Syllabus: CHM 481: Inorganic Chemistry Capstone

Course Title: CHM 481: Inorganic Chemistry Capstone

Semester: Fall 2024

Instructor: Dr. John Miller

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Office Hours: Mondays 2:00-4:30 PM OR by appointment

Class Time & Place: Monday or Wednesday 3:00-4:15 PM in SANCA 325

Course Description:

This capstone course focuses on the synthesis and characterization of novel inorganic complexes with potential applications in catalysis or materials science. Students will design, synthesize, and test the catalytic activity of an inorganic complex, culminating in a presentation of their findings at the Innovation Showcase. The course includes the development of a project proposal, synthesis planning, laboratory work, and a final report.

Course Objectives:

Design and synthesize a novel inorganic complex.

Characterize the complex using advanced techniques.

Test and optimize the catalytic activity of the complex.

Effectively present the project at the Innovation Showcase.

Learning Outcomes:

Gain expertise in inorganic synthesis and characterization techniques.

Develop practical skills in laboratory research and catalytic testing.

Improve communication skills through written reports and presentations.

Enhance the ability to manage complex chemistry projects from conception to completion.

Group Project and Required Subtasks:

The group project for this course will involve the design and synthesis of an inorganic complex with potential applications in catalysis or materials science. The project will be broken down into the following subtasks:

1. **Project Proposal (Week 3):**
   - Create a proposal detailing the objectives, the complex being synthesized, and the anticipated impact. Include a timeline and assign roles to team members.

2. **Literature Review and Synthesis Planning (Weeks 4-6):**
   - Conduct a thorough literature review to identify existing methods and gaps. Plan the synthesis route, including reagents, conditions, and techniques.

3. **Synthesis and Characterization (Weeks 7-10):**
   - Carry out the synthesis in the laboratory. Characterize the complex using techniques such as X-ray crystallography, UV-Vis, and IR spectroscopy.

4. **Catalytic Testing and Optimization (Weeks 11-12):**
   - Test the catalytic activity of the complex and optimize conditions for maximum efficiency. Conduct additional tests to confirm the structure and properties.

5. **Final Report and Presentation (Weeks 13-15):**
   - Document the entire synthesis process, including challenges, solutions, and outcomes in a final report.
   - Prepare a presentation and poster for the Innovation Showcase that highlights the key aspects of the project.

Groups are expected to collaborate closely, meeting regularly to discuss progress and resolve any issues. Instructor check-ins will be scheduled to provide guidance and feedback.

Evaluation:

Class meetings (5): 20 points

Individual meetings (3): 12 points

Project Proposal: 10 points

Literature Review and Synthesis Planning: 15 points

Synthesis and Characterization: 18 points

Catalytic Testing and Optimization: 10 points

Final Report: 10 points

Presentation: 5 points

Poster: 10 points

Total: 100 points

Course Policies:

Attendance and Participation: Regular attendance and active participation are crucial for success in this course. Students are expected to attend all scheduled class meetings and individual sessions. If a student is unable to attend a class, they should inform the instructor in advance and arrange to complete any missed work.

Academic Integrity: All students must adhere to ASU's academic integrity policy. Any form of academic dishonesty, including plagiarism, will be reported and may result in severe penalties, including a failing grade for the course.

Accommodations: Students with disabilities or special needs should contact the ASU Disability Resource Center to arrange appropriate accommodations and notify the instructor as soon as possible.

Important Dates:

Class Week 1: Introductions & Project Brainstorming (Aug 26)

Individual Meeting #1: Discuss Ideas and Readings (Sep 4)

Class Week 2: Proposal Presentation & Group Feedback (Sep 18)

Individual Meeting #2: Proposal Feedback & Methods Discussion (Oct 2)

Class Week 3: Revised Proposal Presentation & CERTT Tour (Oct 23)

Individual Meeting #3: Data Analysis & Progress Review (Nov 13)

Class Week 4: Professional Development & Project Discussion (Nov 27)

Innovation Showcase: Final Presentations & Poster Display (Dec 6)