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 450. INSTRUMENTAL ANALYSIS AND LABORATORY (4)
Three hours lecture and three hours laboratory per week.
Prerequisite: CHEM 250, CHEM 251, CHEM 305 (or concurrent enrollment or consent of instructor), and CHEM 315 with a grade of C or better
This course is designed to introduce chemical analysis using instrumental methods. Areas covered will include atomic and molecular spectroscopy, chromatography, and mass spectroscopy. Lectures will focus on theory and application of these techniques to organic, inorganic, and biochemical analysis. Experimental design, materials used in scientific apparatus, vacuum science and electronic circuits will also be examined. Lab fee required.

2. Mode of Instruction.

<table>
<thead>
<tr>
<th>Units</th>
<th>Hours per Unit</th>
<th>Benchmark Enrollment</th>
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</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>3</td>
<td>1</td>
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<tr>
<td>Seminar</td>
<td></td>
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<tr>
<td>Laboratory</td>
<td>1</td>
<td>3</td>
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<tr>
<td>Activity</td>
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</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 typically taken by Chemistry majors, as well as other science majors, who are interested in using instrumentation for chemical analysis in their profession or graduate studies. This course will be an upper-division elective for chemistry majors.

Students who successfully complete this course will be able to:
• Outline the development of the field of instrumental chemical analysis from a historical perspective including different techniques and how these techniques have contributed to the science.
• Describe the theories governing spectroscopy, chromatography, and mass spectroscopy.
• Demonstrate the ability to use state-of-the-art scientific instrumentation in the analysis of organic, inorganic and biochemical samples.
• Describe how molecular shape, electronic structure, thermodynamics, kinetics, and intermolecular interactions are involved in instrumental analysis.
• Compare advantages and disadvantages of commonly used techniques in chemical analysis.
• Describe simple electronic circuits, vacuum technology, optics, and materials used in construction of scientific apparatus.
• Plan their own chemistry experiments using scientific instrumentation.
• Evaluate methodologies utilizing scientific instrumentation for reasonable limits to what data can be obtained from these techniques.
• Interpret, discuss, and evaluate a primary literature article.

4. Is this a General Education Course
   YES
   NO

If Yes, indicate GE category:

NEWCRSFR 9/30/02
5. **Course Content in Outline Form.** [Be as brief as possible, but use as much space as necessary]

   - Fundamentals of Instrumentation
   - Experimental Design
   - Materials
   - Vacuum Technology
   - Optics
   - Charged Particle Optics
   - Electrical Components and Circuits
   - Signals and Noise
   - Optical Spectroscopy
     - Components of an Optical Instrument
     - Atomic Absorption, Fluorescence, and Emission
     - X-Ray spectroscopy
     - UV/Visible Spectroscopy and fluorescence
     - Infrared Spectroscopy, Raman, and Fourier Transforms
     - Nuclear Magnetic Resonance Spectroscopy
   - Separation Methods
     - Gas Chromatography
     - Liquid Chromatography
     - Supercritical Fluid Chromatography and Extraction
     - Capillary and Gel Electrophoresis
   - Mass Spectroscopy
     - Sector and Electrostatic Analyzers
     - Quadropole Mass Spectroscopy
     - Other charged particle separation techniques
   - Surface Techniques
   - Electroanalytical Techniques
     - Potentiometry, Coulometry, and Voltametry

6. **References.** [Provide 3 - 5 references on which this course is based and/or support it.]


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

   - Dr. Simone Aloisio

8. **Frequency.**
   a. Projected semesters to be offered: Fall _X_ Spring ____ Summer ____
   Alternating with other upper-level chemistry electives on a two-year cycle.

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.

    __Simone Aloisio_________________________12-16-03________________________
    Proposer of Course    Date