

COURSE SYLLABUS STEM Ed Abroad Program

Course Title: General Chemistry II (including laboratory component)

Course Semester: Fall

University and Country: Adam Mickiewicz University; Poznan, Poland (AMU)

Number of ECTS: 6 (lecture) and 2 (laboratory)

Course Designations for Transfer Credit: CH201/202 (NCSU), CHEM178/178L (ISU)

Content: General Chemistry II is the second course in a two-semester sequence of introductory university-level chemistry courses. The focus is on chemical equilibrium and kinetics. This course is based on NCSU courses CH201 (lecture 3 credits) and CH202 (laboratory 1 credit). The ISU course is Chem178 and the laboratory is Chem178L.

Pre-requisites: University level General Chemistry I (NCSU 101 course) with a grade of C- or better.

Aims: By the end of this course, you will have acquired an overview of the general principles of quantitative chemistry with a particular focus on: complex solutions, thermodynamics, equilibria, kinetics and electrochemistry. You will be able to solve elementary and some more advanced problems related to specific topics mentioned above.

The second semester of General Chemistry emphasizes thermodynamics and kinetics. There is a brief review of units and stoichiometry followed by a multi-week survey of applications of equilibrium, including emphasis on acid-base equilibria, solubility products, and equilibria of various types of inorganic and organic reactions.

The Learning Objectives for each exam will be posted on each section's web site prior to the first lecture of the sequence leading up to that exam and will serve as both a study outline and a summary of items to review. The Learning Objectives also include the topics listed in the table below. A student must know and apply to demonstrate mastery of the material listed in these topics as presented in this course.

Recommended Books: Quantitative Chemistry by Dr. Dennis Wertz, additional web materials are available online on the AMU Moodle platform

Teaching Staff: Instructor: Dr. Tomasz Pedzinski, AMU (lectures + labs), Dr. Piotr Filipiak (labs)

Consultant: NCSU faculty member Dr. Lori Petrovich

The class consultant, Dr. Lori Petrovich will provide materials and act as the consultants for both the lecture and laboratory components. The textbook is Quantitative Chemistry by Dr. Dennis Wertz. There are extensive web materials and the textbook is also available on-line.

COURSE SYLLABUS STEM Ed Abroad Program

The laboratory portion of the course follows experiments designed by NCSU faculty and, in part by AMU faculty, and is implemented by Dr. Pedzinski.

The AMU course is 02-GCQ-STEM

Details and grades of the course at AMU will be available for students and instructors at www.usosweb.amu.edu.pl (login and password required).

Grading System and Percentage Contribution

A. Lecture assessment

Lecture participation	5%
Continuous assessment (preparation for class)	5%
Homework	12%
Problem Sessions	10%
Exam (3 @16% each)	48%
Final Exam, Cumulative	30%
Total	100%

B. Laboratory assessment

Preparation for laboratories	35%
Laboratory reports	65%
Total	100%

AMU Grading system and scale

The grading system used at Adam Mickiewicz University (AMU), is as follows:

Tests, exams, homework assignments grading scale

- 5 100%-91%
- 4+ 90%-86%
- 4 85%-76%
- 3+ 75%-71%
- 3 70%-60%
- 2 59% and less

Mid-term Exams (3 x 20%) – 60% weight

Final Exam – 40% weight

This translates into the following ECTS (European internationally recognized system) grading scale:

ECTS Grade	AMU grade	Definition
A	5.0	EXCELLENT – outstanding performance with only minor errors
B	4+ / 4.5	VERY GOOD – above the average standard but with some errors
C	4.0	GOOD – generally sound work with a number of notable errors
D	3+ / 3.5	SATISFACTORY – fair but with significant shortcomings
E	3.0	SUFFICIENT – performance meets the minimum criteria
FX	2.0	FAIL – some more work required before the credit can be awarded

COURSE SYLLABUS STEM Ed Abroad Program

F	2.0	FAIL – considerable further work is required
---	-----	--

Hours: 3 Lecture hours and 1 Tutorial hour per week. The laboratory component consists of 28 specific topics listed below. Each laboratory has a duration of 2.5 hours.

Course Lecture and Laboratory Topics:

Lecture	Topics	Book Sections	Week No.
1	Conversion Factors	1.1	1
	Significant Figures	Appendix A	1
	Balancing Chemical Equations	1.4	1
2	Reaction Stoichiometry	1.5	1
	Limiting Reactants	1.5	1
3	Limiting Reactants, cont.	1.5	2
	Solution Concentration Units	2.0 – 2.1	2
4	More on Concentration Units	2.2	2
	Dilutions	2.3	2
	Spectrophotometry	2.4	3
	Reaction Stoichiometry in Solution	2.4	3
5	Colligative Properties	2.5	3
6	Substance Stoichiometry	1.1 – 1.3	4
7	Work and Heat	3.0 – 3.2	4
	First Law of Thermodynamics	3.3	4
	Enthalpy	3.4 – 3.5	4
8	Calorimetry	3.9	5
	Thermochemical Equations	3.5	5
9	Mid-term EXAM #1		6
10	Hess' Law	3.6	6
	Heats of Formation	3.7	6
	Bond Energies	3.8	6
11	Entropy	4.0 – 4.4	7
12	Free Energy Changes	4.5	7
	Coupled Reactions	4.8	7
	Free Energy and Equilibrium	4.6	8

COURSE SYLLABUS STEM Ed Abroad Program

13	Temperature Dependence of K Properties of K LeChatelier's Principle	4.7 5.1 5.2	8 8 8
14	Manipulating K		9
15	Net Equations for Acid/Base Reactions Water and p-scales Acid Strength	5.3 6.0, also see CH 101 text 6.1 – 6.2	9 9 9
16	pH of Strong Acids pH of Strong Bases pH of Weak Acids pH of Weak Bases	6.3 6.6 6.4 6.7	10 10 10 10
17	Mid-term EXAM #2		11
18	pH of Weak Bases, cont. pH of Polyprotic Acids Acid/Base Properties of Salts pH of Amphiprotic Salts	6.7 6.5 6.8 6.9	11 11 11 11
19	Common Ion Effect pH of Buffer Solutions	7.1 7.2	12 12
20	Preparing Buffer Solutions pH of Acid/Base Mixtures with Reactions	7.2 7.3	12 12
21	pH of Acid/Base Mixtures w/ Reactions cont. Solution Composition at Fixed pH	7.3 7.4	12 12
22	Summary of pH Problems Solubility Equilibria Precipitation and Separation of Ions	8.2 8.3	12 12 12
23	Mid-term EXAM #3		13
24	Concentration Effects on Redox	9.1 – 9.4	13
25	Reaction Rates Rate Laws Initial Rates	10.0 – 10.1 10.2 10.3	13 13 13
26	Integrated Rate Laws Reaction Mechanisms	10.4 10.4	14 14

COURSE SYLLABUS STEM Ed Abroad Program

27	Temperature Effects on Reaction Rates Catalysis	10.5 10.6	14 14
28	Review + Final Exam		15