gas Law, the Ideal Gas Law, STP, Dalton's Law of Partial Pressure, mole fractions, and related stoichiometric calculations.	Module 6 Text – Chapter 5

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	MIDTERM 2	
Week 11	**Equilibrium** Reversible reactions, equilibrium constants, the Law of Mass Action, homogeneous and heterogeneous equilibria, the reaction quotient, Le Châtelier's Principle.	Module 7 Text – Chapter 14
Week 12	**Thermochemistry** Heat capacity, specific heat capacity, calorimetry, enthalpy, standard enthalpy, standard enthalpy of formation, Hess's Law (Methods Indirect and Direct)	Module 8 Text – Chapter 6
Week 13	**Thermodynamics** The first law of Thermodynamics, the Second Law of Thermodynamics, and Gibbs Free Energy	Module 8 Text – Chapter 6
Week 14	**Redox Reactions** Oxidation numbers, balancing redox reactions, oxidizing acids, single replacement reactions, and the activity series	Module 9 Text – Chapter 18
Classes end: Wednesday, December 8th, 2021 Final Examination Period: Thursday, December 9 to Wednesday, December 22 All examinations MUST be written during the scheduled examination period.		
List of experiments		
Lab 1	**Introduction – Virtua Lab Tutorial and Lab Skills. Personal Safety** Do hands-on chemistry; Connect chemical practice to theory; Organize and produce written reports. Students have to complete the virtual lab but with no grade (only to get used to the software).	
Lab 2	**Introduction – Virtual Lab tutorial and Lab Skills. Personal Safety** Do hands-on chemistry; Connect chemical practice to theory; Organize and produce written reports. Students have to complete the virtual lab but with no grade (only to get used to the software).	
Lab 3	**Titration - Concentration of Vinegar**	
Lab 4	**Titration - Concentration of Vinegar**	
Lab 5	**Stoichiometry – Synthesis of Calcium Carbonate**	
Lab 6	**Stoichiometry – Synthesis of Calcium Carbonate**	
Lab 7	**Reactions – Reactions in Solution**	
Lab 8	**Reactions – Reactions in Solution**	
Lab 9	**Gas Law – Ideal Gas Law Constant**	
Lab 10	**Gas Law – Ideal Gas Law Constant**	

Lab 11	**Calorimetry – Heat Capacity of a Colorimeter**
Lab 12	**Calorimetry – Heat Capacity of a Colorimeter**

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**
Assignments	15 (4 x 3.75%)
2 Mid-term tests	30 (2 x 15%)
Labs	15 (5 x 3%)
Final examination (tests cumulative knowledge)	40
TOTAL	**100%**

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

5. LEARNING OUTCOMES

1. To review and apply the concepts of chemical symbols, formulae, atoms and molecules, the mole (mol), and stoichiometry of chemical compounds and chemical composition.
2. To discuss the most important rules and concepts for writing chemical reactions as standard equations, to calculate reacting amounts and yields of products, and to determine theoretical and percentage yields using reactions of industrial importance
3. To name chemical compounds using different systems in current use and to demonstrate a basic vocabulary of compounds by name and formula.
4. To define appropriate terms and make calculations in the use of chemicals in solutions, including units, solution preparation and solution reaction stoichiometry.
5. To define basic terms and explain the importance of Arrhenius and Bronsted acids and bases and the pH/pOH concept, and to perform calculations involving acid-base stoichiometry and simple titrations.
6. To apply the Ideal Gas Law equation, Avogadro's Law and Dalton's Law to mass relationships and stoichiometry where the product is a gas or a mixture of gases.
7. To explain reversible reactions, equilibrium constants, and Le Chatelier's Principle and apply them to a variety of chemical reactions.
8. To define the basic terms associated with thermochemistry and thermodynamics including specific heat capacity and Hess' Law, to apply Hess' Law to calculate heat changes associated with a variety of chemical reactions, and to explain the First and Second Laws of Thermodynamics and the Gibbs Free Energy term.
9. To define oxidation numbers and assign them by using simple rules and to balance a variety of oxidation-reduction (redox) reactions.

6. COURSE OUTLINE – APPROVED ADVISORY STATEMENTS

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 expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. It is your responsibility to understand what constitutes academic dishonesty.

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. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/

The following illustrates only three forms of academic dishonesty: The following illustrates only three forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

AUTHENTICITY / PLAGIARISM DETECTION

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com, please go to www.mcmaster.ca/academicintegrity.

COURSES WITH AN ON-LINE ELEMENT

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

ONLINE PROCTORING

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

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.

CONDUCT EXPECTATIONS

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the Code of Student Rights & Responsibilities (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, whether in person or online.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy.

REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK

McMaster Student Absence Form (MSAF): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests. http://www.mcmaster.ca/policy/Students-AcademicStudies/Studentcode.pdf

COPYRIGHT AND RECORDING

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, including lectures by University instructors

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

EXTREME CIRCUMSTANCES

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.