

# CHEM 32 (93799): General Chemistry Fall 2020\*

## I. Lecture

**Lecturer:** Erik Ruggles, Ph.D.

**Office:** The Internet Ethereal (Innovation 333)

**Email:** [Erik.Ruggles@uvm.edu](mailto:Erik.Ruggles@uvm.edu)

**Office Hours:** Mon, Wed, Fri, 1:10pm-2:00pm  
Or by appointment (Virtual Chat using [Teams](#))

**Virtual Class Time:** M, W, F, 1:10-2:00pm

**Location:** Your Work Station using [Teams](#)

**Textbook:** If you've taken Chem31 at UVM recently, then probably have all the materials necessary for Chem32. If not, there are four options to purchase "**Chemistry Structure and Properties**" 2<sup>nd</sup> Ed., by Tro (Pearson Publishing; Full text ISBN-13: 978-0-13-429393-6) along with **Mastering Chemistry online access**. 1) The full textbook and mastering can be bought on Pearson's online site (~\$300; text and mastering), or 2) at the UVM bookstore (~\$160; UVM custom textbook, solutions manual, and mastering), or 3) just digital access (~\$120; etext and mastering) or 4) purchase a used textbook and MasteringChemistry (~\$75 mastering separately). *The digital solutions manual will be provided for free but also comes with the UVM package and has the complete solutions to all the assigned problems. **The most bang for your buck is the UVM bookstore package (option 2), but the most economical (option 4).***

**Assignments and Lecture:** The homework assignments are broken down into Modules and can be found in BlackBoard (BB) under the **2. Assignments** link. Each module contains Lecture Videos, Homework Problem Sets, and Homework Video Examples of Problems (for extra help). ***These will be assigned after each class period and you are expected to watch the lecture(s) and attempt the homework prior to the next virtual class time.*** The Video Lectures for discussions on Mondays, Wednesdays and Fridays will be used to cover new material and concepts along with sample problem solving. The Homework Problem Sets will strengthen your connection between concept and the mathematics that describes the concept. I strongly encourage you to do as many problems as possible, the more you practice the better you will get. Use the Homework Problem Video Examples for extra help. My video lecture notes as well as in class discussions will be posted in pdf format on BB (**4. Course Materials** link). In class discussions will be recorded and then posted in video format on [Teams](#).

**Virtual Class Time:** Class will be held virtually from 1:10pm-2:00pm Monday, Wednesday and Friday. Class is meant for question and answers. Questions could be homework related, lecture related, exam related, etc. The homework assigned should be finished prior to class discussion as I want to use this time to clarify lecture concepts and homework problems. I will be omnipresent on **5. Discussion Boards** (within BB) for question and answer as well. I will also be available by email as much as possible.

**Office Hours:** Our virtual class time is pretty much the same as office hours. However, if you have questions outside of class, questions of a more personal nature or feel the need to meet in private then feel free to set up an individual meeting with me via email that fits both of our schedules.

**Extra Practice:** For added examples, blank old exams from my 2019 and 2018 classes, SI Sessions, as well as their answer keys are posted on BB within **4. Course Materials**. Remember that even though questions will change from year to year, the concepts will remain the same. **Do not study with just the old exams!** The Meat and Potatoes, or Seitan and Broccoli, is in the Homework Problems. Also there are homework problem videos posted on Blackboard for extra “at-home” help.

**Recitations:** Throughout the semester I will hold recitations on the Wednesday evening from 6:45-7:45 pm on [Teams](#). The Sunday before a mid-semester exam I will hold an exam review session from 11:00am-12:30pm also on [Teams](#). These problem sessions are meant to address your questions about lecture topics and/or homework problem solving, so come prepared with questions. Review sessions will be recorded and then posted in video format on [Teams](#).

**Homework Quizzes:** There will be ten graded homework quizzes (best 10 out of 10) during the semester. These assignments will occur once we finish a chapter and will be found in MasteringChemistry. To access, log in to BB and follow the **3. MasteringChemistry** link. You will have several days to complete each assignment, but I would not wait until the last moment.

**Exams:** The exams are scheduled to be open on **Wednesdays from 6:40pm-9:40pm. Exams will be taken on BlackBoard at the digression of the student.** There are no scheduled make up dates. The three Mid-Semester Exams are the same regardless of Chem32 Section, so all Chem32 students are being tested the same. The Mid-Semester Exams are written to take 1.5 hours to complete, but every student has a full 3 hours to take the exam (*double time already provided to all, so ACCESS time accommodations not applicable*). The only exception to this is the Final Exam (ACCESS time accommodations will be allowed). To get your full time on the exam you would want to start before 6pm, as the exam closes right at 9pm. All exams and quizzes can be accessed after their due dates for practice, save for the final exam. While I do not mind discussing the final, copies of the final exam will not be distributed. While taking the exams only non-programmable non-graphing calculators are permitted. No other electronic devices are allowed (i.e. no cell phones, mp3 players, ipods, etc.). **Students caught using sources other than themselves as well as any other electronic device other than a non-programmable non-graphing calculator will receive a zero for the exam.**

**Exam Dates:**

<b>September 23</b>	Exam 1
<b>October 21</b>	Exam 2
<b>October 29</b>	Last Day to Withdraw
<b>November 18</b>	Exam 3
<b>December XX</b>	Final Exam

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\*All times are on Vermont time

## II. Laboratory normal

**Lab Manuals:** All experiments can be found online on your lab's BB website as individual pdfs. Please make sure you ***print out each experiment and bring to lab.***

**Lab Notebook:** A notebook with carbon-less copies is required for recording lab data. All data is to be recorded in ink (not pencil). A carbon-less copy lab notebook can be bought at UVM's bookstore.

**Safety Eye Wear:** Everyone in the lab must wear OSHA approved (EZ87stamped) safety glasses or goggles once any experimentation has been started. Students not observing this rule will receive a **ZERO** for the experiment, warnings will not be given. Safety eyewear can be purchased at the UVM bookstore or in the Discovery Building stockroom. ***Contact Lenses are a potential health hazard and can be worn in the laboratory only if no other types of corrective lenses are available. If you have to wear contact lenses then you must wear goggles and please let your TA know.***

**COVID-19 Safety Masks:** Safety masks compliant with UVM standards need to be worn at all times. Students not observing this rule will receive a **ZERO** for the experiment, warnings will not be given. These have been provided to you from UVM.

**Lab Attire:** This is a chemical laboratory dress appropriately! It is best to wear full pants and a shirt with at least short sleeves. Shorts and short pants (capris, crops, etc.) are not allowed in the laboratory. Shirts that expose the shoulders, midriff, or back are also not allowed. Proper footwear is also necessary in the laboratory. Full shoes, preferably constructed of leather or other chemically resistant material, should be worn in when in the laboratory. Open toed shoes, open backed shoes, and shoes that expose the top or other portions of the foot are not allowed. If you arrive at lab in inappropriate attire, you will not be allowed to perform the experiment that day.

**Prior to Start of Lab:** Purchase your lab manual, lab notebook, and safety glasses. Also, on Blackboard review and complete the Safety Presentation and Safety Quiz. ***If you have not purchased or completed these items you will not be able to begin the lab portion of the course.***

**Attendance:** Students must attend the lab section they are assigned to. If more than two labs are missed you will receive an **F** for the course. Only the academic dean of your college may grant an incomplete. An unexcused absence will result in a **ZERO** grade for the laboratory experiment. Official documentation of sickness or a family crisis is required for an excused absence. If there is a need to reschedule your lab time to one that is not your assigned time you must obtain permission from me a week in advance.

**Lab Videos:** Prior to attending your lab it is mandatory to view the video that accompanies the lab. These videos demonstrate the proper use of new equipment and the safe handling of chemicals. Videos can be found at: <https://www.youtube.com/channel/UC8r6fR2K-8xAtsf-a8edMg>.

### III. Course Grade

#### Percent Ranges for Grades:

I cannot say in advance which point ranges correspond to which letter grades, but I will give approximate correlations throughout the semester following each of the exams. Please note that you are not competing with each other for grades in this course: if everyone scores in the "A-range," I will give everyone "A"s for the course (really!). I encourage you all to work together as you study, to help each other learn the material, but do also recognize that all graded work must be solely your own, so be prepared to work independently to demonstrate your mastery of the material.

#### How to Calculate Your Points:

- 1) Class = **750 total points** (75% of grade; exams and homework)
- 1a) Mid-Semester Exams = **375 points** (125 points/exam)
- 1b) Homework = **125 points** (12.5 points/assignment)
- 1c) Final Exam = **250 points**

There are three mid-semester exams (each 125 points) and a final exam (250 points). If your final is your lowest grade it will count only as one unit. If one of the mid-semester exams is your lowest grade then your final will count as two units. The lowest mid-semester exam grade will be replaced by the percentage on the final. If you are absent from an exam official documentation of sickness or family crisis is required or you will receive a **ZERO** for the exam. Students with legitimate excuses will be permitted to take the exam early. Except in very unusual circumstances makeup exams will not be administered after the scheduled exam time.

Example 1:	Exam 1	Exam 2	Exam 3	Final
Actual Scores:	106.25 (85%)	56.25 (45%)	97.5 (78%)	187.5 (75%)
Counted Scores:	106.25 (85%)	93.75 (75%)	97.5 (78%)	187.5 (75%)
Homework Score:	105.0 (84%)	Class Points = 485.0 exam + 105.0 homework		
Total = 590.0 points				

Example 2:	Exam 1	Exam 2	Exam 3	Final
Actual:	87.5 (70%)	97.5 (78%)	95.0 (76%)	170.0 (68%)
Counted:	87.5 (70%)	97.5 (78%)	95.0 (76%)	170.0 (68%)
Homework Score:	87.5 (70%)	Class Points = 446.25 exam + 87.5 homework		
Total = 537.5 points				

2) Laboratory = **250 lab points** (25% of grade)

Safety Quiz	1 point
Prelab (3 pts/per)	27 points
Lab Reports (15 pts/per)	100 points
Quizzes (8 pts/per)	<u>72 points</u>
	250 points

3) Course Grade Determination

Add up your points from class and lab and then use the chart at the beginning of this section to determine your course grade.

Example 1:

$$\begin{array}{r} 590.0 \text{ class points} \\ + \quad \underline{200 \text{ lab points}} \\ \hline 790.0 \text{ total points} / 1000 \text{ points} = 79.00\% \end{array}$$

Example 2:

$$\begin{array}{r} 537.5 \text{ class points} \\ + \quad \underline{200 \text{ lab points}} \\ \hline 737.5 \text{ total points} / 1000 \text{ points} = 73.75\% \end{array}$$

**To summarize:**

$$[(\text{Ex1} + \text{Ex2} + \text{Ex3} + \text{Final} + \text{Homework} + \text{Lab}) = \text{Total Points}]$$

$$[(\text{Total Points}) / 1000] \times 100 = \text{Total Percent}$$

## Academic Integrity

**Offenses against the Code of Academic Integrity (i.e. cheating) are deemed serious and insult the integrity of the entire academic community. Any suspected violations of the code are taken very seriously and will be forwarded to the Center for Student Ethics and Standards for further investigation.**

<http://www.uvm.edu/policies/student/acadintegrity.pdf>

## IV. Tentative Lecture Schedule and End-of-Chapter Homework

<u>Dates</u>	<u>Chapters</u>	<u>Homework Problems (Learning Objectives)</u>
Aug 31 - Sept 4	Syllabus	(Class Dynamics)
	13	Ch13: 25,27,29,31,33,35,37,43,45,47,49,51, 59,63,65,67,69,71,73,77,79,81,83,85,87,89,93, 97,99,105,109,115 ( <u>Module13</u> : Solution Concentration, Temperature Effects, Colligative Properties, Melting and Boiling Points, Osmotic Pressure)
<b>Sept 7</b>	<b>LABOR DAY HOLIDAY</b>	
Sept 7 - 11	13 and 14	Ch14: 27,29,31,37,41,45,47,53,55,59,65,71, 75,77,83,89,91,95,103,105,107 ( <u>Module14</u> : Chemical Kinetics, Rate Laws, Integrated Rate Laws, Mechanism, Temperature Effects)
<b>Sept 14</b>	<b>LAST DAY TO ADD/DROP COURSE</b>	
Sept 14 - 18	14	
<b>Sept 23</b>	<b>EXAM 1**</b>	<b>Chapters 13 and 14**</b>
Sept 21 - 25	15	Ch15: 21,23,27,29,31,33,35,37,39,41,45,47, 49,53,55,59,63,65,67,69,71,73,75,79,81,83,89 ( <u>Module15</u> : Chemical Equilibrium, $K_c$ , $K_p$ , and Le Châtelier)
Sept 28 - Oct 2	15 and 16	Ch16: 31,33,35,37,39,41,45,49,51,55,59,61, 65,67,69,71,75,79,81,83,85,87,89,91,95,97,99, 101,103,107,109,111,113,115,117,121,123, 127,129,133,141 (Module 16: Acid-Base Reactions and Equilibria, Conjugate Acid/Conjugate Base Equilibria, Polyprotics)
Oct 5 - 9	16	
Oct 12 -16	16	
<b>Oct 21</b>	<b>EXAM 2**</b>	<b>Chapters 15 and 16**</b>

\*\*Extent of exam material will depend on our progress in lecture.

<u>Dates</u>	<u>Chapters</u>	<u>Homework Problems (Learning Objectives)</u>
Oct 19 – 23	17	Ch17: 25,27,29,31,33,35,39,41,43,45,49,51, 53,57,59,61,63,65,67,69,71,75,81,83,85,87,93, 95,97,103,105,111,113,115,121,125 (Module17: Buffers, Titrations, and Solubility Equilibria)
<b>Oct 29</b>	<b>LAST DAY TO WITHDRAW FROM COURSE</b>	
Oct 26-30	17	
Nov 2 - 6	17 and 18	Ch18:31,35,37,39,41,45,47,51,53,55,59,61, 67,71,73,75,85,87,93,101 (Module18: Entropy, Gibbs Free Energy, Free Energy and Equilibrium, Standard State and Non-Standard State)
Nov 9 - 13	18 and 19	Ch19: 33,35,37,39,41,43,45,47,49,53,57,59, 61,63,65,69,71,73,77,83,85,89,97,99,103,105, 115,119 (Module19: Redox, Cell Potential, Redox and Equilibrium, Batteries, Electrolysis and Corrosion)
<b>Nov 18</b>	<b>EXAM 3**</b>	<b>Chapters 17,18 and 19**</b>
Nov 16 - 20	19	
Nov 23 - 24	19	
<b>Nov 25 - 27</b>	<b>THANKSGIVING HOLIDAY</b>	
Nov 30 - Dec 4	19 and 20 Review	Ch20: 31,33,35,37,41,45,51,57,61,71,73,81, 83,89 (Module20: Radioactivity, Kinetics of Radioactivity, Fusion, Fission, and Binding Energy)
<b>Dec XX</b>	<b>Final Exam</b>	<b>Cumulative</b>

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\*\*Extent of exam material will depend on our progress in lecture.

## V. Laboratory Schedule

### Lab Groups A and B

<u>Date</u>	<u>Experiment</u>	<u>Description*</u>
Aug 31 - Sept 4	<b>Purchase Items</b>	Purchase lab manual and safety glasses
<b>Lab A and Lab B</b>	<b>Online</b>	On Blackboard, review and complete the <i>Introduction to Lab</i>
Sept 7 - 11	<b>Online</b>	On Blackboard, review and complete the <i>Lab Safety Presentation and Quiz</i>
<b>Lab A and Lab B</b>		
Sept 14 - 18	Check In	
<b>In Person Lab A</b>	Experiment 1 Assignment Due	Molar Mass and Freezing Point Safety Presentation and Safety Quiz
<b>Online Lab B</b>	Experiment 2 Assignment Due	Kinetics of Iodination of Acetone Safety Presentation and Safety Quiz
Sept 21 - 25	Check In	
<b>Online Lab A</b>	Experiment 2 Assignment Due	Kinetics of Iodination of Acetone Exp1: Lab Report Exp2: Prelab and Quiz
<b>In Person Lab B</b>	Experiment 1 Assignment Due	Freezing Point Depression Exp1: Prelab and Quiz Exp2: Lab Report
Sept 28 - Oct 2		
<b>In Person Lab A</b>	Experiment 3 Assignment Due	Determination of $K_{eq}$ Exp2: Lab Report Exp3: Prelab and Quiz
<b>Online Lab B</b>	Experiment 4 Assignment Due	Le Châtlier's Principle Exp1: Lab Report Exp4: Prelab and Quiz



<u><b>Date</b></u>	<u><b>Experiment</b></u>	<u><b>Description</b></u>
Oct 5 - 9		
<b>Online Lab A</b>	Experiment 4 Assignment Due	Le Châtlier's Principle Exp3: Lab Report Exp4: Prelab and Quiz
<b>In Person Lab B</b>	Experiment 3 Assignment Due	Determination of Keq Exp4: Lab Report Exp3: Prelab and Quiz
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Oct 12 -16		
<b>Online Lab A</b>	Experiment 5 Assignment Due	Neutralization Potential of Antacids Exp4: Lab Report Exp5: Prelab and Quiz
<b>In Person Lab B</b>	Experiment 6 Assignment Due	Acid-base Equilibria and Buffers Exp3: Lab Report Exp6: Prelab and Quiz
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Oct 19 - 23		
<b>In Person Lab A</b>	Experiment 6 Assignment Due	Acid-base Equilibria and Buffers Exp5: Lab Report Exp6: Prelab and Quiz
<b>Online Lab B</b>	Experiment 5 Assignment Due	Neutralization Potential of Antacids Exp6: Lab Report Exp5: Prelab and Quiz
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Oct 26 - 30		
<b>Online Lab A</b>	Experiment 7 Assignment Due	Determination of Solubility Product Exp6: Lab Report Exp7: Prelab and Quiz
<b>In Person Lab B</b>	Experiment 8 Assignment Due	Thermodynamics Hot/Cold Packs Exp5: Lab Report Exp8: Prelab and Quiz
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<b><u>Date</u></b>	<b><u>Experiment</u></b>	<b><u>Description</u></b>
Nov 2 - 6		
<b><i>In Person Lab A</i></b>	Experiment 8 Assignment Due	Thermodynamics Hot/Cold Packs Exp7: Lab Report Exp8: Prelab and Quiz
<b><i>Online Lab B</i></b>	Experiment 7 Assignment Due	Determination of Solubility Product Exp8: Lab Report Exp7: Prelab and Quiz
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Nov 9 - 13		
<b><i>Online Lab A</i></b>	Experiment 9 Assignment Due	Thermodynamics of Borax Exp8: Lab Report Exp9: Prelab and Quiz
<b><i>In Person Lab B</i></b>	Experiment 10 Assignment Due	Oxidizing Power of Bleaches Exp7: Lab Report Exp10: Prelab and Quiz
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Nov 16 - 20		
<b><i>In Person Lab A</i></b>	Experiment 10 Assignment Due	Oxidizing Power of Bleaches Exp9: Lab Report Exp10: Prelab and Quiz
<b><i>Online Lab B</i></b>	Experiment 9 Assignment Due	Thermodynamics of Borax Exp10: Lab Report Exp9: Prelab and Quiz
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<b>Nov 23 - 27</b>	<b>No Labs</b>	
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Nov 30 - Dec 4		
<b><i>Lab A and Lab B</i></b>	<b><i>Online</i></b>	<b><i>Conclusion of lab</i></b>
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## Online Lab Group

<u>Date</u>	<u>Experiment</u>	<u>Description*</u>
Aug 31 - Sept 4	<b>Purchase Items</b>  <b>Online</b>	Purchase lab manual and safety glasses On Blackboard, review and complete the <i>Introduction to Lab</i>
Sept 7 - 11	<b>Online</b>	On Blackboard, review and complete the <i>Lab Safety Presentation and Quiz</i>
Sept 14 - 18	Check In	
<b>Online Lab</b>	Experiment 1 Assignment Due	Molar Mass and Freezing Point Safety Presentation and Safety Quiz
Sept 21 - 25	Check In	
<b>Online Lab</b>	Experiment 2 Assignment Due	Kinetics of Iodination of Acetone Exp1: Lab Report Exp2: Prelab and Quiz
Sept 28 - Oct 2		
<b>Online Lab</b>	Experiment 3 Assignment Due	Determination of $K_{eq}$ Exp2: Lab Report Exp3: Prelab and Quiz
Oct 5 - 9		
<b>Online Lab</b>	Experiment 4 Assignment Due	Le Châtlier's Principle Exp3: Lab Report Exp4: Prelab and Quiz
Oct 12 -16		
<b>Online Lab</b>	Experiment 5 Assignment Due	Neutralization Potential of Antacids Exp4: Lab Report Exp5: Prelab and Quiz

Oct 19 - 23

**Online Lab**

Experiment 6  
Assignment Due

Acid-base Equilibria and Buffers  
Exp5: Lab Report  
Exp6: Prelab and Quiz

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Oct 26 - 30

**Online Lab**

Experiment 7  
Assignment Due

Determination of Solubility Product  
Exp6: Lab Report  
Exp7: Prelab and Quiz

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Nov 2 - 6

**Online Lab**

Experiment 8  
Assignment Due

Thermodynamics Hot/Cold Packs  
Exp7: Lab Report  
Exp8: Prelab and Quiz

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Nov 9 - 13

**Online Lab**

Experiment 9  
Assignment Due

Thermodynamics of Borax  
Exp8: Lab Report

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Nov 16 - 20

**Online Lab**

Experiment 10  
Assignment Due

Oxidizing Power of Bleaches  
Exp9: Lab Report  
Exp10: Prelab and Quiz

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**Nov 23 - 27**

**No Labs**

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Nov 30 - Dec 4

**Online Lab**

**Online**

Conclusion of Lab

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## VI. ACCESS Accommodations

### Student Learning Accommodations Statement

*In keeping with University policy, any student with a documented disability interested in utilizing accommodations should contact ACCESS, the office of Disability Services on campus. ACCESS works with students to create reasonable and appropriate accommodations via an accommodation letter to their professors as early as possible each semester.*

Contact ACCESS: A170 Living/Learning Center - 802-656-7753 - [access@uvm.edu](mailto:access@uvm.edu).

ACCESS Office: <http://www.uvm.edu/~access/>

Policy on disability certification and student support:  
<http://www.uvm.edu/~uvmppg/ppg/student/disability.pdf>

## VII. Religious Holidays

### Religious Holiday Policy Statement

*Religious Holidays: Students have the right to practice the religion of their choice. If you need to miss class to observe a religious holiday, please submit the dates of your absence to me in writing by the end of the second full week of classes. You will be permitted to make up work within a mutually agreed-upon time.*

## VIII. Illness Accommodations

The Center for Health and Wellbeing does not provide students with notes verifying medical illness. This approach makes the best use of their limited medical resources by not having students who are required to provide verification of a recent illness utilize appointment times which can be used for students who require evaluation and therapy. Instead, contact your college's Dean's office so they can report your illness to all of your professors.

When students experience a serious illness requiring hospitalization or when an extended absence from class is foreseen, a Center staff member will (with the student's permission) notify the Dean's Office of the student's College or School so that faculty members can be made aware and the student supported in working successfully through the absence.

## IX. COVID-19 Accommodations

Due to COVID-19 we advise that a student feeling any symptoms should get checked out before attending an in-person class. Keep in mind that if a student attends an in-person class and tests positive for COVID-19 that they are putting other students at risk and their possibly quarantine as well. So when in doubt, go get tested.