1. Catalog Description of the Course. [Include the course prefix, number, full title, and units. Provide a course narrative including prerequisites and corequisites. If any of the following apply, include in the description: Repeatability (May be repeated to a maximum of ___ units); time distribution (Lecture ___ hours, laboratory ___ hours); non-traditional grading system (Graded CR/NC, ABC/NC). Follow accepted catalog format.]

CHEM 124. General Chemistry II Problem-Solving (1)
One hour of activity per week.
Co-requisite: CHEM 122
An instructor/peer-supervised interactive problem-solving session for students in CHEM 122 where students work in small groups on problems related to the content in CHEM 122.

2. Mode of Instruction.

<table>
<thead>
<tr>
<th></th>
<th>Units</th>
<th>Hours per Unit</th>
<th>Benchmark Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seminar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity</td>
<td>1</td>
<td>1</td>
<td>30</td>
</tr>
</tbody>
</table>

3. Justification and Learning Objectives for the Course. (Indicate whether required or elective, and whether it meets University Writing, and/or Language requirements) [Use as much space as necessary]

This course is an optional problem-solving session for the second semester general chemistry course (CHEM 122), and provides students with an interactive, problem-solving session where students work in small teams to solve problems in chemistry.

The course is designed to provide the student with a basic knowledge of the following:

- The scientific method and how it is used to approach scientific problems in chemistry
- History of the development of the field of chemistry
- Basic chemical principles relevant to all sub-fields of chemistry

Students who successfully complete this course will be able to:

- Describe chemical equilibrium both qualitatively and quantitatively
- Explain solubility of material in aqueous solutions and be familiar with non-aqueous solutions
- Solve problems dealing with acid-base chemistry
- Describe oxidation-reduction chemistry qualitatively and in terms of equilibrium
- Evaluate problems involving complex equilibrium (e.g. solubility in acidic solution)
- Identify the most common crystal structures of chemicals
- Describe the chemistry of common inorganic species
- Identify different types of organic species
- Explain the differences between basic categories of biologically important chemicals

4. Is this a General Education Course
   YES
   NO

If Yes, indicate GE category:
5. **Course Content in Outline Form.** [Be as brief as possible, but use as much space as necessary]

- Chemical Equilibrium
- Vapor pressure
- Melting and boiling
- Gas Phase Equilibrium
- Equilibrium and temperature
- Le Chatlier’s principle

**Solutions**
- Solvents and Solutes
- Water
- Solubility
- Solubility and equilibrium
- Solubility product
- Henry’s Law
- Freezing and melting of solutions
- Raoult’s Law
- Common Ion Effect
- Complex Ions

**Acids and Bases**
- Hydronium ions and pH
- Equilibrium in water
- Strong and weak acids and bases
- Equilibrium of weak acids and bases
- Acid-base titrations
- Buffers
- Polyprotic acids and bases

**Oxidation and Reduction**
- Oxidation-Reduction half reactions
- Balancing Redox reactions
- Redox reactions in acidic and basic solutions

- Electrical cells
- Standard state potentials
- Equilibrium and Nernst

**Electrolysis**

**Inorganic Chemistry**
- Crystals
- Description of crystal structure
- Common unit cells
- Non-crystalline solids
- Liquids
- Surface tension
- Phase diagrams

**Organic Chemistry**
- Saturated and unsaturated hydrocarbons
- Aromatic compounds
- Functional groups
- Alcohols, Esters, Aldehydes and Ketones
- Organic acids and Amines

**Biochemistry**
- Carbohydrates
- Lipids
- Amino acids and Proteins
- Nucleic acids and DNA
- Vitamins
6. **References.** [Provide 3 - 5 references on which this course is based and/or support it.]

   Pauling, L. *General Chemistry*, 3rd Ed., 1970
   Silberberg, M.S. *Chemistry*, 3rd Ed., 2003
   Zumdahl, S.S.; Zumdahl, S. *Chemistry*, 2000

7. **List Faculty Qualified to Teach This Course.**

   Dr. Simone Aloisio, Dr. Philip Hampton

8. **Frequency.**
   a. Projected semesters to be offered: Fall _____ Spring ___X____ Summer _____

9. **New Resources Required.**
   None.

10. **Consultation.**
    Attach consultation sheet from all program areas, Library, and others (if necessary)

11. If this new course will alter any degree, credential, certificate, or minor in your program, attach a program modification.

    ___________________________________________________
    Proposer of Course    Date