Course Syllabus
Fall 2021
CHE 4175 010

Special Supervised Problems
Electrochemical and Spectroscopic Studies of Polycyclic Aromatic Compounds

Course Description: Individual study and/or laboratory research.

Number of Credit Hours: 1 – 4 semester hours.

COVID-19 Safety Guidelines
Masks (cloth face coverings) must be worn over the nose and mouth at all times in this class and appropriate physical distancing must be observed. Students not wearing a mask and/or not observing appropriate physical distancing will be asked to leave the class. All incidents of not wearing a mask and/or not observing appropriate physical distancing will be reported to the Office of Student Rights and Responsibilities. Students who are reported for multiple infractions of not wearing a mask and/or not observing appropriate physical distancing may be subject to disciplinary actions.


Hour Justification: This course is for one credit and typically meets for 150 minutes a week for 15 weeks plus preparations for a final Report. Students have significant weekly, reading, correcting, and analysis of data, and Experiments. This will involve critical thinking and quantitative reasoning. Students will meet with students in lab with advisor every week. These activities average at a minimum 3-4 hours of work each week to prepare outside of classroom hours.

Course Prerequisites and Corequisites: Permission of instructor. Pass - Fail grading.

Program Learning Outcomes:
1. The student will perform qualitative/quantitative chemical analyses/syntheses using modern instrumentation.
2. The student will articulate scientific information through oral communication. (depending on instructor or project)
3. The student will articulate scientific information through written communication.
4. The student will demonstrate ability to integrate knowledge content, laboratory skill, critical thinking and problem solving, and communication skills via participation in research projects.

General Education Core Curriculum Objectives: There are no specific general education core curriculum objectives in this course. This course is not a general education core curriculum course.

Course Objective: The student should demonstrate their ability to conduct chemical research.

Student Learning Outcomes: Upon completion of this course, students will be able to:
• apply the chemistry knowledge obtained during the college career. (PLO 3, 6)
• analyze experimental results based upon trends in data. (PLO 5)
• practice the safe use/handling of chemicals and their proper storage. (PLO 3)
Class Syllabus
Fall 2021
CHEM 4175 010
Special Supervised Problems
Electrochemical Studies of Polycyclic Aromatic Compounds

Name: Dr. Kefa K. Onchoke
Department: Chemistry
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Office: M-118
Office Hours: TBA with student
Class meeting time and place: Chemistry Building in Rm. C-302/305 R 5-8

CATALOG DESCRIPTION: A, B, C, D. Chemistry Practicum: 1-4 semester hours. May be repeated for a total of four credit hours. Undergraduate only. Individual research.

PREREQUISITES: Consent of instructor

CO-REQUISITES: must have done CHE 1112L to be enrolled in course. Must have done CHE 1112 and 3331, 3332, 2175 to be enrolled in CHE 2176

REQUIRED TEXTS AND OTHER MATERIALS: Literature pertaining to research topic. Modeling software (Gaussssian, Chem Sketch etc).

REQUIRED SUPPLEMENTARY READINGS: Literature pertaining to research topic. Modeling software (Gaussssian, Chem Sketch etc). Relevant Journal papers

COURSE OBJECTIVES: The student will develop an understanding of the basic concepts, laws and theories of chemistry and apply them to chemistry problems through research techniques. The student should learn the skills needed to demonstrate competency in chemical research and be proficient in the use of instruments.

STUDENT LEARNING OUTCOMES: Upon completion of this course, students are expected to:
1.) Apply chemistry concepts to problem solving,
2.) Analyze experimental results based upon the trends in the data
3.) Demonstrate the knowledge of issues facing modern science, and
4) Have the confidence and laboratory skills needed to complete research experiments,
5.) Demonstrate the knowledge of the influence of modern technology on chemistry by using instrumentation to collect data during laboratory experiments.

COURSE REQUIREMENTS:
Conduct experiments – Lab Reports. Accurate Lab reports will be maintained whenever experiments are conducted. Data, data generated must be entered into the lab notebook. This constitutes personal a personal record of what has been done. We will be writing lab reports every week following a proper ACS scientific style
- Introduction
- Experiments
- Results
- Discussion (interpretation of results)
- Conclusion
- Acknowledgments
**Progress Report:** Minimum 500-word progress report based on the data and interpretation of the results they have obtained before mid-term exams. (20%)

**Final Report:** This report should cover the background material for the project, data, and interpretation of the results. This report should be written following the guidelines of the department. Report is due during exam week. (40%)

An ACS style guide should be used in writing Reports.

**COURSE CALENDAR:**

| Wk 1 and 2 | Lab introduction, safety video, assignment
|            | Introduction into the Lab and experiments to be done this semester.
|            | - Introduction into what to do in this semester. Planning the experiment for this week
|            | - Lab report format & planning the experiments
|            | - Literature search and report writing formats
|            | **Importance of PAHs in the environment. Effects and various health risks of PAHs on human health.**
|            | - To acquire spectra on some specific benzanthrones & specific PAHs
|            | Assessment of Spring 2021 Data, and Planning next set of experiments.
|            | - Acquisition of spectra with UV-Vis, FTIR, fluorescence and NMR

| Wks 3 & 4, 5 | Electrochemical instrumentation & acquisition of data
|             | - Review of last semester’s data
|             | - Sample preparation and degassing of current samples.
|             | - Various background electrolytes used for this semester’s cpds
|             | - What information to get from Electrochemical measurements? Interpretation of data.
|             | - Search literature (on specific PAHs provided, occurrence. How are they prepared?).
|             | - Methods of analysis – differential pulse voltammetry
|             | - Practical determination of cyclic voltammetry
|             |  • Preparation of samples for analysis
|             |  • Design methods for analysis and acquisition of data using cyclic voltammetry/
|             |  Plan to acquire cyclic voltammetry of various PAHs (to be provided).
|             | **Samples:** Various samples of chemical compounds will be assigned and will be provided.
|             | - Acquisition of spectra with UV-Vis, FTIR, HPLC, fluorescence and NMR, 2-D NMR tec
|             | - Quantum yields calculations. Linear sweep expts. begin (planning and execution)

| Wk 6-7 | Literature search – Reports of effects and occurrences of the PAHs in nature. Standards
|        | - For cyclic voltammetry, supporting electrolytes to use
|        | - Various CVs and electrochemical methods
|        |  • DPV, linear sweep methods
|        |  • Use DMSO for sample acquisition

| Wk 8 & 9 | Analysis of samples using Cyclic voltammetry, $E_{pa}/E_{pc}$ and electrochemistry
|          | (Dr. Onchoke and student), DPV experiments

| Wk 10 | Analysis of samples with electrochemical equipment, preparation of standards
|       | - Analytical acquisition of PAH derivatives
|       | - DPV experiments, **Linear sweep measurements**

| Wk 11 & 12 | Analytical acquisition of PAH derivatives
|            | (Procedures from previous weeks will be repeated)

| Wk 13 | **(Dr. Onchoke and student) Interpretation of data:**
|       | - Implications of the electrochemical data. Other useful spectroscopic methods such as NMR
|       | - Preparation of Results/Data Tables

| Wk 12-14 | - Write the research reports as per guideline on page 5 - 6 of this syllabus
|          | - Summary and draft copies of the write-up
|          | - Evaluation of acquired data
|          | - Recommendations
Analysis of data and full report (Student/Dr. Onchoke in November)

**Introduction to the use of NMR for the analysis of the PAHs in appropriate solvents**

**Standard Operating Procedures (SOP)/Professionalism**

1. The laboratory area must be kept clean.
2. All safety rules must be followed.
3. All the equipment must be used properly.
4. Any time any absence is necessary, the student is to notify the instructor ahead of time and arrangements for make up to be made.

**METHOD OF EVALUATION:**
The course is Pass/Fail; however I do keep grades for my records. The point total for the semester is 300 points.

- Lab notebook - 100 points
- Report -100 points
- SOP/professionalism -75 points
- Presentation - 25 points

Grad grading scale - A ≥ 270; B ≥ 240 - 269.99; C ≥ 210 – 239.99; D ≥ 180 - 209.99; F < 179.99.

**MAKE-UP POLICY & ATTENDANCE:** The student will work about 3-4 hours per week. A regularly scheduled time will be arranged. See SOP/Professionalism.

**ACADEMIC HONESTY POLICY:** CHEATING OR SCHOLASTIC DISHONESTY WILL NOT BE TOLERATED AND WILL RESULTY IN AN F IN THE COURSE AND FURTHER ACTION BY THE UNIVERSITY. Any student found cheating will be subject to the penalties as stated in the Student Code of Conduct handbook; including but not limited to a score of zero on exam or laboratory experiment, expulsion from the class or expulsion from the University.

**WITHHELD GRADES SEMESTER GRADES POLICY (A-54):**
Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students register for the same course in future terms the WH will automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average.

The circumstances precipitating the request must have occurred after the last day in which a student could withdraw from a course. Students requesting a WH must be passing the course with a minimum projected grade of C.

**STUDENTS WITH DISABILITIES:**
To obtain disability related accommodations, alternate formats and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. Failure to request services in a timely manner may delay your accommodations. For additional information, go to http://www.sfasu.edu/disabilityservices/.

**CLASSROOM BEHAVIOR POLICY:** To ensure a classroom environment conducive to learning, any forms of classroom disruptions will not be tolerated (examples but not limited to talking, use of cell phones/beepers, sleeping, reading other material, eating/drinking). Students who violate these rules will be asked to leave. Repeat offenders will be subject to disciplinary action in accordance with University policies as described in the Code of Student Conduct.
STATEMENTS OF CONCERN:
1) Students are expected to be prepared for every class, which includes having the following items done before they arrive for class:
   a) be prepared for the experiment to be performed that day
   b) have the plan for the next set of experiments
   c) Summarize your results from previous experiments as necessary
2) THERE IS NO FOOD, DRINK, CHEWING OF ANYTHING, SHORTS/SKIRTS, OR OPEN ENDED SHOES ALLOWED IN THE LAB!!!!!!!
3) APPROVED SAFETY GOGGLES ARE TO BE WORN AT ALL TIMES IN THE LAB.
4) Infractions of any safety regulations will result in one warning being issued. If a second infraction occurs, the student will be asked to leave the lab for that day and will be assigned an unexcused “0” for the experiment.

CHEMISTRY - UNDERGRADUATE RESEARCH REPORT

1.) Title Page
2.) Abstract
   This is a short, quantitative discussion of the main purpose and findings of the experiment. It should be stated clearly and briefly. What was done and what results were obtained.

3.) Introduction/Literature Review
   In general, the section will consist of a brief review of the major field, and a more intensive coverage of the specific topic at hand. You want to give the background of the project which will help define your purpose.

4.) Experimental
   Should begin with a listing of where the chemicals used were obtained, what the purity was, and any prior purification of the starting material. The manufacturer and model number of all major equipment should be listed. The manner in which spectra were obtained should be included. The experimental equipment and glassware should be described, with a diagram if necessary. All diagrams should be labeled and numbered. All steps performed in the experimental procedure should be listed in the order that they were performed, in exactly the manner in which you performed them. Observations as to physical and chemical changes should be included.

5.) Results
   List all data obtained with information provided as to how the data was obtained, as well as the experimental accuracy of all measurements. The data should be compiled into tables or graphs if appropriate. All figures, spectra, and tables should be labeled, contain important parameters, and numbered. Only significant results should be presented.

6.) Discussion
   Data should be discussed and evaluated, both positively and negatively. Do not try to twist the data to fit the results you think should be obtained. Let the data "speak for itself", and evaluate the data fairly, even if the data seem to contradict theory you may have been expecting the data to follow. If theory predicted a straight line and your results confirmed the theory, then say so, remembering that the slope and the intercept may be of importance also. If the anticipated straight line was not obtained, say so, and give reasons why it was not obtained. Explain why or why the data does not agree with the theory. Bear in mind that the
Discussion is the building block for the Conclusions. One should be able to read your discussion without making undue reference to your results section. Quite often the results of an experiment do not confirm theory. The reader will be interested in why the discrepancy exists, and it is the function of the writer to supply the information. Use the discussion section for comparison, generalizations, and other relations. Don’t describe your graphs verbally; discuss their significance. A discussion of possible sources of error should be included as well as any limitations which may have affected the validity, and/or application of the results.

7.) Conclusion
The conclusions are deductions from the results, not statements of the results. The conclusions should be limited to the experimental work at hand, but if the work confirms or is contrary to accepted theory, a conclusion may be written based on that fact. Purely personal opinions or general statements should not be written. In a well-written report, the reader will have been led to the point where the writer’s conclusions seem obvious and inevitable.

8.) Recommendations
This section should include recommendations for changes in equipment or procedure to improve accuracy or usefulness of the results for future work. The basis for these recommendations should have been developed in the discussion section. You should state the problem; describe the effect it has on the results, and how to fix the problem.

9.) Reference (Do not use only web address references – report requires over 50% grounded references)

The majority of references must be journal articles and not websites or textbooks. Papers with an inappropriate reference section will not be given a passing grade. All materials that were used in writing the laboratory report or to gather background material should be listed. References should be consecutively numbered, as encountered in the lab report. The reference number should be superscripted following the phrase or idea that is being referenced.

   Journal citation: authors (last name first), title of journal (usually abbreviated, in italics), year of publication (boldface), volume number (italics), and page number.


   Book citation: authors (last name first), title of book (italics), edition (if other than first), publisher (followed by colon), city (and state if the city is small) of publication, and the year of publication.


10.) Appendices

Note: Report must be typed in 12 pt font, 1 in. margins