PART I: CATALOG DESCRIPTION

1. Course prefix and number, such as ART 1000: GEL 2100
2. Title (may not exceed 30 characters, including spaces): Geology of Energy Resources
3. Long title, if any (may not exceed 100 characters, including spaces): Geology of Energy Resources
4. Class hours per week, lab hours per week, and credit [e.g., (3-0-3)]: 3-0-3
5. Term(s) to be offered: Fall Spring Summer On demand
6. Initial term of offering: Fall Spring Summer Year: 2011
7. Course description (not to exceed four lines): This course is designed to explore the science behind the energy resources – how the deposits form geologically, how geologists explore the earth to discover where the deposits are located and what techniques and technology are required to extract and process the resources as well as the remediation techniques necessary to restore the landscape after extraction has ceased.
8. Registration restrictions:
   a. Identify any equivalent courses (e.g., cross-listed course, non-honors version of an honors course). N/A
   b. 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.
      ESC/GEL 1300G, ESC/GEL 1320G, ESC/GEL 1390G or equivalent; may not be taken concurrently.
   c. Who can waive the prerequisite(s)?
      ☐ No one ☐ Chair ☒ Instructor ☐ Advisor ☐ Other (Please specify)
   d. Co-requisites (course(s) which MUST be taken concurrently with this one):
   e. Repeat status: ☒ Course may not be repeated.
      ☐ Course may be repeated to a maximum of hours or times.
   f. Degree, college, major(s), level, or class to which registration in the course is restricted, if any:
   g. Degree, college, major(s), level, or class to be excluded from the course, if any:
9. Special course attributes [cultural diversity, general education (indicate component), honors, remedial, writing centered or writing intensive] None.
10. Grading methods (check all that apply): ☒ Standard letter ☐ C/NC ☐ Audit ☐ ABC/NC (“Standard letter”—i.e., ABCDF--is assumed to be the default grading method unless the course description indicates otherwise.)
11. Instructional delivery method: ☒ lecture ☐ lab ☐ lecture/lab combined ☐ independent study/research ☐ internship ☐ performance ☐ practicum or clinical ☐ study abroad ☐
other
PART II: ASSURANCE OF STUDENT LEARNING

1. List the student learning objectives of this course:
   a. Discuss the science behind how energy resources are concentrated in the Earth
   b. Analyze the relationships between general geological concepts and the application to real-world situations (finding energy resources)
   c. Review and discuss techniques and technology required to extract, process and remediate energy sources
   d. Develop and explore a research topic regarding energy sources and the future outlook for continuing use or increasing technological advances

   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: N/A
      • 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: N/A
      • Depth of content knowledge
      • Effective critical thinking and problem solving
      • Effective oral and written communication
      • Advanced scholarship through research or creative activity

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

<table>
<thead>
<tr>
<th>Learning Objective</th>
<th>Quizzes</th>
<th>Exam</th>
<th>Paper</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Discuss the science behind how energy resources are concentrated in the Earth</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>b. Analyze the relationships between general geological concepts and the application to real-world situations</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>c. Review and discuss techniques required to extract, process and remediate energy sources</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
d. Develop and explore a research topic regarding energy sources and the future outlook for continuing use or increasing technological advances

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

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes (10)</td>
<td>100</td>
<td>(18%)</td>
</tr>
<tr>
<td>Exams (2 in-term, 1 final)</td>
<td>300</td>
<td>(55%)</td>
</tr>
<tr>
<td>Research Paper</td>
<td>100</td>
<td>(18%)</td>
</tr>
<tr>
<td>Presentation</td>
<td>50</td>
<td>(9%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>550</td>
<td></td>
</tr>
</tbody>
</table>

4. For technology-delivered and other nontraditional-delivered courses/sections, address the following: N/A
   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: N/A
   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 *.) Not applicable.

**PART III: OUTLINE OF THE COURSE**

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>Introduction to Energy</strong></td>
</tr>
<tr>
<td></td>
<td>Introduction to the course and classroom policies/expectations</td>
</tr>
<tr>
<td></td>
<td>Review of some geological/scientific principles – formation of earth, fusion, plate tectonics, convection/conduction, plate boundaries, folds/faults</td>
</tr>
<tr>
<td>2.</td>
<td><strong>Energy Consumption and Society</strong></td>
</tr>
<tr>
<td></td>
<td>Energy consumption</td>
</tr>
<tr>
<td></td>
<td>Materials we use</td>
</tr>
</tbody>
</table>
Energy exploitation

3. **Origins of Energy Resources**
   Geochemical processes – hydrocarbon maturation

**Research Topics Submitted**

4. **Origins of Energy Resources**
   Geologic processes

**Exam #1**

5. **Fossil Fuels**
   Petroleum: exploration and extraction technology

6. **Fossil Fuels**
   Petroleum: processing technology and remediation techniques

7. **Fossil Fuels**
   Coal, natural gas, tar sands: exploration and extraction technology

8. **Fossil Fuels**
   Coal, natural gas, tar sands: processing technology and remediation techniques

9. **Fossil Fuels**
   Oil shale, tar sands: exploration, extraction and processing technology and remediation techniques

10. **Methane Hydrates**
    Exploration and potential extraction technology

11. **Nuclear Power – Uranium Deposits**
    Extraction, use and technology issues/discussion

12. **Geothermal Energy**
    Extraction, use and technology issues/discussion

**Exam #2**

13. **Alternative Energy Sources**
    Solar energy, hydrological, wind, bioenergy

14. **Student Presentations of Research**

15. **Student Presentations of Research**
PART IV: PURPOSE AND NEED

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

   Energy usage is currently an extremely volatile and interesting topic of political debate and societal concern, such as has been seen with the local FutureGen project as well as the EIU Renewable Energy Center. Geologists are increasingly being relied upon to help direct future paths. Understanding the science behind how these energy sources are emplaced/concentrated/generated as well as the techniques and technology needed to utilize them is vital to any discussion of solutions to these issues. Students who take this class will become better prepared to participate in framing future decisions; at the least, the students will better understand the scientific issues involved instead of relying upon popular media and/or political statements to form opinions. This course will provide background information in energy resources that will help students understand the industry.

   Within our department, this class will be used as an elective for Geology majors. The course will incorporate integrative learning objectives as it will build upon information learned in the introductory course (the prerequisite), will require students to draw upon concepts and formulae learned in physics, mathematics and chemistry, will include class discussions about current events/legislation/conferences regarding energy usage and will build upon and augment students’ skills in communication by the requirements of both a written research paper as well as an oral presentation of their results.

   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. N/A

   b. If the course or some sections of the course may be technology delivered, explain why. N/A

2. Justify the level of the course and any course prerequisites, co-requisites, or registration restrictions.

   The course is being offered at the 2000 level because it will cover material at an intermediate level suitable to a 2000 level class. The prerequisite introductory course is needed to ensure that the students have a basic grasp of underlying geological concepts in order to facilitate understanding at an intermediate level.

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

   Similar courses include:
   - ESC/GEG 3200 – Human Impacts
   - GEL 3460 – Economic Mineral Deposits
   - GEG 3600 – Economic Geography
   - GEG 3320 – Conservation of Natural Resources
   - ECN 3810 – Economics of Natural Resources

   Geology of Energy Sources is fundamentally different from each of the above-mentioned classes in that it explores the geology driving how these resources are emplaced and located, as well as the technology and techniques required to extract them. The possible overlap with ESC/GEG 3200 was discussed with Dr. Jim Davis and Dr. Chris Laingen. Both agreed that there are similar topics between the two classes (approximately ¼ of the Human Impacts class), but the two faculty agreed that the proposed class approaches the topics in a different manner. The possible overlap with GEL 3460 was discussed with Dr. Craig Chesner and is considered to be minimal. The possible overlap with GEG 3600 was discussed with Dr. Jim Davis, and he agreed that this was a substantially different approach than the one he takes with his class. Dr. Davis’ focus is on the economy and societal impacts of using agriculture, transportation,
resources and similar topics; the coincidence between material covered in this class and the proposed course is minor. The possible overlap with GEG 3320 was discussed with Dr. Chris Laingen, and he agreed that this was a substantially different approach than the one for his class. Dr. Laingen’s class deals with soils, agriculture, fauna and similar resources. The possible overlap with ECN 3810 was discussed with Dr. Hui Li, and she states that there is about a two week overlap as far as topics are concerned. Dr. Li, however, said that she does not focus on the geology of the resources but the nature of the reserves, current usage and economic analysis. She does not believe that there is any substantive similarity between the classes and is supportive of this proposed class being approved.

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.

The Geology of Energy Resources will be included as an elective in the Geology major. Because energy resources are vital to global economies and offer employment opportunities to geologists, there is considerable student interest in this topic. This course will add a critical energy/exploration element to the current set of geology electives to satisfy both interest and career preparation.

This course incorporates many of the components of GEL 3490 Coal Geology and GEL 4000 Petroleum Geology which are being removed from the course catalog.

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.

This class will be used as an approved elective in the Geology major.

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. N/A

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:

Dr. Diane Burns or any other qualified faculty member of the Geology Program.

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. N/A
2. Additional costs to students: None

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):


Additional readings may be assigned.

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.

A community college course will not be judged equivalent to this course.

PART VII: APPROVALS

Date approved by the department or school: January 25, 2010

Date approved by the college curriculum committee: April 9, 2010

Date approved by CAA: April 22, 2010

*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).