APPLICATION FOR NEW COURSE

1. Submitted by College of  
   Arts and Sciences  
   Department/Division offering course  Earth and Environmental Sciences  
   Date  Feb 15, 2006

2. Proposed designation and Bulletin description of this course
a. Prefix and Number  GLY 511  
b. Title*  Petroleum Geology
   *NOTE: If the title is longer than 24 characters (including spaces), write
   A sensible title (not exceeding 24 characters) for use on transcripts

c. Lecture/Discussion hours per week  3  
d. Laboratory hours per week  0

e. Studio hours per week  0  
f. Credits  3

g. Course description
   Survey of the origin, chemical composition, occurrence in the context of stratigraphy, structure, and reservoir types of
   natural hydrocarbons; exploration methods and production techniques; environmental impacts of exploration and
   production.

h. Prerequisites (if any)
   Prerequisites: GLY 450G, 420G, or equivalent, or consent of instructor.

i. May be repeated to a maximum of  N/A  
   (if applicable)

4. To be cross-listed as
   Prefix and Number  
   Signature, Chairman, cross-listing department

5. Effective Date  Spring 2007  
   (semester and year)

6. Course to be offered  0 Fall  X Spring  0 Summer

7. Will the course be offered each year?  X Yes  0 No
   (Explain if not annually)

8. Why is this course needed?
   With the increase in job opportunities in the oil industry, this is a critical course for both our undergraduate and graduate
   students who have interests in this area. This course used to be offered in the department > 15 years ago, but was dropped after
   the faculty member who taught it retired. This will be a much updated version reflecting recent advances in the field.

9. a. By whom will the course be taught?  Dr. Sue Rimmer

   b. Are facilities for teaching the course now available?
      If not, what plans have been made for providing them?  X Yes  0 No
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10. What enrollment may be reasonably anticipated?  15-20

11. Will this course serve students in the Department primarily?  
   Will it be of service to a significant number of students outside the Department?
   □ Yes □ No
   □ Yes □ No

12. Check the category most applicable to this course:
   □ traditional; offered in corresponding departments elsewhere;
   □ relatively new, now being widely established
   □ not yet to be found in many (or any) other universities

13. Is this course applicable to the requirements for at least one degree or certificate at the
    University of Kentucky?  □ Yes □ No

14. Is this course part of a proposed new program:
    If yes, which?  □ Yes □ No

15. Will adding this course change the degree requirements in one or more programs?*  
    If yes, explain the change(s) below
    □ Yes □ No

16. Attach a list of the major teaching objectives of the proposed course and outline and/or reference list to be used.

17. If the course is a 100-200 level course, please submit evidence (e.g., correspondence) that the Community College System has
    been consulted. □ Check here if 100-200.

18. If the course is 400G or 500 level, include syllabi or course statement showing differentiation for undergraduate and graduate
    students in assignments, grading criteria, and grading scales. □ Check here if 400G-500.

19. Within the Department, who should be contacted for further information about the proposed course?

   Name  Dr. Sue Rimmer (srimmer@uky.edu)  Phone Extension  7-4607

*NOTE: Approval of this course will constitute approval of the program change unless other program modifications are proposed.
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Signatures of Approval:

Department Chair

Dean of the College

Date

02-02-06

Date

2/02/06

Date of Notice to the Faculty

Date

1/13/06

*Undergraduate Council

*University Studies

*Graduate Council

*Academic Council for the Medical Center

*Senate Council (Chair)

*If applicable, as provided by the Rules of the University Senate

Date of Notice to University Senate

ACTION OTHER THAN APPROVAL

Rev 3/04
ARTS AND SCIENCES
EDUCATIONAL POLICY COMMITTEE
INVESTIGATOR REPORT

INVESTIGATING AREA:  Nat. & Math. Sci.  COURSE/MAJOR, DEGREE or PROGRAM:  MATH 101

DATE FOR EPC REVIEW:  2/1/06  CATEGORY: NEW, CHANGE, DROP

INSTRUCTIONS: This completed form will accompany the course application to the Graduate/Undergraduate Council(s) in order to avoid needless repetition of investigation. The following questions are included as an outline only. Be as specific and as brief as possible. If the investigation was routine, please indicate this. The term "course" is used to indicate one course, a series of courses or a program, whichever is in order. Return the form to Leonidas Bachas, Associate Dean, 275 Patterson Office Tower for forwarding to the Council(s). ATTACH SUPPLEMENT IF NEEDED.

1. List any modifications made in the course proposal as submitted originally and why.

2. If no modifications were made, review considerations that arose during the investigation and the resolutions.

3. List contacts with program units on the proposal and the considerations discussed therein.

4. Additional information as needed.

5. A&S Area Investigator Recommendation:

   ☐ APPROVE, ☐ APPROVE WITH RESERVATION, OR ☐ DISAPPROVE

6. A&S Education Policy Committee Recommendation:

   ☐ APPROVE, ☐ APPROVE WITH RESERVATION, OR ☐ DISAPPROVE  Date:  2/10/06

7. A&S Council Investigator, Phil Bonner

File: InvestigatorRpt
Proposal: We are proposing to continue our colloquium series on Neuroscience and Psychology. Neuroscience, the study of the brain and brain processes, is one of the hottest, best-funded, fastest growing areas in psychology. Although neuroscience can be said to exist as a field in its own, it can be argued that it makes its greatest contribution as a methodology and orientation. In this way, it is being applied across all of the traditional areas within psychology—clinical, cognitive, social, personality, and developmental. There are developing areas of clinical neuroscience, cognitive neuroscience, social neuroscience, and the neuroscience of personality.

The previous year we brought the leader of the field of social neuroscience to UK, Dr. Matt Lieberman. Dr. Lieberman gave a stimulating talk attended by students and faculty from across areas within Psychology and areas outside of Psychology. In addition, he met as a consultant with several groups of researchers. This year we propose to bring in one of the leading experts in the areas of clinical/affective neuroscience which as a field seeks to identify the neural substrates involved in different forms of psychopathology.

We anticipate inviting either Dr. Adrian Raine or Dr. Richard Davidson. Both have indicated their willingness to visit UK. Which one is finally invited will depend on their availabilities.

Adrian Raine, Ph.D. at University of Southern California
http://www.usc.edu/assets/college/faculty/profiles/322.html. Professor Raine researches the biosocial bases of antisocial and violent behavior in children and adults. For 25 years, his research of brain imaging, psychophysiology, neurochemistry, antisocial behavior, schizotypal personality and alcoholism has identified biological factors that may contribute to violent behaviors. Raine is currently the Robert Grandford Wright Professor of Psychology at the University of Southern California. He was the 1980 winner of the British Psychological Society Young Scientist of the Year Award, and the winner of the Joseph Zubin Memorial Award for Distinguished and Creative Early Contributions to Psychopathology and Research. He has been supported on the NIH/NSF Career Development Independent Scientist Award since 1999.

Richard Davidson, Ph.D. at University of Wisconsin-Madison
http://psyphz.psych.wisc.edu/front/Director's%20page.htm. His research is focused on cortical and subcortical substrates of emotion and affective disorders, including depression and anxiety. He studies normal adults and young children, and those with, or at risk for, affective and anxiety disorders. He uses quantitative electrophysiology, positron emission tomography and functional magnetic resonance imaging to make inferences about patterns of regional brain function. Davidson helped to found the area of affective neuroscience, demonstrated its relevance to developmental psychology, clinical psychology, personality psychology, comparative psychology, and health psychology, and made major contributions to the refinement of measures of brain electrical activity. As a result of this work, he was awarded the American Psychological Association’s Distinguished Scientific Award.

Guidelines: The proposed colloquium series meets the guidelines set down for visiting scholars.

1. The nominee should be a teacher/scholar of considerable distinction whose presence on campus will provide new perspectives and raise issues of interest to undergraduates, graduate students, and colleagues.
2. Sponsoring departments and programs must arrange for at least one public lecture so that students and faculty in other disciplines may participate in the exchange of ideas. The public lecture must be of appeal to a wide range of people in the UK community.
Drs. Raine and Davidson are leaders in their field. They are engaged in productive, ongoing research programs. Their work overlaps with faculty within and outside of psychology. There is already a vital organization of neuroscientists on campus (Psychology, Psychiatry, Anatomy, Behavioral Sciences, Communications, Sanders-Brown, etc.) who will greatly benefit from this visit. Their areas of research fall within the coverage of several of our largest lecture courses; there is little doubt that these instructors will be willing to direct their students towards this lecture. The colloquium will appeal to undergraduates within psychology and to faculty and undergraduates outside of psychology.

3. In addition to the public lecture, the visitor must engage with undergraduates, graduate students, and faculty in other formal and informal settings during the course of their visit to campus. Dr. Raine and Davisdon will be asked to give more informal presentations of their research to graduate students and faculty as part of a regular brown bag series. Additionally, they will be expected to meet with interested faculty, individually or in groups. Finally, they will go out to dinner with faculty from the department following the colloquium.

Budget Justification

Either visit will cost approximately $1500.00. The speaker will be asked to arrive on Thursday and to leave on Saturday.

We propose to pay $300.00 in honoraria.

Publicity costs are anticipated to be $100.

Travel costs should be around $500.00 for round-trip airline tickets.

Lodging for two nights will be approximately $200.00.

The speaker will eat dinner on Thursday, two meals on Friday, and breakfast on Saturday. These meals will cost approximately $100.00.

A dinner following the colloquium is planned. It will involve 3 to 5 faculty members We anticipate that this will cost approximately $300.00.

Nominees’ CVs and Websites: Dr. Davidson’s CV is available on his website (http://psych.psych.wisc.edu/web/personnel/director.html). Briefly, he is the author of multiple books, hundreds of peer-reviewed articles appearing in the best journals, and an awardee of millions of dollars of grant money. Dr. Raine’s curriculum vitae is also available on his website (http://www-ref.usc.edu/~raine/). He is also the author of multiple books, over 170 journal articles, and an awardee of millions of dollars of grant money.
GLY 511
Petroleum Geology

Sample Syllabus

Professor: Dr. Sue Rimmer
Associate Professor
216 Sloane Building
257-4607
srimmer@uky.edu

Class Time: TBA

Office Hours: TBA

Location: TBA

Readings: 

**Recommended Textbook:**
Elements of Petroleum Geology, R. C. Shelley, 1997

**On reserve:**
Petroleum Formation and Occurrence, B.P. Tissot and D.H. Welte, 1984
Petroleum Geochemistry and Geology, J.M. Hunt, 1996
Petroleum Geoscience, J. Gluyas and R. Swarbrick, 2004
Petroleum Source Rocks, B. J. Katz, 1995

Readings will be assigned from the textbook and other books placed on reserve, and journal articles available in the library or as on-line full-text journals through the UK library system.

Course Objectives:
This course will examine the fundamental aspects of petroleum geology including:
(1) the origin or hydrocarbons in organic-rich source beds, including black shales;
(2) the geochemistry of petroleum in terms of the spectrum of naturally occurring organic compounds and the stability of these compounds in terms of temperature (thermal maturation);
(3) the geologic framework of deposits in the context of stratigraphy and structure;
(4) reservoir characteristics in terms of porosity and permeability;
(5) exploration methods including seismic stratigraphy;
(6) production methods; and
(7) and potential environmental impacts of exploration and production.

Learning Outcomes:
Upon completion of this course you will be able to:
- Describe the geological factors that control oil and gas occurrences
- Understand the relationships among evolution, migration, and occurrence of petroleum deposits in major producing world basins
- Analyze and interpret a variety of data sources including lithologic logs, geophysical logs, maturity indices, and geochemical markers
- Analyze and interpret simple seismic cross sections in the context of sequence stratigraphy
- Construct and interpret structure and stratigraphic sections for the purpose of predicting potential exploration targets
- Synthesize regional and site-specific geologic constraints to propose and communicate, orally and in writing, a potential exploration target
- Work and cooperate with peers on team projects

Grading Policy:

Differentiation of undergraduate and graduate students: Graduate and undergraduate students, as required by the university, are evaluated by different standards in all 400G- and 500-level courses. As practice in both written and oral presentations is critical at all stages of our student’s education, both undergraduate and graduate students will do both in this course, but the scope of the report will be less for the undergraduate students. Graduate student written reports must be more in depth, longer (15-20 pages), and contain more references (at least 12 primary (journal) references). By contrast, the undergraduate written reports will be 10 pages long and will include at least 6 primary references. The oral component will include a professional 10-minute presentation followed by a 5-minute question and answer period for both graduate and undergraduate students, but the weighting in the overall grade will be different, reflecting the fact that for many undergraduates this could be one of their first presentations. There will also be an extra question on each exam for the graduate students (one that may be attempted by undergraduates for extra credit).

The grade for the course will be computed from the following components and their respective weights:

**Graduate Students:**
- Exam 1: 20%
- Exam 2: 20%
- Assignments: 15%
- Written Report: 15%
- Oral Report: 10%
- Final Exam: 20%

**Undergraduate Students:**
- Exam 1: 25%
- Exam 2: 25%
- Assignments: 10%
- Written Report: 10%
- Oral Report: 5%
- Final Exam: 25%

Letter grades will be assigned based on the final computed grade as follows:
- ≥ 90%: A
- 80-89%: B
- 70-79%: C
- 60-69%: D
- < 60%: E

Field Trips:
There will be two required field trips in this course. The first will be to examine core at the Kentucky Geological Survey core facility, the second will be to an active drill site and producing field in the Appalachian Basin.
Assignments:
Unless otherwise stated, assignments are due at the beginning of the class period one week following the class period that the homework is assigned. Assignments will consist of analytical problem solving, running simple burial models, and reports (oral and written); the latter will include summaries of articles from the literature, mostly dealing with seminal papers in the field and case studies. This course will involve numerous team exercises, including projects (such as proposing an oil or gas ‘play’ or basin evaluations) with in-class presentations and peer review and I encourage a "team" approach to learning. However, work that is submitted must be your own work, and all sources cited appropriately.

Exams:
Exams will be short answer/essay format, and will include questions from the entire range of topics covered. Exams will be prepared using questions from the primary instructor as well as those suggested by “module” instructors. One question on each exam will be primarily for graduate students, but may attempted by undergraduates for “extra credit”.

Presentations and Reports:
Each student will give a 10-minute presentation on a topic to be assigned, followed by a question period, following the format of professional meetings in our field (for example, annual meetings of the Geological Society of America). Students will use Powerpoint in their presentations, and attention will be given to clarity and format of the slides, as well as content and presentation style. Feedback will be provided by the class (using feed-back cards) as well as by the instructor, emphasizing “good areas” and “areas for improvement” as well as assigning individual grades to each presentation. Students will also hand out paper copies of their slides (6 per page) to each student. Grades for the presentation will be based on instructor assessment in conjunction with peer review (student assessment). Previous use of this format has shown that students truly benefit from such “peer review,” find this less intimidating than simple instructor evaluation, and helps build camaraderie in the group.

One week after the presentations, the written report will be due (Dates TBA). Papers must be typed, 1.5 spacing, and be appropriately referenced. Details on the format will be discussed in class. Graduate student written reports will be 15-20 pages and contain more references (at least 12 primary (journal) references); undergraduate written reports will be 10 pages long and will include at least 6 primary references.

Course Outline:

I. Introduction and History of Petroleum Industry

II. Geochemistry, Origin, and Evolution of Petroleum
   - Source Beds
   - Chemical Composition of Petroleum
   - Thermal Maturation of Hydrocarbons

III. Occurrence of Petroleum: Reservoirs
   - Porosity
   - Permeability
   - Siliciclastic vs. Carbonate Reservoirs
   - Primary and Secondary Migration
   - Burial History and Diagenesis
   - Case Studies
IV. Occurrence of Petroleum: Structure and Stratigraphy
   - Types of Traps: Structural, stratigraphic, and combinations
   - Trap Sealing
   - Basin Analysis
   - North American and World Basins: Case Studies

V. Exploration Methods
   - Reflection and Refraction Seismology
   - Sequence Stratigraphy
   - Borehole Geophysical Methods and Lithologic Properties
   - Core Analysis

VI. Production Methods
   - Drilling; vertical and horizontal
   - Well completion
   - Reservoir Enhancement
   - Secondary Recovery Techniques

VII. Environmental Impacts
    - Toxicology of Petroleum
    - Site-Specific Impacts
    - Transportation Impacts
    - Greenhouse Gases
    - Geochemical Constraints on Climate Change