

Course Outline

1. COURSE INFORMATION			
Session Offered	Winter 2021		
Course Name	Analytical Chemistry		
Course Code	ENGTECH 1AC3		
Date(s) and Time(s) of lectures	C01: Mon 12:30PM - 2:30PM; Fri 11:30AM - 12:20AM C02: Mon 10:30AM - 12:20PM; Wed 10:30AM - 11:20AM C03: Thur 10:30AM - 11:20AM; Fri 12:30PM - 2:30PM		
Program Name	Biotechnology; Automation Engineering Technology		
Calendar Description	Introduction to laboratory procedures used in chemical analysis for classical wet and instrumental methods, statistical data treatment, gravimetric analysis, volumetric analysis, pH measurements and optical methods. Three-hour lectures, one lab (three hours) per week; one term		
Instructor(s)	Lectures Dr. Amin Rajabzadeh – C01, C03 Dr. Zoi Bogdanova – C02	Office Hours: by appointment only E-Mail: rajaba@mcmaster.ca E-Mail: bogdanz@mcmaster.ca	
	Lab Instructors: Dr. Zoi Bogdanova – L01, L02, L03, L06, L08 Ms. Nicoletta Ladanyi – L04, L05, L07, L09	Office Hours: by appointment only E-Mail: bogdanz@mcmaster.ca E-mail: ladanyi@mcmaster.ca	
2. COURSE SPECIFICS			
Course Description			
Instruction Type	Code	Type	Hours per term
	C	Online Classroom instruction	39
	L	Virtual Laboratory, workshop or fieldwork	36
	T	Tutorial	0
	DE	Distance education	0
	Total Hours		75
Resources	ISBN	Textbook Title & Edition	Author & Publisher
	ISBN: 978-1-285-19023-5 IT IS MANDATORY TO BUY THE BOOK AS IT COMES WITH VIRTUAL LABS ACCESS	Fundamentals of Analytical Chemistry with lab access - Online package for multiple term "OWL"	Douglas A. Skoog; Donald M. West; F. James Holler; Stanley R. Crouch <i>Cengage Learning</i>
ISBN: 978-1-264-16792-0 IF YOU DON'T HAVE IT FROM FALL 2020, IT IS MANDATORY TO BUY THE BOOK WITH LABS ACCESS	Chemistry - Online package with 1-year access "Connect"	Chang, R. <i>McGraw Hill Education</i>	

	Other Supplies	Source
	ISBN: 978-1-319-27402-3	Quantitative Chemical Analysis, Tenth Edition, 2020, Daniel C. Harris, Charles A. Lucy, <i>Macmillan Learning</i> http://avenue.mcmaster.ca
Prerequisite(s)	ENGTECH 1CH3 and registration in Biotechnology or Automation Engineering Technology	
Corequisite(s)	n/a	
Antirequisite(s)	n/a	
Course Specific Policies	<p>1. Attendance and Participation <u>Regular attendance and active participation in all classroom sessions are essential for success in this course.</u></p> <p>2. All grades will be posted on Avenue to Learn. 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.</p> <p>3. Quizzes, Assignments and Tests All quizzes, assignments and tests must be written online and must be submitted by the stated deadlines. Late quizzes and assignments will not be accepted.</p> <p>There are <u>no re-writes on Quizzes, Assignments and Tests</u> under any circumstance. If you miss a quiz, assignment or test because of an emergency, you must contact the professor no later than the next two business days and send MSAF. <u>After receiving your MSAF, the weight of the missing quiz, assignment and test will be added to the final exam.</u> Students who fail to send MSAF will be considered “absentees” and will be assigned a grade of zero for the task.</p> <p>4. Labs A three-hour virtual lab will be performed every week. Students are expected to attend and complete all 12 virtual lab sessions and to submit 10 lab reports (one per experiment, excluding the first two introductory lab sessions). Absence from a lab will result in a grade of zero for that lab. If a student misses a lab but provides a MSAF, then the final lab mark will be calculated based on the remaining labs.</p> <p>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.</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 (Module 1)	An introduction to Analytical methods	Chapter 1
Week 2 (Module 1)	Chemical, apparatus, and unit operations of analytical chemistry	Chapters 2
Week 3 (Module 2)	Errors in Chemical Analysis – Statistical treatment	Chapter 5 and 6
Weeks 4 and 5 (Module 3)	Statistical data treatment and evaluation – Quality assurance	Chapter 7
Week 5 (Module 4)	Gravimetric analysis – unit dimensional analysis Gravimetric factor, and percent composition	Chapter 12
Week 6	Midterm Recess	
Week 7 (Module 5)	Chemical Equilibria Solubility and solubility product constant	Chapters 9 and 11
Week 8 (Module 5)	Precipitation titration analysis Argentometric Titrations	Chapter 17
Week 9 (Module 6)	Chemical Equilibria Monoprotic and polyprotic acid-base equilibria	Chapter 9
Weeks 10 and 11 (Module 6)	Complex acid and base systems Acidic, basic, and neutral salts Buffer solutions	Chapter 15
Week 11 (Module 6)	Principles of neutralization titration-indicators	Chapters 14
Week 12 (Module 7)	Fundamentals of spectrophotometry Properties of electromagnetic radiation	Chapter 24
Week 13 (Module 7)	Spectroscopic Methods Instrumental analysis	Chapter 24
Week 14 (if time allows)	Fundamentals of electrochemistry Electrodes and potentiometry	Chapter 20
Midterm Recess: Monday, February 15 to Sunday, February 21 Classes end: Wednesday, April 14 Final Examination Period: Thursday, April 15 to Friday, April 30		

All examinations MUST be written during the scheduled examination period

List of experiments

Lab 0 - Introduction to Laboratory Procedures (no report needed) Jan.18-22, 2021	Virtual lab Tutorial and Registration on Cengage OWL and McGraw Hill Connect.
Lab 1 - (Cengage OWL) Jan. 25-29, 2021	An Introduction to the Use of the Analytical Balance. Report writing. Significant figures and Errors Analysis
Lab 2 - (Cengage OWL) Feb. 1-5, 2021	Using Glassware and Preparing Solutions, Measuring pH
Lab 3 - (Cengage OWL) Feb. 8-12, 2021	Titration, Filtration, Recrystallization
Feb.15 -19, 2021	Midterm Recess
Lab 4 - (Cengage OWL) Feb. 22-26, 2021	Qualitative Tests and Calculations
Lab 5 - (McGraw Hill Connect) March 1-5, 2021	Identify weak acid using titration curve
Lab 6 - (McGraw Hill Connect) March 8-12, 2021	Synthesis of Calcium Carbonate – Precipitation Titration
Lab 7 - (McGraw Hill Connect) March 15-19, 2021	Equilibrium
Lab 8 - (McGraw Hill Connect) March 22-26, 2021	Buffers
Lab 9 - (Video and data provided on Avenue to Learn) March 29-April 2, 2021	Calibration and Use of a pH Meter. Determination of Alkalinity in Water Using Titration Curves
Lab 10 - (Video and data provided on Avenue to Learn) April 5-9, 2021	Method of Standard Addition. Spectrophotometric Determination of Potassium Chromate Content in a Sample by the method of Standard Addition

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	20
Term Tests	20
Labs	25
Final examination (tests cumulative knowledge)	35
TOTAL	100%

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

5. LEARNING OUTCOMES

- Describe the basic principles to perform quantitative chemical analysis

- Interpret terminology and describe methods of analysis found in an analytical laboratory
- Apply statistical methods to evaluate analytical data and interpret results
- Apply equilibrium calculations to complex systems
- Explain and apply the theory of gravimetric and volumetric analysis and titration
- Explain and apply the theory of spectrophotometric analysis
- Develop analytical problem-solving skills
- Demonstrate the ability to work effectively and perform different laboratory activities
- Communicate experimental results in written and oral formats

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.