NJIT New Jersey Institute of Technology

THE COLLEGE OF SCIENCE AND LIBERAL ARTS

THE DEPARTMENT OF CHEMISTRY AND ENVIRONMENTAL SCIENCE

**Chemical Technology – Lecture and Lab**
**Chem301 section 102**
***Spring 2023 Course Syllabus***

**NJIT Academic Integrity Code**: All Students should be aware that the Department of Chemistry & Environmental Science (CES) takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the instructor.

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**COURSE INFORMATION:** *Combination of Lecture and Laboratory components*

**Course Description**: Introduction to chemistry geared for students in Engineering Technology. No prior knowledge of chemistry is assumed or required.
***Lecture:*** Attendance is taken at the beginning of each lecture. You may miss one lecture without excuse. Beyond one absence evidence of an unavoidable situation (Doctors Note, Police Report of a car accident, Jury Duty summons, National Guard Orders, etc.) will be necessary to avoid loss of participation points for the class. All exams are given during Lecture Hours.
***Laboratory*:** As Qualification of Engineering Programs at NJIT require laboratory experience **Attendance in LAB is MANDATORY**: If you cannot come to lab during your designated in-lab period please inform your instructor as soon as possible. You may be able to work with a different Lab Set for that lab. Missing 1 lab will not affect your grade but **missing 3** in person Lab classes for any reason will result in a **failing grade**. **Missing more than one Lab for an excused reason will require taking the lab separately to make your degree qualification requirement.**

**Number of Credits**: 3
**Prerequisites**: none
**Course-Section and Instructors**

| Course-Section | Day | Lecture Time | Lab Time | Instructor |
|---|---|---|---|---|
| Chem 301 102 | Thursday | 6:00 PM – 7:55 PM TIER 111 | 8:05 PM – 10:00 PM TIER 204 | Dr. Xianyang Meng |

**Office Hours: 1:00 pm – 3:00 pm on Friday or by appointment**

**Required Textbook**: (Hard Copy or Electronic, your choice)

| | |
|---|---|
| **Title** | Chemistry for Engineering |
| **Author** | Brown & Holme |
| **Edition** | 3rd or 4th |
| **Year** | 2015 and on |
| **Publisher** | Cengage |
| **ISBN #** | 978-1-337-39890-9 |

**Required Lab manual**: Chem301 Lab Manual is available in the NJIT bookstore.

**Also Required**:

- Scientific calculator: capable of handling logs & exponentials. No cell phone, programmable or any other communications/internet active calculator will be permitted on exams.
- Personal Protective Equipment (PPE) – *ALL Required*:
  - Goggles*:* you must wear protective eye wear whenever you are in lab. If you wear glasses, purchase side shields or goggles designed to fit over your glasses.
  - Lab coat: an extra protective layer between your body and your experiment. Designed to cover and protect your arms and your body from your neck down to your knees. It also protects your clothes.
  - Shoes: you must wear closed shoes in lab. The shoe itself must cover your entire foot. Sox with sandals are not acceptable.
  - Gloves: Nitrile (not latex). A box of gloves is good for 5 people so consider a group purchase. If nitrile gloves are not what is required, we will provide the appropriate substitute.

**University-wide Withdrawal Date**: The last day to withdraw with a **W** is Monday, April 3, 2023. It will be strictly enforced.

**POLICIES**

**All CES students must familiarize themselves with, and adhere to, all** official university-wide student policies. CES takes these policies very seriously and enforces them strictly.

**Grading Policy**: The final grade in this course will be determined as follows:

**You must pass BOTH the lecture and the lab portions of the course to be eligible to pass the entire course**

**LECTURE (60%):**

| **Homework & Exams collectively = 1 exam grade** | | Maximum Points |
|---|---|---|
| **Exam I** - tentatively 2/23 (R), 2/27 (M) | Top 3 scores = 80% | 100 |
| **Exam II** tentatively 4/6 (R), 4/10 (M) | | 100 |
| **Exam III** (during final exam period TBA) | | 100 |
| **Homework (the lowest grade will be dropped)** | | 100 |
| **Maximum Test and Homework Points** | | 300 |
| **Class participation (attendance, answering & asking questions,** | 20% | 75 |
| **Total Grade Lecture Component** | | **375** |

- Exams are open book. You may use the textbook (hardcopy), course notes, homework assignments, and labs. You **may not** use any other resources, including the internet. All exams have a periodic table of the elements on the last page.
- Exams will either be On-line or in person as per university guidelines. In person exams are the rule with on-line exams given only in accordance with university restrictions.
- On-line exams are given via the Respondus lockdown browser. You must have a computer capable of running this browser to take the exam. The NJIT library has several computer stations running the Respondus lockdown browser if your computer cannot support this browser.
- **1 exam score must be at least 60 to pass the class. The instructors remind you that the first exam is the easiest of the 3 exams. If you feel yourself excessively challenged in Chemistry this is the exam to focus on to satisfy the 60 point requirement.**
- The only exam extra credit is on the exams.
- Homework is submitted online to the CANVAS portal and is due at the *beginning* of lecture & is gone over in class; NO late homework is accepted but the lowest score for one homework is dropped.
- Homework points are converted to percent at the end of the semester.

**Makeup Exam Policy**: Since 1 exam may be exchanged for the homework grade will normally be **NO MAKE-UP QUIZZES OR EXAMS** during the semester. In extraordinary instances due to extended illness or mandated quarantine arrangements may be made with your professor. If a student has a legitimate reason for an extended illness or mandated quarantine, the student should contact the Dean of Students office and present written verifiable proof.

**LAB (40%):** Make sure you sign the attendance sheet after you have completed the lab, cleaned up and put back any instruments and glassware (cleaned) have been put away. There are 1 lab safety training and 10 labs in this course. The lowest grade will be dropped for a total of 10 marked labs. Each lab will be graded on the point scale as detailed below. Everyone submits every component of the lab. All submissions are online.

| | **Maximum points per lab** |
|---|---|
| **Pre-Lab Worksheet(s)** | 10 |
| **In-Lab:** technique, adherence to safety procedures and lab | 5 |
| **Lab Worksheet(s)** | 15 |
| **Total Grade Laboratory Component** | 25 |
| **10 Graded Labs Total** | 250 Points |

- ***Pre-lab worksheets must be submitted before the student is allowed to do In-Lab experimentation*.** Pre-Lab worksheets are submitted *one day before the laboratory work* via the appropriate CANVAS Portal.
- **Anyone without a graded pre-lab worksheet or not wearing the appropriate PPE will not be allowed in lab – no exceptions**.
- In lab teams of 2 or 3 students perform the experiments. Each student must be an active participant in performing the lab. Anyone not appearing to be actively participating in the lab will be asked to leave.
- Although a team completes **each lab *every team member submits her or his own completed lab sheet***. Obviously, team members sheets will contain the same data and much of the same analysis. NOTE: questions on lab techniques, data analysis, and conclusions have appeared on past exams. It pays to understand each lab so you can score these points on the exam.
- ***You cannot submit data you did not acquire yourself with your team.*** If you do not attend the lab, you cannot use the data that your regular lab team acquired, and you are missing that lab. You may be scored for the pre-lab if it is submitted before the deadline. Attempts to turn in a post-lab summary will be considered cheating. All lab members will receive a 0 for the lab (cannot be dropped). Due dates for each lab are clearly posted in CANVAS. No lab submissions will be accepted.
- *Keep track of your lab grades:* ***missing 3 labs*** *regardless of the reason* will result in an **F** in the lab portion of the course and therefore and F grade for the course.

Your final letter grade in this course will be based on the following *tentative* point score out of 375 + 250 = 625 possible points:

| | | | |
|---|---|---|---|
| **A** | >560 | **C** | 435-464 |
| **B+** | 530-559 | **D** | 375-434 |
| **B** | 500-529 | **F** | <375 |
| **C+** | 465-499 | | |

The lecturers are empowered to raise grades by one half scale (*i.e.* C → $C^+$) in instances where the point score to the next step is close. This will only be considered for individuals who have submitted **every** homework assignment. Do your homework… it pays off in more ways than one.

**Cellular Phones**: All cellular phones and other electronic devices must be switched off during all class times. During exams cell phones and smart watches will join your books in your backpack at the front of the classroom. During lab students can take *brief* calls by stepping out of the lab room. Habitual or lengthy interruptions will result in penalties.

## LEARNING OUTCOMES:

- Analyze problems using the scientific method.
- Make computations using metric system units & be able to convert between units.

- Factor in experimental limits in precision when doing calculations.
- Explain how atomic components and their arrangement dictate periodic trends.
- Form ionic compounds from constituent metals, nonmetals, and polyvalent ions.
- A basic understanding of covalent bonding.
- Apply conservation of mass to balancing chemical reactions.
- Determine empirical and molecular formulas
- Balance chemical equations.
- Determine quantities of reactants required or of products produced in a given chemical reaction using the principles of stoichiometry.
- Determine concentrations of aqueous solutions: molarity, mole fraction.
- Determine volumes or concentrations of reactants required or of products produced in a given aqueous reaction using the principles of solution stoichiometry.
- Determine unknown concentrations in acid-base titration reactions.
- Use concentration or density to convert between volume and mass.
- Analyze the effects of intermolecular forces on liquid systems in terms of their effects on physical properties including boiling points, vapor pressure, and solubility.
- Describe the flow of electrons in oxidation-reduction reactions.
- Analyze the conversion and transfer of energy or heat in a chemical reaction.
- Understand the difference between thermodynamic & kinetic effects.
- Analyze voltaic (Galvanic) cells
- Compute cell potentials.
- Understand the operation of batteries & fuel cells

## ADDITIONAL RESOURCES

**Chemistry Tutoring Center**: Located in the Central King Building, Lower Level, Rm. G12. Hours of operation are Monday – Friday 10:00 am - 6:00 pm. For further information please click here.

**Good on-line general textbook sources:**

1. Chem1 virtual chemistry textbook: http://www.chem1.com/acad/webtext/virtualtextbook.html
2. chemMystery is geared for high school but a lot of it applies here too. http://library.thinkquest.org/3659/

**Accommodation of Disabilities**: **O**ffice of **A**ccessibility **R**esources and **S**ervices (***formerly known as Disability Support Services***) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you need accommodations due to a disability, please contact Chantonette Lyles, Associate Director at the Office of Accessibility Resources and Services at 973-596-5417 or via email at lyles@njit.edu. The office is in Fenster Hall Room 260. A Letter of Accommodation Eligibility from the Office of Accessibility Resources Services office authorizing your accommodations will be required.

For further information regarding self-identification, the submission of medical documentation and additional support services provided please visit the Accessibility Resources and Services (OARS) website at:

- http://www5.njit.edu/studentsuccess/disability-support-services/

**Spring 2023 Calendar** (See https://www.njit.edu/registrar/calendars)

| Month | date | Day | Event |
|---|---|---|---|
| January | 16 | Monday | Martin Luther King, Jr. Day |
| January | 17 | Tuesday | First Day of Classes |
| January | 21 | Saturday | Saturday Classes Begin |
| January | 23 | Monday | Last Day to Add/Drop a Class |
| January | 23 | Monday | Last Day for 100% Refund, Full or Partial Withdrawal |
| January | 24 | Tuesday | W Grades Posted for Course Withdrawals |
| January | 30 | Monday | Last Day for 90% Refund, Full or Partial Withdrawal, No Refund for Partial Withdrawal after this date |
| February | 13 | Monday | Last Day for 50% Refund, Full Withdrawal |
| March | 6 | Monday | Last Day for 25% Refund, Full Withdrawal |
| March | 13 | Monday | Spring Recess Begins - No Classes Scheduled - University Open |
| March | 18 | Saturday | Spring Recess Ends |
| April | 3 | Monday | Last Day to Withdraw |
| April | 7 | Friday | Good Friday - No Classes Scheduled - University Closed |
| April | 9 | Sunday | Easter Sunday - No Classes Scheduled - University Closed |
| May | 2 | Tuesday | Friday Classes Meet |
| May | 2 | Tuesday | Last Day of Classes |
| May | 3 | Wednesday | Reading Day 1 |
| May | 4 | Thursday | Reading Day 2 |
| May | 5 | Friday | Final Exams Begin |
| May | 11 | Thursday | Final Exams End |
| May | 13 | Saturday | Final Grades Due |
| TBA | | | Commencement |

**Spring 2023 LECTURE, HOMEWORK AND LAB SCHEDULE.**

| Wk | M, R | Lecture | Homework (25 pts) & *pre-LAB (10 pts)* Due @ start of class | Lab (in person), Lab worksheet (15 pts) due @ 11:59P R (R lab) |
|---|---|---|---|---|
| 1 | 1/19 (R), | Introduction to course. Ch 01: Numbers & measurements, Density, units & unit conversions. Physical Properties, separation of mixtures. | | Safety |
| 2 | 1/26 (R), | Ch 02: atomic structure & mass, Isotopes; periodic table & trends. Ions, ionization energy, | Understanding Syllabus (5 pts), EXAM 1 HWK 1, *Pre-Lab 01: Measurement and Density* | Lab 01: Measurement & Density (in lab) |
| 3 | 2/2 (R), | Ch 07 sec 2: ionic compounds – criss cross rule. Ch 03: Chemical Formulas, hydrates, formula mass, % composition, moles | EXAM 1 HWK 2, *Pre-Lab 02: Atoms & Ions* | Lab 02÷Synthesis of Soap, Lab 01 worksheet |
| 4 | 2/9 (R), | Empirical & molecular formulas, elemental analysis for formula determination, balancing eqns. | EXAM 1 HWK 3, *Pre-lab 03: isotopes, ions & ionic compounds* | Lab 03: Experiment: Investigation of Pennies, Lab 02 worksheet |
| 5 | 2/16 (R), | Stoichiometry, theoretical yield, percent yield | EXAM 1 HWK 4, *Pre-Lab 4: Mass, Moles, & Avogadro's #* | Lab 04: Determination of the Chemical Formula of a copper hydrate, Lab 03 worksheet |
| 6 | 2/23 (R), | EXAM 1 (chapters 1, 2 & part 3) | None | No Lab |
| 7 | 3/2 (R), | Limiting Reagents, solutions: units, dilution, solution chemistry | EXAM 2 HWK 1, *Pre-Lab 5: Balancing Chemical Equations* | Lab 05: Synthesis of Zinc Iodide, Lab 04 worksheet (22F ver Lab 06 is skipped) |
| 8 | 3/9 (R) | Acids & Bases, Acid-base titrations; Ch 05: Gases pt1 | EXAM 2 HWK 2, *pre-Lab 7: Royal society titration lab* | Lab 7 Experiment: Acid-Base Titration Reaction |
| 9 | 3/13 (M) – 3/18 (F) | SPRING BREAK | | |
| 10 | 3/23 (R), | Ch 05: Gases pt2 | EXAM 2 HWK 3, & Concentration and molarity (virtual), *Pre-Lab 8: Gases* | Lab 8 Experiment: Analysis of $CO_2$ in an Alka-Seltzer Tablet, Lab 07 worksheet |
| 11 | 3/30 (R), | Ch 09: Energy Exchange and Thermodynamics | EXAM 2 HWK 4, *Pre-Lab 9: Calorimetry Simulations* | Lab 9 Calorimetry Experiment, Lab 08 worksheet |
| 12 | 4/6 (R), | EXAM 2 (ch 3 – 5) | None | No Lab |
| 13 | 4/13 (R), | Enthalpy of phase changes: Heating curves & | EXAM 3 HWK 1, *Pre-Lab* | Lab 10: Electrochemistry Experiment, |

| | | | | |
|---|---|---|---|---|
| | | phase diagrams | *10: Electrochemistry* | Lab 09 worksheet |
| 14 | 4/20 (R), | Ch 13: Electrochemistry pt1 | EXAM 3 HWK 2, *Pre-Lab 11: Coin cells and thin layer cells* | Lab 11: Coin cells and thin layer cells, Lab 10 worksheet |
| 15 | 4/27 (R), | Ch 13: Electrochemistry pt2 | EXAM-3 HWK 3 | Lab 11 worksheet |
| 16 | 5/11 (R) | EXAM 3, TBD | | |