CGS Agenda Item: 11-53
Effective: Spring 2013

Eastern Illinois University

NEW COURSE PROPOSAL

Please check one: __x_ New course ___ Revised course

PART I: CATALOG DESCRIPTION

1. **Course prefix and number,** ***such as ART 1000*****:** **CHM 5007** **Title (*may not exceed 30 characters, including spaces*):** **Energy Chemistry**
2. ***Long title, if any (may not exceed 100 characters, including spaces*):**
3. **Class hours per week, lab hours per week, and credit [*e.g., (3-0-3)*]:** 3-0-3
4. **Term(s) to be offered:** ___ Fall ___ Spring ___ Summer _x__ On demand
5. **Initial term of offering:** ___ Fall _x_ Spring ___ Summer **Year:** _2013_____
6. **Course description:** This course reviews the thermochemistry of traditional hydrocarbon fuels including petroleum, natural gas, and coal, the chemical reactions and materials involved in battery technology, solar energy conversion using organic photovoltaics, and energy related biomolecules and their metabolic and biochemical transformation into fuel-grade molecules. Students will gain a general understanding of chemical bonding and energy stored in chemical bonds as well as energy-related biomolecules and their catabolism. In addition, students will gain comprehensive knowledge of microbial and biochemical bioprocesses.

7. **Registration restrictions:**
   a. **Equivalent Courses**
      - **Identify any equivalent courses** (e.g., cross-listed course, non-honors version of an honors course).
        None
      - Indicate whether coding should be added to Banner to restrict students from registering for the equivalent course(s) of this course. __ Yes ___ No

   b. **Prerequisite(s)**
      - **Identify the prerequisite(s),** including required test scores, courses, grades in courses, and technical skills. Indicate whether any prerequisite course(s) MAY be taken concurrently with the proposed/revised course. Admission to the Master of Science in Sustainable Energy degree program or permission of Chemistry Department Chair. Recommended courses include college algebra, general chemistry, and one semester of organic chemistry.
      - Indicate whether coding should be added to Banner to prevent students from registering for this course if they haven't successfully completed the prerequisite course(s). ___ Yes ___ No

        If yes, identify the minimum grade requirement and any equivalent courses for each prerequisite course:

   c. **Who can waive the prerequisite(s)?**
      ___ No one **x** Chair ___ Instructor ___ Advisor ___ Other (Please specify)

   d. **Co-requisites** (course(s) which MUST be taken concurrently with this one):

   e. **Repeat status:** _x__ Course may not be repeated.

___ Course may be repeated once with credit.

Please also specify the limit (if any) on hours which may be applied to a major or minor.

f. Degree, college, major(s), level, or class to which registration in the course is restricted, if any: graduate standing

g. Degree, college, major(s), level, or class to be excluded from the course, if any: None

8. Special course attributes [cultural diversity, general education (indicate component), honors, remedial, writing centered or writing intensive] None

9. Grading methods (check all that apply): __**x**_ Standard letter ___ CR/NC ___ Audit ___ ABC/NC ("Standard letter"—i.e., ABCDF--is assumed to be the default grading method unless the course description indicates otherwise.)

Please check any special grading provision that applies to this course:

___ The grade for this course will not count in a student's grade point average.

___ The credit for this course will not count in hours towards graduation.

If the student already has credit for or is registered in an equivalent or mutually exclusive course, check any that apply:

___ The grade for this course will be removed from the student's grade point average if he/she already has credit for or is registered in _____ (insert course prefix and number).

___ Credit hours for this course will be removed from a student's hours towards graduation if he/she already has credit for or is registered in _____ (insert course prefix and number).

10. Instructional delivery method: (Check all that apply.)

_**x**__ lecture ___ lab ___ lecture/lab combined ___ independent study/research

___ internship ___ performance ___ practicum or clinical ___ study abroad

___ Internet ___ hybrid ___ other (Please specify)

PART II: ASSURANCE OF STUDENT LEARNING

1. List the student learning objectives of this course:

As a result of this course students will:

1. Analyze balanced chemical equations and solve quantitative problems involving energy generation from chemical reactions.

2. Compare and contrast the energies available from hydrocarbon fuels, organic photovoltaics, and renewable sources.
3. Identify energy-related biomolecules and describe their catabolism.
4. Describe microbial and biochemical bioprocesses related to sustainable energy development.
5. Use both writing and oral communication to evaluate issues involved in switching from nonrenewable to renewable sources of energy.

a. If this is a general education course, indicate which objectives are designed to help students achieve one or more of the following goals of general education and university-wide assessment:

- **EIU graduates will write and speak effectively.**
- **EIU graduates will think critically.**
- **EIU graduates will function as responsible citizens.**

b. If this is a graduate-level course, indicate which objectives are designed to help students achieve established goals for learning at the graduate level:

- **Depth of content knowledge – 1-5**
- **Effective critical thinking and problem solving – 1-2, 5**
- **Effective oral and written communication - 5**
- **Advanced scholarship through research or creative activity- 5**

2. Identify the assignments/activities the instructor will use to determine how well students attained the learning objectives:

Objective	Exams	HW Assignments	Research Paper	Class presentation
1	X	X		
2	X	X	X	X
3	X	X		
4	X	X		
5			X	X

3. Explain how the instructor will determine students' grades for the course:

a. Two one-hour exams (30%)
b. HW assignments (20%)
c. Final exam (15%)
d. Research paper (20%)
e. Class presentation (15%)

4. For technology-delivered and other nontraditional-delivered courses/sections, address the following:

a. Describe how the format/technology will be used to support and assess students' achievement of the specified learning objectives:
b. Describe how the integrity of student work will be assured:
c. Describe provisions for and requirements of instructor-student and student-student interaction, including the kinds of technologies that will be used to support the interaction (e.g., e-mail, web-based discussions, computer conferences, etc.):

5. **For courses numbered 4750-4999, specify additional or more stringent requirements for students enrolling for graduate credit. These include:**
    a. **course objectives;**
    b. **projects that require application and analysis of the course content; and**
    c. **separate methods of evaluation for undergraduate and graduate students.**

6. **If applicable, indicate whether this course is writing-active, writing-intensive, or writing-centered, and describe how the course satisfies the criteria for the type of writing course identified. (See Appendix *.)**
    a. **Writing active**
        (1) The hour exams and final exam will all be short-answer/essay questions.
        (2) HW assignments will involve some written descriptions of quantitative problems.
        (3) The research paper will be an extensive writing assignment.
        (4) The class presentation will require a written abstract.

PART III: OUTLINE OF THE COURSE

Provide a week-by-week outline of the course's content. Specify units of time (e.g., for a 3-0-3 course, 45 fifty-minute class periods over 15 weeks) for each major topic in the outline. Provide clear and sufficient details about content and procedures so that possible questions of overlap with other courses can be addressed. For technology-delivered or other nontraditional-delivered courses/sections, explain how the course content "units" are sufficiently equivalent to the traditional on-campus semester hour units of time described above.

Week 1: Introduction to hydrocarbon chemistry – formula writing, petroleum composition.
Week 2: Writing balanced chemical reactions for combustion reactions – introduction to the mole concept and reaction stoichiometry.
Week 3: Calculating heats of reaction for various hydrocarbon fuels including methane, octane (gasoline), and ethanol.
Week 4: Hydrocarbon fuels – CO_2 production and the greenhouse effect
Week 5: Design and operation of a gas and/or coal-fired plant, including waste disposal.
Week 6: Oxidation-reduction reactions and calculating energy produced from these reactions for batteries.
Week 7: Traditional battery design.
Week 8: Organic Photovoltaics
Week 9: Organic Photovoltaics.
Week 10: Overview of biomolecular structures / molecular biology
Week 11: Catabolism of carbohydrates and lipids
Week 12: Introduction to analytical techniques and measurements
Week 13: Fermentation / Biorefinery / Microbial manipulations
Week 14: Industrially important bio-derived fuel-grade molecules
Week 15: Biotransformation of organic compounds

PART IV: PURPOSE AND NEED

1. **Explain the department's rationale for developing and proposing the course.**

Specifically, this course is being proposed to meet the course requirement stipulated by the multidisciplinary Sustainable Energy Masters Program. More broadly, this course will give students a basic understanding, at both qualitative and quantitative levels, of how current dependence on fossil fuels is the result of the large energy demands of the planet. Comparison with the energy available from alternative sustainable sources (and their cost and availability) will give students a realistic overview of proposed future energy sources. Consequently, these future energy industry leaders will be better equipped to assess the calculated economic viabilities of these and other sustainable energy sources.

a. **If this is a general education course, you also must indicate the segment of the general education program into which it will be placed, and describe how the course meets the requirements of that segment.** This is not a general education course
b. **If the course or some sections of the course may be technology delivered, explain why.** This course is not technologically delivered

2. **Justify the level of the course and any course prerequisites, co-requisites, or registration restrictions.**
   a. This course is intended to be a core course in the Master of Science in Sustainable Energy degree program.

3. **If the course is similar to an existing course or courses, justify its development and offering.**

   a. **If the contents substantially duplicate those of an existing course, the new proposal should be discussed with the appropriate chairpersons, deans, or curriculum committees and their responses noted in the proposal.**
   b. **Cite course(s) to be deleted if the new course is approved. If no deletions are planned, note the exceptional need to be met or the curricular gap to be filled.**

4. **Impact on Program(s):**

   a. **For undergraduate programs, specify whether this course will be required for a major or minor or used as an approved elective.**
   b. **For graduate programs, specify whether this course will be a core requirement for all candidates in a degree or certificate program or an approved elective.** (This will be a core requirement for the Master of Science in Sustainable Energy degree program.)

   If the proposed course changes a major, minor, or certificate program in or outside of the department, you must submit a separate proposal requesting that change along with the course proposal. Provide a copy of the existing program in the current catalog with the requested changes noted.

PART V: IMPLEMENTATION

1. **Faculty member(s) to whom the course may be assigned:** This course will be team taught. Instructors: Dr. Mark McGuire, Dr. Gopal Periyannan, Dr. Mary Konkle, or other qualified graduate faculty.

   If this is a graduate course and the department does not currently offer a graduate program, it must document that it employs faculty qualified to teach graduate courses.

2. **Additional costs to students:**

   Include those for supplemental packets, hardware/software, or any other additional instructional, technical, or technological requirements. (Course fees must be approved by the President's Council.)

3. **Text and supplementary materials to be used (Include publication dates):** For weeks 1-7: *Chemistry: The Central Science, 12th ed.* Brown, Lemay, Bursten, Murphy, Woodward. Prentice Hall, **2012.** For weeks 8-15: No textbook available; class materials will be assembled from various texts and the chemical literature.

PART VI: COMMUNITY COLLEGE TRANSFER

If the proposed course is a 1000- or 2000-level course, state either, "A community college course may be judged equivalent to this course" OR "A community college course will not be judged equivalent to this course." A community college course will not be judged equivalent to a 3000- or 4000-level course but may be accepted as a substitute; however, upper-division credit will not be awarded.

PART VII: APPROVALS

Date approved by the department or school: Chemistry Department approval 12/7/11

Date approved by the college curriculum committee: December 9, 2011

Date approved by CGS:

*In **writing-active courses**, frequent, brief writing activities and assignments are required. Such activities -- some of which are to be graded – might include five-minute in-class writing assignments, journal keeping, lab reports, essay examinations, short papers, longer papers, or a variety of other writing-to-learn activities of the instructor's invention. Writing assignments and activities in writing-active courses are designed primarily to assist students in mastering course content, secondarily to strengthen students' writing skills. In **writing-intensive courses**, several writing assignments and writing activities are required. These assignments and activities, which are to be spread over the course of the semester, serve the dual purpose of strengthening writing skills and deepening understanding of course content. At least one writing assignment is to be revised by the student after it has been read and commented on by the instructor. In writing-intensive courses, students' writing should constitute no less than 35% of the final course grade. In **writing-centered courses** (English 1001G, English 1002G, and their honors equivalents), students learn the principles and the process of writing in all of its stages, from inception to completion. The quality of students' writing is the principal determinant of the course grade. The minimum writing requirement is 20 pages (5,000 words).