Course Syllabus
CHM-240 General Chemistry II

Semester and year:
Course Number:
Meeting Times and Locations:

Instructor:
Office Location:
Phone:
Office Hours:
Email Address:

COURSE DESCRIPTION:
CHM-240 General Chemistry II is the second course of a two-semester sequence of general chemistry. Topics covered include intermolecular forces, properties of solutions, chemical kinetics, equilibrium, thermodynamics, acids and bases, and electrochemistry.

CREDITS/HOURS: 3 credits/3 hours (3 contact hours lecture)

PREREQUISITES: CHM-140; MAT 160 with a grade of C or better

RECOMMENDED PREREQUISITE: CHM-141

RECOMMENDED COREQUISITE: CHM-241

GENERAL ED COURSE: Yes

STUDENT LEARNING OBJECTIVES (LEARNING OUTCOMES): As a result of meeting the requirements in this course, students will be able to:
1. Explain spectrophotometry, Beer-Lambert Law and solution concentrations
2. Identify the forces of interaction between molecules
3. Interpret a phase diagram
4. Explain the properties of liquids
5. Explain the classification of solids by type and crystalline structure
6. Express solution concentrations in the technical terms used in chemistry
7. Apply the concepts of colligative properties to the solution of chemistry problems
8. Explain the nature of strong and weak acids and bases
9. Interpret kinetic data and apply the principles of kinetics to reaction mechanisms
10. Explain the principles of equilibrium and calculate equilibrium constants
11. Explain the nature of acid-base buffers and calculate pH
12. Interpret the laws of thermodynamics as they apply to chemical reactions
13. Balance oxidation-reduction reactions in acid and base solutions
14. Calculate the electromotive force of voltaic cells (batteries)
15. Define and explain technical terms used in chemistry
## Course Outline and Calendar*

CHM-240  General Chemistry II

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic/Activity/Assignments</th>
<th>Student Learning Objectives</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to course</td>
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<tr>
<td></td>
<td>Chapter 4: Section 4.8 Spectrophotometry</td>
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<tr>
<td></td>
<td>Beer-Lambert Law, Solution Concentrations</td>
<td>1, 15</td>
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<td></td>
<td>Chapter 11: States of matter and intermolecular forces</td>
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<td></td>
<td>Interactions between molecules</td>
<td>2, 3, 15</td>
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<tr>
<td></td>
<td>Properties of Liquids</td>
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<td></td>
<td>Assigned homework problems</td>
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<tr>
<td>2</td>
<td>Chapter 11: Properties of Liquids – Vapor Pressure</td>
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<td></td>
<td>Enthalpy of Vaporization, Boiling Point</td>
<td>2, 4, 15</td>
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<td>Assigned homework problems</td>
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<td></td>
<td>Chapter 12: Crystalline Solids and Unit Cells</td>
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<tr>
<td></td>
<td>Ionic Compounds and Lattice Energy</td>
<td>2, 5, 15</td>
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<td></td>
<td>Assigned homework problems</td>
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<td>3</td>
<td>Chapter 12: Solid Materials</td>
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<tr>
<td></td>
<td>Phase Changes and Phase Diagrams</td>
<td>2, 3, 15</td>
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<td></td>
<td>Assigned homework problems</td>
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<td></td>
<td>Chapter 13: Units of Concentration: Molarity, Molality</td>
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<td></td>
<td>Mole Fraction, Mass Percentage of Solute</td>
<td>2, 4, 6, 15</td>
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<td></td>
<td>Assigned homework problems</td>
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<td>4</td>
<td>Chapter 13: Solubility and the Solution Process</td>
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<td></td>
<td>Effects of Temperature and Pressure</td>
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<td></td>
<td>Henry’s Law</td>
<td>2, 4, 6, 15</td>
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<td>Assigned homework problems</td>
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<td></td>
<td>Chapter 13: Colligative Properties:</td>
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<td>Assigned homework problems</td>
<td>2, 6, 7, 15</td>
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<td>5</td>
<td>Chapter 14: Rates of Reactions and Orders</td>
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<td></td>
<td>Rate Law and Rate constant</td>
<td>6, 9, 15</td>
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<td></td>
<td>Assigned homework problems</td>
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<td>6</td>
<td>Chapter 14: Integrated Rate Laws</td>
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<td></td>
<td>Graphing Kinetic Data</td>
<td>6, 9, 15</td>
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<td>Half –Life</td>
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<td>Assigned homework problems</td>
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<td></td>
<td>Chapter 14: Activation Energy</td>
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<td></td>
<td>Arrhenius Equation</td>
<td>6, 9, 15</td>
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<td></td>
<td>Assigned homework problems</td>
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</tbody>
</table>

*Dates for all tests will be announced by the individual instructor.
<table>
<thead>
<tr>
<th>Week</th>
<th>Topic/Activity/Assignments*</th>
<th>Student Learning Objectives (Learning Outcomes)</th>
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</table>
| 7    | Chapter 14: Reaction Mechanisms  
Catalysis  
Assigned homework problems | 9, 15 |
|      | Chapter 15: Equilibrium, Equilibrium Constant Calculations  
Interpreting Equilibrium Constants  
Calculating Equilibrium Concentrations  
Assigned homework problems | 6, 10, 15 |
| 8    | Chapter 15: LeChatelier’s Principle  
Disturbing a Chemical Equilibrium  
Changing Reaction Conditions - Effect on Equilibrium Constant  
Predicting Equilibrium Shifts  
Assigned homework problems | 10, 15 |
|      | Chapter 16: Arrhenius Acids and Bases  
Bronsted Acids and Bases – Conjugate Pairs  
Polyprotic Acids  
Water Autoionization; pH Scale  
Assigned homework problems | 4, 6, 8, 10, 11, 15 |
| 9    | Chapter 16: Relative Strengths of Acids and Bases  
Equilibrium (Ionization) Constants  
Strong Acids and Strong Bases  
PH of a Solution  
Acid–Base Properties of Salt Solutions  
Assigned homework problems | 6, 8, 10, 11, 15 |
|      | Chapter 16: Predicting the Direction of Acid Base Reactions  
Equilibrium Constant Calculations:  
Weak Acid Ionization: Equilibrium & pH  
Weak Base Ionization: Equilibrium & pH  
Assigned homework problems | 6, 10, 11, 15 |
| 10   | Chapter 16: Molecular Structure and Acid Strength  
Lewis Acids and Lewis Bases | 6, 10, 11, 15 |
|      | Chapter 17: Common-Ion Effect  
Buffers – Controlling pH  
Assigned homework problems | 6, 10, 11, 15 |

*Dates for all tests will be announced by the individual instructor.*
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<thead>
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<th>Week</th>
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<th>Student Learning Objectives (Learning Outcomes)</th>
</tr>
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</table>
| 11   | Chapter 17: Solubility of Salts: Equilibrium  
Solvency Product Constant, Ksp  
Precipitation Calculations; Complex-Ion formation  
Assigned homework problems | 6, 10, 11, 15 |
|      | Chapter 18: Second Law of Thermodynamics - Entropy  
Entropy Measurement and Values  
Third Law of Thermodynamics  
Assigned homework problems | 12, 15 |
| 12   | Chapter 18: Entropy Changes and Spontaneity  
Gibbs Free Energy - Concept  
Free Energy, Spontaneity and Chemical Equilibrium  
Assigned homework problems | 2, 4, 5, 6, 12, 15 |
|      | Chapter 18: Free Energy and Temperature  
Assigned homework problems | 12, 15 |
| 13   | Chapter 19: Balancing Oxidation-Reduction Equations  
Redox in Acid and Basic Solutions  
Assigned homework problems | 4, 6, 12, 13, 15 |
| 14   | Chapter 19: Construction of Voltaic Cells  
Commercial Voltaic Cells  
Standard Reduction Potentials  
Electromotive Force (EMF)  
E° of Cells  
Oxidizing and Reducing Agents  
Assigned homework problems | 4, 5, 6, 12, 13, 14, 15 |
|      | Chapter 19: Nernst Equation  
Electrochemistry and Thermodynamics  
Electrolysis  
Assigned homework problems | 3, 5, 6, 12, 13, 14, 15 |
| 15   | Review  
Final Exam |  |

*Dates for all tests will be announced by the individual instructor.*

The above calendar may be modified at the discretion of the instructor to accommodate test dates.
### Bergen Community College Core Competencies

<table>
<thead>
<tr>
<th>Competency</th>
<th>Student Learning Objectives (Learning Outcomes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Communication</td>
<td>1–5, 7–12, 15</td>
</tr>
<tr>
<td>2. Quantitative Reasoning</td>
<td>5, 6, 8 - 14</td>
</tr>
<tr>
<td>3. Critical Thinking</td>
<td>1-15</td>
</tr>
<tr>
<td>4. Technological and Information Fluency</td>
<td>4, 5, 13, 14, 15</td>
</tr>
<tr>
<td>5. Applied Knowledge</td>
<td>1 - 15</td>
</tr>
</tbody>
</table>

### ASSESSMENT MEASURES:
The student learning objectives will be assessed by:
- 1. Assigned homework problems from the text and OWL
- 2. Quizzes
- 3. Class participation
- 4. Unit Examinations (a minimum of 3)
- 5. Final Examination (**comprehensive**)
- 6. A writing component in the form of essays or short answer questions on examinations.

At the discretion of the instructor, assessment measures may be somewhat modified.

### TEXTBOOK:

**note:** Text Comes with OWL and Chemistry Now. The Student Solutions Manual and Study Guide are available as separate purchases.

### COURSE CONTENT:
- Chapter 4: Section 4.8: Spectrophotometry; Beer-Lambert Law
- Chapter 11: Intermolecular Forces and Liquids.
- Chapter 12: The Solid State.
- Chapter 13: Solutions and their Behavior. *Omit* Sect. 13.5
- Chapter 14: Chemical Kinetics: The Rates of Chemical Reactions.
- Chapter 15: Principles of Chemical Reactivity: Equilibria
- Chapter 16: Principles of Chemical Reactivity: The Chemistry of Acids and Bases. Sect. 16.9 qualitative aspects only
- Chapter 17: Principles of Chemical Reactivity: Other Aspects of Aqueous Equilibria.


Chapter 25: Nuclear Chemistry (optional).

SUPPLEMENTARY READINGS / MATERIALS:


OTHER REQUIREMENTS:

1. A scientific or graphing calculator is required.
2. Students are required to use the factor-label method/dimensional analysis for problem solving.

GRADING POLICY

Instructor’s Grading Policy:
The grading policy for each section will be provided separately by the individual instructor at the first class meeting.

General Guidelines:

<table>
<thead>
<tr>
<th>Component</th>
<th>Maximum Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assigned homework problems from the text and OWL</td>
<td>not more than 10%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>not more than 20%</td>
</tr>
<tr>
<td>Class participation</td>
<td>not more than 5%</td>
</tr>
<tr>
<td>Unit Examinations (a minimum of 3)</td>
<td>50 to 75%</td>
</tr>
<tr>
<td>Final Examination (comprehensive)</td>
<td>15 to 25%</td>
</tr>
</tbody>
</table>

1. Any examination not taken will receive a grade of zero. Make-up examinations will be administered in accordance with the instructor's policy.
2. Any student caught cheating (including using unauthorized formula sheets of any kind) will receive a grade of zero on that particular examination or paper. That zero cannot be replaced by any other examination grade or extra work.

Please read The Bergen Community College Statement on academic integrity as found in the college catalog.
3. Late work is not accepted unless specifically authorized by the instructor.
4. Instructors may make minor modifications to the grading guidelines.

**ATTENDANCE/LATENESS POLICY:**

All students are expected to attend punctually every scheduled meeting of each course in which they are registered. Attendance and lateness policies and sanctions are to be determined by the instructor for each section of each course. These will be established in writing on the individual course outline. Attendance will be kept by the instructor for administrative and counseling purposes.

**OTHER POLICIES:**

**Electronic Devices:**

The use of portable electronic devices such as pagers and cell phones is not permitted while class is in session. Please silence these devices before entering class.

**Code of Student Conduct:**

Students are encouraged to read, understand and follow the rules and standards of conduct as explained in the Student Handbook. The Student Handbook is available in the Office of Student Life and on the BCC website.

**STUDENT SUPPORT SERVICES:**

The STEM Learning Center in Room S-315 and the Tutoring Center (L-125) provide student support in chemistry, math and other sciences.

Faculty office hours may be a productive vehicle for assistance in understanding the course material.

The BCC Library provides extensive support services for student research.

**SERVICES FOR STUDENTS WITH DISABILITIES**

Bergen Community College aims to create inclusive learning environments where all students have maximum opportunities for success. Any student who feels he or she may need an accommodation based on the impact of a disability should contact the Office of Specialized Services at 201-612-5269 or via email at ossinfo@bergen.edu for assistance.

**FACULTY ABSENCE PROCEDURE:**

A daily listing of cancelled classes will appear in a glass case near the registration area on the first floor. Another such listing will appear in a glass case in Ender Hall. Students can consult these cases before going to class. Cancelled classes are also listed under class cancellations at bottom of the BCC website page. Under no circumstances are notices regarding class cancellations taped to classroom doors binding.

If students find a class cancelled which has not been listed, they should report this to the Divisional Dean’s Office, A-304 or the Evening Office C-107.

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All BCC students enrolled in credit courses are entitled to a WebAdvisor account. With WebAdvisor, you may register online, pay your bill, check your schedule, room assignments, GPA, and find out what courses you need to take. To find out more about WebAdvisor or to sign up online, visit <http://go.bergen.edu>. While there, please make sure you give us your preferred email address. You'll find directions how to do this at <http://go.bergen.edu/email>.

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