Introduction: The Studio Laboratory provides an overview of the chemical concepts and laboratory techniques that the chemistry department believes are important to your chemistry careers and place a strong emphasis on developing your laboratory skills. Studio Laboratory II is the second part of this two-semester sequence and focuses on topics such as kinetics, equilibrium, thermodynamics, electrochemistry, and organic chemistry. The material presented in class is only sufficient to provide you with a guide on which you base your private study. If you take very good notes in class, learn that material well, and apply it to the laboratory experience, you will (probably) be fine. However, if you want a good grade then you must spend a few more hours writing and expanding your notes using your textbook and the library resources, and working problems. It is up to you to make sure that you understand the theory behind problems you are solving and the experiments you performed. A typical week will be laid out as follows:

Tuesday: 09:35 – 12:20 Laboratory Session (First 30-60 mins will be theory)
14:05 – 14:55 Recitation Session

Thursday: 09:35 – 12:20 Laboratory Session (First 30-60 mins will be theory).

Recitations: Will be structured to provide you with opportunities to ask questions and improve your understanding of material from your previous weeks experiments. Your recitation instructor, Dr. Hill, will describe the recitation format during the first session.

Handouts: Several handouts will be distributed during the course to complement the text. The class PowerPoint slides will be printed at a rate of four slides per page and provided as a digital or print format. It is hoped that we will have them ready during the week before the class you need them for, but this may not always be possible. It is assumed that you all have a computer or printer. These notes are NOT designed to replace taking good notes, but they will reduce your need to copy everything from the slides and so allow you to pay more attention to classroom discussion. The lecture component of each studio lab session will be paced based on the assumption that you are using the RediNotes.

Homework: We will have weekly homework worth a total of 100 points. It is intended that the assignments will be distributed during class and collected one week later.

Laboratory Reports: Typed laboratory reports are typically collected one week after the experiment, giving about 7 days, but your Laboratory Teaching Assistant will set the specific schedule based on the experiments. If you require an extension, for any reason, you must request that extension from your teaching assistant when the assignment is distributed, not when it is due. Late assignments will be penalized 10% of the assignment value per day. Therefore, a 15-point assignment that is 5 working days late would be worth a maximum of 7.5 points.
Examinations: The examination schedule consists of three 100pt “hour” examinations. These will be hand-graded and cover material up to the Thursday recitation period before the exam date. In addition to the three “hour” examinations, there will be an ACS Standardized Chemistry Examination during the week-14 recitation session, and one comprehensive final examination held finals week.

1. Hour exam dates:

   - Exam 1       Wednesday, Feb 13th       6:00 - 7:00 pm
   - Exam 2       Wednesday, Mar 20th       6:00 - 7:00 pm
   - Exam 3       Thursday Apr 25th during final class.

1. Your final examination schedule, when posted, is available at the following web page:
   http://www.admin.mtu.edu/em/students/plan/finalexam.php

   2. University regulations require that one hour of class is canceled per hour of evening exam therefore I will cancel one three hour laboratory session on the Thursday before Spring Break.

Grading: Your grade will be based on the percentage of total accumulated points from the following assignments. The pass mark for this class is currently set at 60%, a grade C is set at 68%, a Grade B is set at 78%, and a Grade A is set at 88%. The actual “curve” will be determined after the final exam.

| Laboratory | 100 |
| Homework/Quizzes | 100 |
| Recitation | 100 |
| Exams | 500 |
| Total | 800 |

Absence Policy: Attendance in class is mandatory. **If you miss more than two unexcused class sessions, you risk an automatic fail in this class.** If you are repeatedly late to class, you risk an automatic half-grade reduction. For exams, an UNexcused absence is an automatic zero for any exam that is missed. The Office of Student Affairs or your instructor may grant an excused absence. If you know that you will have an official university excused absence on a day that an exam is scheduled (university athletic event or religious holiday), you are required to make arrangements as early as possible in advance of the exam date. Failure to provide at least one weeks notice will result in your misery. Excused absences will not be given to travel home or to attend a social event. Plan to take your exam at the scheduled time. If you believe you are too sick to take an exam, you must have a doctors note stating your illness prevents (or prevented) you from taking the exam, not simply that you visited the doctors office.
Chemistry Learning Center (CLC): The CLC is a free service provided by the Department of Chemistry and the University to provide support for students enrolled in first year chemistry lecture courses. The Center is located in room 208 of the chemical sciences building and staffed by upper level undergraduates (coaches), who have a good background in chemistry and are familiar with the courses. Services offered include weekly appointments, walk-in assistance, reference library, computer-assisted learning and a comfortable place to study chemistry. Stop by for more information.

Walk-in Hours and other Resources

Beginning on Tuesday, January 20th, the Chemistry Learning Center walk-in hours for Fall Semester are:

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CH0011 - Development of Chemistry Skills (0 credit): Students who would like to have a scheduled weekly individual appointment with a coach must be enrolled in CH0011. Students enrolled in CH0011 should visit the CLC during the first week of class to sign up for a weekly appointment time. You must attend your first weekly appointment, which begins the second week of classes. Grades in CH0011 are satisfactory/unsatisfactory based on attendance. You are expected to attend every appointment. However, you are allowed to miss one appointment if an emergency comes up and still receive a satisfactory grade. Walk-in hours are also available.

Academic Integrity: Both students and faculty are responsible for insuring the academic integrity of the University according to the procedures in Academic Integrity at MTU - A Guide for Students and Faculty. Specific violations in this course would be the intentional use of any unauthorized study aids, equipment, or another is work during an examination (cheating) or allowing/helping another individual to cheat (facilitating academic dishonesty). Possible sanctions include an academic integrity warning, grade reduction, an “F*” grade indicating failure due to academic dishonesty, suspension or expulsion.

CLASS SCHEDULE: Is designed to provide you with a guide to the class material so that you may read the relevant chapters prior to the class and again after the class. The dates are approximate and do not represent an exact schedule.

**Topic 01: Chemical Kinetics**
- Reaction Rates (12.1)
- Rate Laws (12.2 - 12.3)
- Integrated Rate Laws (12.4)
- Reaction Mechanisms (12.5)
- Temperature Dependence (12.6)

**Topic 02: Chemical Equilibrium**
- Equilibrium Condition (13.1)
- Equilibrium Constants (13.2 - 13.4)
- Equilibrium Concentrations (13.5 & 13.6)
- Factors Affecting Equilibrium (13.7)
Topic 03: Acids & Bases
- Acid-Base Concept (14.1)
- Acid Strength (14.2, 14.9, 14.10)
- The pH of Strong and Weak Acids (14.3-14.5)
- Bases (14.6)
- Polyprotic Acids (14.7)
- Acid-Base Properties of Salts (14.8)

Topic 04: Aqueous Equilibria
- Common Ion Effect (15.1)
- Buffers (15.2 & 15.3)
- Titrations (15.4 & 15.5)
- Solubility & Solubility Product (16.1)
- Precipitation & Qualitative Analysis (16.2)
- Complex Ion Equilibria (16.3)

Topic 05: Thermodynamics
- Spontaneity & Entropy (17.1-17.3, 17.5)
- Free Energy (17.4-17.9)

Topic 06: Redox & Electrochemistry
- Redox Reaction Recap (4.9, 4.10, 18.1)
- Galvanic Cells and Reduction Potentials (18.2 - 18.4)
- Concentration Cells (18.5)
- Batteries and Corrosion (18.6 & 18.7)
- Electrolysis (18.8 & 18.9)

Topic 07: Organic & Biochemistry
- Alkanes, Alkenes, and Alkynes (22.1 & 22.2)
- Aromatic Hydrocarbons (22.3)
- Hydrocarbon Derivatives (22.4)
- Organic Reactions (Handouts)
- Polymers (22.5 & 22.6)

Topic 08: Coordination Complexes
- Transition Metals (21.1 & 21.2)
- Coordination Complexes (21.3-21.5)
- Crystal Field Theory (21.6)
LABORATORIES: The following experiment topics are initially planned, but are subject to change if I find a cool experiment to do. The exact schedule will depend on your progress in the experiments, timing of university holidays, and whether I find some different experiments to try. Some, such as qualitative analysis will take at least two weeks to complete. Others will take much less time:

Chemical Kinetics
- Base Hydrolysis of Ethyl Acetate - Rate law expressions using conductivity
- Rate and Order of Chemical Reactions - Rate law expressions using colorimetry
- Decomposition of hydrogen peroxide - Rate laws and activation energy using pressure
- Rate determination and activation energy - Crystal violet experiment using colorimetry.

Chemical Equilibrium
- Iron Thiocyanate Equilibrium Constant - By colorimetry
- Diammine silver Equilibrium Constant - By titration

Acid–Base and Aqueous Equilibrium
- Standardization solutions of sodium hydroxide, including using gran plots.
- Acid-base titrations
- Indicators
- Titration of Diprotic Acids
- Determination of $K_a$ by half-titration of a weak acid.
- Buffers
- $K_{sp}$ of calcium hydroxide

Qualitative Analysis
- Separation and Analysis of Cations
- Separation and Analysis of Anions

Thermodynamics
- Enthalpy of neutralization
- Entropy of solution

Redox and Electrochemistry
- Redox titrations of iron and cerium
- Voltic & Electrolytic Cells

Organic & Biochemistry
- Organic Synthesis and Analysis
- Electrophoresis