I. Description of Course:

1. Department/Course: CHEM - 190
2. Title: Scientific Research Methodology
3. Cross Reference:
   4. Units: 1.00
   Lec Hrs: .50
   Lab Hrs: 1.50
5. Repeatability: No
6. Grade Options:
   Grade Only (GR)
7. Degree/ Applicability:
   Credit, Degree Applicable, Not Transferable (D)
8. General Education:
9. CAN Numbers:
10. Field Trips: Optional
11. Requisites:
   Advisory
   Major in a STEM Program MATH 188
   Prerequisite
   Consent of instructor

12. Catalog Description:
This course introduces students to scientific research methods. It includes hypothesis writing, variable identification, experiment design, literature reviews, data interpretation and analysis, research proposal preparation and presentation of scientific papers.

13. Class Schedule Description:
Introduction to research methods -- hypothesis, experimental design, data analysis, literature review.

14. Counselor Information:
This course is offered to prepare students for scientific research and internships who are majoring in science, technology, engineering and mathematics (STEM) disciplines.

II. Student Learning Outcomes

The student will:
1. Write hypothesis
2. Identify variables (dependent and independent)
3. Design experiment with suitable controls and replicates
4. Identify a research problem
5. Conduct a literature review
6. Prepare graphs manually and with Excel
7. Statistically and graphically analyze data from experiments
8. Write a research proposal
9. Make an oral presentation and defense of a research proposal
10. Prepare a scientific abstract for presentation in a peer reviewed journal and/or conference
11. Generate documents using MS Word, PowerPoint, and Excel software
III. Course Outline:

A. Hypothesis development
   1. Identifying independent, dependent and extraneous variables
B. Literature searches
   1. Primary, secondary, and tertiary literature
   2. Use of university libraries
C. Experimental design using one independent and one dependent variable
   1. Identification of variables
   2. Protocols and procedures
D. Data collection and analysis
   1. Statistical methods
   2. Data tables
   3. Graphs -- prepared manually and with Excel software
E. Literature Citation
   1. Literature cited
   2. Bibliography
F. The written research proposal
   1. Organization and format
   2. Using Word to write the proposal
G. Presenting research proposals, reports and abstracts
   1. Oral presentations using PowerPoint
   2. Poster Presentations
H. Final presentations

IV. Course Assignments:

   Reading Assignments
   Textbooks and journal articles

   Writing Assignments
   short written assignments - including
   hypothesis statements
   literature reviews and abstracts
   experimental methods
   written research paper
   using scientific research proposal guidelines

   Projects, Activities, and other Assignments
   Oral presentation of research proposal using PowerPoint and other methods.

V. Methods of Evaluation:

   A. Term paper
   B. Research paper
   C. Defense of the Research proposal

   Methods of Instruction:
   Lecture
   Laboratory

VI. Textbooks:
Required

Optional

Optional

VII. **Supplies:**

1. none