##### SYLLABUS

**Course Number: REAL 695 Z6**

**Course Title: Summer Secondary Chemistry Institute**

##### 1 Semester Hour Graduate Credit

**1. Catalog Description:**

This course will bring **high school chemistry teachers** together to experience and discuss ideas for applying the *Next Generation Science Standards* to high school chemistry. We will share at least one “grabber,” demonstration, teaching idea, student lab activity, and science and engineering practical lab assessment for each of the seven crosscutting concepts of the *Next Generation Science Standards*.

**2. Course Overview\Course Teaching Methods:**

This course will connect high school chemistry content and pedagogy to the *Next Generation Science Standards* (NGSS). Content will be at an appropriate level for participants and sound pedagogy will be modeled. Time will be included for reflection and discussion of best pedagogical practices. This course will be especially useful for new teachers and teachers teaching out of the physical science field.

Course Teaching Methods:

Instructors will facilitate the course by providing opportunities for discussion, experiencing demonstrations and student-driven labs and activities. Participants will bring a demonstration, lab or teaching tool to share with the class. The focus of the course will be modification of teaching practices in chemistry to align with Next Generation Science Standards.

**3. Student Learning Objectives\Illinois Content or Teaching Standards Addressed:**

As a result of this course, participants will be able to:

* Describe the three dimensions of the *Next Generation Science Standards*.
* Use shared resources to apply the *Next Generation Science Standards* in high school chemistry.
* Modify their own lessons to better fit the goals of the *Next Generation Science Standards*.

**Illinois Teaching and Content Standards Addressed:**

* Teaching Standard 2K: The competent teacher engages students in the processes of critical thinking and inquiry and addresses standards of evidence of the disciplines.
* Teaching Standard 2M: The competent teacher uses a variety of explanations and multiple representations of concepts that capture key ideas to help each student develop conceptual understanding and address common misunderstandings.
* Teaching Standard 2N: The competent teacher facilitates learning experiences that make connections to other content areas and to life experiences.

*NGSS Science and Engineering Practices Addressed*

1. Asking questions (for science) and defining problems (for engineering)

2. Developing and using models

3. Planning and carrying out investigations

4. Analyzing and interpreting data

5. Using mathematics and computational thinking

6. Constructing explanations (for science) and designing solutions (for engineering)

7. Engaging in argument from evidence

8. Obtaining, evaluating, and communicating information

*NGSS Crosscutting Concepts Addressed*

1. Patterns
2. Cause and Effect
3. Scale, Proportion and Quantity
4. System and System Models
5. Energy and Matter
6. Structure and Function
7. Stability and Change

*NGSS Disciplinary Core Ideas Addressed*

* **HS-PS1:** Matter and its Interactions
* **HS-PS3:** Energy

**4. Units of Work\Text and Required Reading:**

Participants will meet for five sessions.

**Session One**

I. Safety

II. What are Next Generation Science Standards?

III. Unpacking the Performance Expectations

IV. Hands-on labs and demonstrations for teachers to experience

**Session Two**

I. Investigating a phenomena through Claim, Evidence, and Reasoning

II. Hands-on labs and demonstrations for teachers to experience

III. Three Dimensional Assessments

**Session Three**

I. Bonding and Intermolecular Forces Unit

II. Participant Presentations

III. Hands-on labs and demonstrations for teachers to experience

IV. Unit Assessment

**Session Four**

I. Periodic Table Unit

II. Participant Presentations

III. Hands-on labs and demonstrations for teachers to experience

IV. Unit Assessment

**Session Five – At Fermilab**

I. Participant Presentations, Reflections, Questions from the Week

II. Fermilab Site Visit or Question and Answer session with lab scientist

III. Fermilab Tour

IV. Fermilab site visit

Required Reading:

Next Generation Science Standards: For States, By States

Author: NGSS Lead States

ISBN-10: 0309272270

ISBN-13: 978-0309272278

**5. Class Assignments:**

Participants who successfully complete the course will:

* Attend class for all five sessions.
* Bring a demonstration, lab, activity, etc., to present. Be prepared to discuss alignment with the *Next Generation Science Standards* and to receive feedback from peers and instructors. Students will provide print or electronic information to other classmates and present the teaching technique to the class.
* Choose three items from the course and write an implementation plan for incorporating them into their own classroom teaching. This plan is due to the instructor no later than **one week** after the last course session, and must include:
* A brief description of context: what will come before and after the material the participant intends to use.
* An approximate timeline and outline for the experiment in your classroom.
* Expectations for student lab reports (if appropriate).
* Anything extra you plan such as:
* Student sharing and peer review of results.
* Student-led extensions of the experiment.
* Any other ideas or considerations unique to your school or teaching situation.

Please understand that this implementation plan is not designed to be just a requirement to complete. It is to assist participants in carefully planning and effectively implementing this activity.

**6. Evaluation and Grading Procedures:**

1. Implementation Plan **(50 points possible**):

1. Context for activity is clearly described. **5 points**

2. Connections to the NGSS crosscutting concepts are appropriate. **10 points**

3. Outline of activity is complete, and timeline is realistic. **25 points**

4. Expectations for student work have been

incorporated into the plan (if appropriate). **10 points**

1. Presentation **(20 points possible**):

Participants will be required to:

1. Present a demonstration, lab or activity. **10 points**

2. Discuss connections to the NGSS crosscutting concepts. **10 points**

1. Class Participation **(30 points possible**):

Participants will be expected to take active roles in both full-class and small- group discussions.

* + - * **30-25 points**: Is always prompt and is a regular attendee. Always participates actively in both small- and large-group settings. Always willing to share ideas and reflections on activities. Listens respectfully when others talk. Communicates results and shares data in a clear and concise fashion. When appropriate, offers constructive criticism of peers’ contributions to class discussions.
      * **24-20 points**: Is a prompt, regular attendee. Participates actively in both small- and large-group settings. Willing to share ideas and reflections on activities. Listens when others talk. Communicates results and shares data. Offers constructive criticism of peers’ contributions to class discussions.
      * **19-15 points**: Is a prompt, regular attendee. Participates in small-group settings. Shares ideas and reflections on activities when called upon. Listens when others talk. Makes an effort to communicate results and share data. Makes an effort to offer constructive criticism of peers’ contributions to class discussions.
      * **15-0 points**: Is an irregular or frequently tardy attendee. Rarely participates in either small- or large-group settings. Does not listen when others talk. Offers minimal or inappropriate comments on peers’ contributions to class discussions.

**Grading Scale**

**A = 92–100 points**

**B = 84–91 points**

**C = 75–83 points**

**F = 0–74 points**

University of St. Francis

College of Education

Graduate Grading System

A (4 quality points per course unit) - Excellent. Denotes work that is consistently at the highest level of achievement in a graduate college or university course.

B (3 quality points per course unit) - Good. Denotes work that consistently meets the high level of college or university standards for academic performance in a graduate college or university course.

C (2 quality points per course unit) - The lowest passing grade. Denotes work that does not meet in all respects college or university standards for academic performance in a graduate college or university course.

F (0 quality points per course unit) - Failure. Denotes work that fails to meet graduate college or uni­versity standards for academic performance in a course.

**7. Attendance Policy:**

Participants are required to attend all course sessions and to actively engage in class discussions, small group activities, experimental and experiential group exercises and projects.

**8. Academic Honesty and Integrity:**

Students are expected to maintain academic honesty and integrity as students at the University of St. Francis by doing their own work to the best of their ability. Academic dishonesty (cheating, fabrication, plagiarism, etc.) will result in the student receiving a zero for that test, assignment or paper. The complete academic integrity statement is found in the current graduate catalog.

**9. Final Examination Policy:**

The final examination for the course will be the laboratory implementation plan, described in detail in Section 5 above.

**10. Americans with Disabilities Act:**

In compliance with ADA guidelines, students who have any condition, either permanent or temporary, which might affect their ability to perform in this course, are encouraged to inform the instructor at the beginning of the course. Adaptations of teaching methods, class materials, including text and reading materials or testing may be made as needed to provide for equitable participation.

**11. Bibliography:**

Books:

Ehrlich, Robert, *Turning the World Inside Out and 174 Other Simple Physics Demonstrations*, Princeton University Press, Princeton, NJ, 1990.

Feynman, Richard, *The Character of Physical Law*, The M.I.T. Press, Cambridge, MA, 1965.

Osborne, Roger, and Peter Freyberg, *Learning in Science*, Heinemann, Auckland, New Zealand, 1985.

Serway, Raymond A., and Jerry S. Faughn, *College Physics*, Saunders Golden Sunburst Series, 1992.

Serway, Raymond A., and Jerry S. Faughn, *Physics*, Holt, Reinhart, and Winston, 2000.

Young, Hugh D., *Physics*, Addison Wesley, 1992.

**References**

Abdul-Haqq (1997). *Professional development schools: Weighing the evidence.* Thousand Oaks, CA: Corwin Press.

Carroll, T. (2009). The next generation of learning teams. *Phi Delta Kappan, 91*(2), 8-13.

Darling-Hammond, L. & Bransford, J. (Eds.) (2005). *Preparing teachers for a changing world: What teachers should be able to learn and be able to do.* San Francisco, CA: Jossey-Bass.

Darling-Hammond, L. (2006). *Powerful teacher education lessons for exemplary programs.* San Francisco, CA: Jossey-Bass.

DuFour, R. (2011). Work together but only if you want to. *Phi Delta Kappan, 92*(5), 57-61.

Eggen, P. & Kauchak, D. (2004). *Educational psychology: Windows on classrooms.* Columbus, OH: Pearson.

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement.* New York: Routledge.