SUFFOLK UNIVERSITY
MADRID CAMPUS

CHEM 112/L112 M1 - GENERAL CHEMISTRY II with LAB

Instructor Information:

Instructor: Carl-Gustaf Pierre Saluste, PhD
Email: gsaluste@suffolk.es
Homepage: www.suffolk.edu/madrid-campus/academics/faculty

Course Information:

Catalog Description: Continuation of the discussion of the fundamental principles of chemistry. Topics include introductions to solutions, kinetics, equilibrium, acid-base systems, thermodynamics and electrochemistry.
Prerequisites: Grade of C or above in CHEM 111/L111
Credit Hours: 4 credits

This course follows the US Federal Government's Credit Hour definition: "An amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutional established equivalence that reasonably approximates no less than:

(1) One hour of classroom or direct faculty instruction and a minimum of two hours of out of class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or ten to twelve weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time; or
(2) At least an equivalent amount of work as required in paragraph (1) of this definition for other academic activities as established by the institution including laboratory work, internships, practica, studio work, and other academic work leading to the award of credit hours."

For full up-to-date statement:
https://cihe.neasc.org/sites/cihe.neasc.org/files/downloads/POLICIES/Pp111_Policy_On_Credits-And-Degrees.pdf

A more detailed breakdown of the student engagement is given below:

Assignment	**Engagement Estimate**	**Engagement Hours**
Course readings	400 pages x 8 min/page	40
Homework	7 assignments x 2 h/assignment	14
Review of PPt-presentations	10 PPt x 30 min / PPt	6
Preparation of lab reports	20 h preparation	20
Midterm exam	8 h preparation	8
Final exam	15 h preparation	15
Class attendance	3h x 15 weeks	45
Lab attendance	3 h x 10 weeks	30
ESTIMATED TOTAL		**178 HOURS**

Textbook/Course Materials:

"Chemistry, Structure and Properties" (custom version for Suffolk University) by Nivaldo J. Tro (ISBN: 978-0-321-83468-3).

Also keep in mind the library collection of books related with basic Chemistry. Homework problems and exams will require the use of a scientific calculator.

Course Goals & Learning Objectives:

Upon successful completion of this course, students will know/understand:	**Upon successful completion of this course, students will be able to:**	**How the student will be assessed on these learning outcomes**
• To know the name and characteristics of phases in matter. • To understand the meaning of melting and boiling point. • To know main forces in different phases and relate it with melting and boiling point in phase diagrams.	• To distinguish phases in substances at room temperature. • To assign main forces to different substances based on the chemical nature of the substance. • To build/interpret phase diagrams for pure substances.	• Examples and questions in class. • Text book exercises collection and questions (chapter 12) • Problem sets.
• To know how to express concentration in solutions. • To know that in solutions the solute presence affects properties of the solvent. • To understand which solvent properties are affected and in which quantitative extent.	• To identify colligative properties. • To estimate how they vary in dilute solutions compared with the pure solvent.	• Examples and questions in class. • Text book exercises collection and questions (chapter 13) • Problem sets.
• To understand reaction rate meaning. • To know that reaction rate relates with concentration. • To understand kinetics and reactions mechanisms.	• To identify different order in rate of reactions and use the appropriate equations. • To interpret reactions in terms of reaction mechanism.	• Examples and questions in class. • Text book exercises collection and questions (chapter 14) • Problem sets.
• To understand the meaning of equilibrium. • To know which factors can affect it.	• To know what equilibrium constant tell us. • To write and calculate equilibrium constant for homogeneous and heterogeneous equilibria. • To calculate equilibrium concentration.	• Examples and questions in class. • Text book exercises collection and questions (chapter 15) • Problem sets.
• To understand the definition of acids and bases. • To know what a buffer solution consist of and relate with acid-base equilibria. • To know the pH expression. • To understand that weak electrolytes imply chemical equilibrium. • To calculate pH in buffer solutions. • To handle solubility equilibria.	• To relate weak electrolytes with equilibrium constant. • To calculate concentrations of ions in buffer solutions. • To calculate concentrations in titrations (indicators) • To use in calculations solubility product. • To predict precipitation	• Examples and questions in class. • Text book exercises collection and questions (chapter 17) • Problem sets.
• To understand that heat in a reaction can be a particular reactant or product.	• To calculate heat evolution in reactions. • To predict spontaneity of reaction. • To use and calculate by using calorimeters.	• Examples and questions in class. • Text book exercises collection and questions (chapter 6) • Problem sets.

Upon successful completion of this course, students will know/understand:	Upon successful completion of this course, students will be able to:	How the student will be assessed on these learning outcomes
• To know that redox reactions can be used to produce energy. • To understand spontaneity of reduction in voltaic cells.	• To balance redox reactions. • To calculate reduction potential in a redox reaction. • To use standard reduction potential tables. • To relate redox reaction with voltaic cells and calculate reduction potential.	• Examples and questions in class. • Text book exercises collection and questions (chapter 19) • Problem sets.

Assignments/Exams/Papers/Projects:

Students will be evaluated in the following areas:
One "problem set" will be handed out on Thursday each two weeks, due the next Tuesday. Students must check blackboard to get them. The grade will be weighted as appears in the "evaluation" section, above. Any changes or other updates will be comunicated verbally in class, and by email. All email communication will be between Suffolk accounts.

Grading/Evaluation:

Attendance is mandatory and class participation will be encouraged. More than two unjustified absences will contribute negatively to the final grade by 10%.
The assigned homework presented by the student will be taken into account as positive if it is handed in on time. Such homework will not be accepted if submitted late. This work will be graded and contribute towards the final grade. Students must take all the tests, midterm and final exams.

The percentage of each part of the course to the final grade will be:

Midterm exam:	20%
Final exam:	30%
Three quizzes:	30%
Problem sets:	20%

If the students regularly arrive late, -5% will be taken away of the grade. If it happens consistently during all the course, it can make the student fail.

Participation/Attendance Policy:

The SUMC Student Handbook states the following:

Once a student is registered for a course, attendance at every meeting of every class is expected, including those held in the first week of the semester. A maximum of two unjustified absences is permitted. Each additional absence will cause the final course grade to be lowered by one-third of a letter grade, i.e., from A to A-; A- to B+; B+ to B, etc.

Excessive absences in a course will have a negative effect on the final grade. When a student is absent, the quality of his or her work in a course will deteriorate since material missed in class sessions can rarely be made up satisfactorily, even though the student remains responsible for that work.

Please note that even when a student has a justified reason for missing class, such as illness, the negative academic impact on learning will be the same as if the absence were for spurious reasons.

In this course, any absence due to illness should be justified by a note from the student's physician or other health professional confirming the day(s) on which the student was unable to attend class. Students are responsible for all material and assignments for the days missed, regardless of the reason for the absence.

The fact that a student is present in class does not alone contribute to the participation score. Participation

and improvement in class is what makes up 10% of the grade.

In the event that a class meeting is unexpectedly cancelled, students will be expected to continue with readings or other assignments as originally scheduled. Any assignments due or class activities (e.g., a quiz, exam or presentation) planned for such a cancelled class are due at the next class meeting unless other instructions are communicated.

Disability Statement

If you anticipate issues related to the format or requirements of this course, please meet with me. I would like us to discuss ways to ensure your full participation in my classroom.

If formal, disability-related accommodations are necessary, it is very important that you be registered with the Office of Disability Services (ODS) at the main Campus in Boston so that I am notified of your eligibility for reasonable accommodations. We can then plan how best to coordinate your accommodations. Check the ODS web site at www.suffolk.edu/disability for information on accommodations.

Student Resources

SUMC provides a range of student services, both academic and personal. To learn more about course-related tutorials and academic workshops, refer to the SUMC Student Handbook, Section 2 "Academic Policies and Services". Section 5, "Living in Madrid", contains information on the medical and mental health resources, including an English-speaking therapist, available to you.

Midterm Review

At midterm, around week 6, you will be given a midterm grade based on your progress to date and performance on assignments, quizzes and midterm exam. Midterm grades of C- or below will be reported to the Madrid Campus Academic Standing Committee, with an explanation of what I believe has contributed to that grade: excessive absences, poor time management or study skills, lack of effort, difficulty with the course material or with writing or language skills, etc. The Academic Standing Committee or I may contact you to suggest strategies for addressing these difficulties. I strongly encourage you to visit me during my office hours so we may discuss how you can be successful in this class.

Academic Misconduct:

www.suffolk.edu/about/mission-history/policies-procedures/academic-misconduct-policy

Suffolk University expects all students to be responsible individuals with high standards of conduct. Students are expected to practice ethical behavior in all learning environments and scenarios, including classrooms and laboratories, internships and practica, and study groups and academic teams. Cheating, plagiarism, unauthorized collaboration, use of unauthorized electronic devices, self-plagiarism, fabrication or falsification of data, and other types of academic misconduct are treated as serious offenses that initiate a formal process of inquiry, one that may lead to disciplinary sanctions.

Student work will be thoroughly examined for academic integrity and may be scanned using plagiarism detection software. A faculty member suspecting academic misconduct will contact the student using the Suffolk email address to schedule a meeting and will make all effort to do so within five business days of detecting the incident. During the meeting, the faculty member will present the documentation that led to suspected academic misconduct. Resolution of the incident will be according to the procedures outlined in the SUMC Student Handbook.

Academic Grievances Policy:

www.suffolk.edu/student-life/student-services/student-handbook/university-policies-for-student-cas-sbs/grievances-academics

Course Schedule

The schedule, policies, procedures, and assignments in this course are subject to change in the event of extenuating circumstances, by mutual agreement, and/or to ensure better student learning.

Weeks	General topic of lesson	Readings or other assignments due
1-2	Intermolecular forces in liquids and solids	Chapter 12: Sections 1-3
3	Normal melting and boiling points: phase diagrams	Sections 5-7; first problem set.
4	Physical properties of solutions	Chapter 13: sections 1-3
5	Colligative properties Quiz 1 Ch. 12 and 13	Sections 4-6; second problem set.
6	Review day: One complex problem covering the material covered so far, will be given. Midterm exam	Chapter 14: sections 1-3; 5
7	Rate of reaction/ concentration-time dependence/ reaction mechanisms.	Review day/midterm exam
8	Spring break	
9	Chemica equilibrium	Chapter 15: all sections
10	Acid-base equilibria	Chapter 17: sections1-4. Third problem set.
11	Solubility equilibria.	Sections 5-8
12	Quiz 2 Ch. 15 and 17 Thermochemistry	
13	Thermochemistry	Chapter 6: sections 1-3. 4th problem set.
14	Calorimetry	Sections 4-6
15	Redox reactions: balancing. Quiz 3 Ch 6	Chapter 19: section 1; 5th problem set
16	Review session	Chapter 19: section 2,3 5, 6.
17	**FINAL EXAM**	

LABORATORY SESSIONS

Text:

Notebook given by the teacher before each lab session. Handout for the experiment will be given to the students prior to the lab session.

Grading:

Lab reports: 90%

Lab notebook: 10%

Lab safety:

Safety rules in the lab will be given at the beginning of the course. Every student is expected to follow all these rules while working in the lab. Specially important is to wear goggles at all time during lab sessions. Accidents or individual or medical problems must be notified the instructor.

Care of equipment:

All laboratory equipment, particularly delicate equipment like the analytical balance, must be handled with care. Students who deliberately mishandle lab equipment will be penalized with a lower grade for the course.

Lab notebooks:

Each student must maintain a laboratory notebook. Loose leaf notebooks are not acceptable. Keep a table of contents on the first page. During the lab session all observations and data are to be recorded clearly

and in order in the notebook. Each student must have his or her lab notebook signed by the instructor at the end of each lab session. The notebook grade is 10% of the total grade.

Attendance:
Attendance in each lab session is mandatory. Each student must sign the attendance sheet for each lab session. A missed lab will be recuperated only due to a forced reason.

Pre-lab assignments:
A pre-lab assignment is part of the report for all labs. It is due at the pre-lab lecture on the first day the lab is to be performed.

Lab reports:
Lab reports are due on the day of the next lab session after the lab is completed. Hand the reports directly to me or put them in my mailbox in Viña 3.
Students who turn in two lab reports late without an excuse, will receive a grade reduced by one-third of a grade level, e.g. A to A-. If three lab reports are handed in late, the grade will be reduced by two-thirds of a grade, e.g. A to B+, and so forth. One excused lab will be made up during the make-up session at the end of the term. A grade of zero will be given for more than one excused labs and for missing reports at the end of the term.

LABORATORY Schedule:
The schedule, policies, procedures, and assignments in this course are subject to change in the event of extenuating circumstances, by mutual agreement, and/or to ensure better student learning.

Week/Lab Title	**Lab Goals**	**Learning Objectives**	**How the student will be assessed on these learning outcomes**
2 Introduction	• To familiarize students with the laboratory and the equipment. Discuss the format of lab reports and notebook writing.	• Be able to make correct use of scientific language. • Know how to structure a lab report.	The skills gained in the introduction will be reflected in the lab activities and report writing.
3 Chemical Properties: The Activity Series	• To be able to understand the activity series, based on the reducing strength of metals.	• Deepen the knowledge of redox reactions and consolidation of the use of oxidation numbers.	Assessment in terms of being able to write and balance redox reactions.
4 Chemical Proportionality: Carbonate and Hydrochloric Acid	• To successfully use the titration technique and follow reactions with color indicators as well as using gas evolution as an indicator for the reaction progression.	• To carry out relevant stoichiometric calculations.	This part is assessed throughout the course, as stoichiometry is one of the cornerstones.
5 Gravimetric Analysis of Phosphorus	• To use reagents for derivatization and the understanding of the concept.	• To perform relevant calculations on mass percentages related to the composition of a precipitate.	Consolidation of stoichiometry.
6	No lab	**MIDTERM EXAM WEEK**	
7 Chemical kinetics	• To set up a kinetics experiment and to be able to, as a group, control different variables at the same time.	• Understand the influence of temperature and concentration on reaction rates. • Be able to report kinetic data graphically, and draw relevant conclusions.	This experiment will constitute an integrative part of the Kinetics chapter, and help consolidating the theory.
8	No lab	**SPRING BREAK**	

9 Titration of a weak acid: The Henderson-Hasselbach equation	• To use pH-meters and to practice the titration techinque.	• To learn how to graphically represent the Henderson-Hasselbach equation studied in class. Understand the shape of the titration curve of a weak acid.	This part will be useful for the understanding of buffers.
10 The chemical equilibrium and Le Chatelier's Principle	• Observe color changes in a reaction. Safe handling of toxic substances.	• Understand how you can influence the position of the chemical equilibrium.	This experiment will help understanding le Chatelier's principle.
11 Acid-Base Titration: Analysis of an Antacid	• Consolidation of the titration technique.	• Understand how titration can be used to determine the concentration of an active component of a drug.	Assessed throughout the course, when working with stoichiometry.
12	**SPRING BREAK**		
13 Oxalate-permanganate titration	Redox titration	Understand how redox reactions can be carried out by titration. Balancing of redox reactions	This experiment will help understanding the redox concept.
14	Make-up session		