WINONA STATE UNIVERSITY
PROPOSAL FOR UNIVERSITY STUDIES COURSES

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<th>Course No.</th>
<th>Course Name</th>
<th>Credits</th>
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<tr>
<td>108</td>
<td>Geology of the Mississippi River</td>
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This proposal is for a(n) XX Undergraduate Course

Applies to: xx Major

Required

XX Elective

XX Elective

University Studies (A course may be approved to satisfy only one set of outcomes.):

Course Requirements:

Basic Skills:

1. College Reading and Writing
2. Oral Communication
3. Mathematics
4. Physical Development & Wellness

Arts & Science Core:

1. Humanities
2. Natural Science
3. Social Science
4. Fine & Performing Arts

Unity and Diversity:

1. Critical Analysis
XX 2. Science and Social Policy
XX a. Global Perspectives
XX b. Multicultural Perspectives
XX 4. a. Contemporary Citizenship
XX b. Democratic Institutions

Flagged Courses:

1. Writing
2. Oral Communication
3. Mathematics/Statistics
   a. Critical Analysis

Prerequisites _______ NONE

Provide the following information (attach materials to this proposal):

Please see “Directions for the Department” on previous page for material to be submitted.

Attach a University Studies Approval Form.

Department Contact Person for this Proposal:

____Toby Dogwiler____________________________ _____5267_______ __tdogwiler@winona.edu_________
Narrative for faculty colleagues discussing how GEOS 108 will address the goals of the Science and Social Policy requirement in the University Studies Program

The purpose of the Science and Social Policy requirement in the University Studies program is to promote students' understanding of the interrelated concerns of society and the sciences. These courses should integrate issues related to one of the sciences with the social and government policy decisions that stem from these issues. Issues might include the environment, genetic testing and mapping, applications of technology, etc. They should be treated from the perspective of the scientific foundations of the problem and address ethical, social, historical, and/or political implications of the issue.

GEOS 108 Geology of the Mississippi River focuses on the geologic history, concepts, and engineering principles involved in understanding large rivers and the management of them as a natural resource. Understanding the geology associated with a complex system such as a large river requires an interdisciplinary survey of ideas from the geosciences, chemistry, ecology, engineering, and physics. Applying this knowledge to the analysis of social and public policy issues related to river resource management entails further considerations that cross into fields such as history, literature, and political science.

Throughout this course the role of humans in studying, engineering, managing, conserving, and utilizing the river will be emphasized. The answer to many of the environmental problems surrounding the Mississippi River can be found in the sciences. However, these potential solutions require changes in current human behavior. Thus, the political, economic, and social ramifications of these scientifically-based resolutions are highlighted in the course content and activities.

These courses must include requirements and learning activities that promote students' abilities to...

a. understand the scientific foundation of the topic;

The structure of the course is designed to introduce students to the relevant scientific concepts and principles before and during the investigation of Mississippi River environmental and resource management issues. Normally, each major lecture topic will be introduced with a case study that presents an environmental or resource management issue to the students. Classroom discussion will be used to encourage students to identify what scientific information they would need to form a well-reasoned opinion about the proposed solutions to the issue. Thus, students will feel engaged in the conceptual lecture topics because they will understand ahead of time how the information is going to be applied to “real world” problems.

b. understand the social, ethical, historical, and/or political implications;

Readings from the required book, *Immortal River*, by Calvin Fremling, as well as from the other readings included in the syllabus bibliography, will provide the social, ethical, historical, and political context in which the geology and the resources of the river have been studied, understood, and managed. A major goal of the course will be to demonstrate to the students how the geological setting of the river has influenced the cultures (pre- and post-Columbian) that have lived along the Mississippi River. For example, cities such as Winona, Red Wing, the twin cities, and St. Louis are all geographically situated where they are because of the local geology of the river and the economic, political, and social advantages that those locations offered. Issues associated with maintaining these cities in their present location also presents opportunities for discussion of social and political (etc.) implications.

c. understand and articulate the need to integrate issues of science with social policy;

The “taming” of the Mississippi River over the past 150 years, largely by European settlers, is excellent fodder for illustrating how scientific issues such as floodplain management, ecosystem protection, and water resource allocation have intersected with political and social issues related to the populations that have settled, exploited, and utilized the Mississippi River. For example, agricultural and forestry practices in the late 19th and early 20th centuries led to significant sedimentation problems in the big river as well as in the tributary streams. These problems resulted in Congressional intervention, via the Army Corps of Engineers and the Soil Conservation Service, to protect the riverine, agricultural, and forestry resources. As related scientific concepts, such as sediment
transport and river dynamics, are presented to the class, these sorts of case study examples will be discussed. This will both demonstrate to students the connections between science and policy and allow them to understand the relevancy of what otherwise might seem to be esoteric scientific knowledge to their own lives as residents of the Mississippi River valley.

d. evaluate the various policy options relevant to the social dilemmas posed by the science;

Studying the geology of the Mississippi River offers many opportunities to evaluate alternative policy solutions to river management issues. Perhaps the most timely and interesting issue is the current debate surrounding the Corps of Engineers proposal to enlarge and expand the Lock and Dam system on the Upper Mississippi River. Discussion of this proposal and the way the debate is playing out in the public arena will be a recurring theme throughout the course. Through discussion and assigned readings students will be asked to consider the pros and cons of the proposal from a variety of perspectives: outdoors people, boaters, environmentalists, farmers, barge operators, land and resource managers, etc. This and other similar policy debates will be used to illustrate the critical analyses processes required to developed an informed opinion on river-related issues.

e. and articulate, choose among, and defend various policy and/or scientific options to cope with the challenges created.

While an understanding of the scientific basis of resource management and environmental problems is important, such issues cannot be fully analyzed without delving into the social, ethical, historical, and political context of the story. In GEOS 108, students will investigate and grapple with all sides of particular river-related issues through readings, videos, case studies, individual research, and in-class discussions. The letter to the editor assignment described in the attached sample syllabus will require that each student research an issue of interest to them, understand the scientific basis for the problem, and then form and articulate a well-reasoned opinion.

Homework assignments, such as the EarthInquiry exercise described in the sample syllabus, will require students to analyze scientific data and determine how those data inform policy issues such as floodplain management. These exercises will be designed to force them to grapple with ideas such as risk management and probability analysis of natural hazards such as floods.

The goal is that students will gain an appreciation of how science can be applied to solving issues that are directly relevant to their lives. Afterall, as WSU students they spend most of their time living and studying on a floodplain.
SYLLABUS

Geology of the Mississippi River (Geoscience 108)
3 Credits Unity and Diversity Science and Social Policy Course
Lecture: M/W/F 10:00-10:50 Room: Stark 103

Course Catalog Description:

108 – Geology of the Mississippi River—3 S.H.
Investigation of the geologic history, river processes, and resource management of large rivers, particularly focusing on the Mississippi River. Topics covered will include an exploration of the relationship between the Mississippi River and its watershed, soils, groundwater, bedrock geology, and humans. Concepts emphasized will include the hydrologic cycle, plate tectonics, river morphology, river dynamics, resource management, and public policy issues. Lecture, no laboratory. Offered alternate years. No Prequisites.

Fall 2004 Office Hours: TBA, Other times by appointment. Feel free to drop by my office anytime and I will be happy to meet with you if I am available.

Prerequisite
None

Instructor
Dr. Toby Dogwiler Pasteur Hall 114-A
tdogwiler@winona.edu

Required Texts
Custom Publication from McGraw-Hill Publishers. There is not an available textbook that focuses on the geology of the Mississippi River. Thus, I have arranged to have chapters from various textbooks and readers compiled into a custom publication. The included chapters cover geological concepts, essays by people who work on or study the river, and social and political policy issues related to rivers.

Additional Resources
Assessment
Grading:  A > 90%; B 80-89; C 70-79; D 60-69; F <60  (Must take for a letter grade)

Exams (3)  
Wednesday, 29 September;  
Monday, 1 November,  
Thursday, 16 December 8:00-10:00 AM  
(Final exam will be semi-comprehensive)  

55%

Letter to the Editor  
This assignment will require you to write a position statement, in the form of a letter to the editor, regarding some issue related to the Mississippi River.  

10%

Homework  
You will have a variety of homework assignments. These assignments will require you to quantitatively analyze real data about the river and then discuss how these data can guide policy makers in managing and regulating the river. An example will be the EarthInquiry: Recurrence Interval of Floods assignment. For this assignment you will obtain discharge data for the Mississippi River and then use those data to calculate the recurrence interval of different magnitude floods. Based on the results, you will be asked to discuss how these data should influence floodplain management.  

The homework and Letter to the Editor assignments are designed to address the outcomes required for fulfilling the Science and Social Policy requirement in the Unity and Diversity category of University Studies (see University StudiesOutcomes section below).  

20%

Pop Quizzes  
Quizzes will cover the material in reading assignments.  

10%

Class Participation/Discussion/Misc  

5%

Total  

100%

Policies

• This course is heavily dependent on student participation. As such, an environment of tolerance, acceptance, courtesy, and open-mindedness is absolutely required. Every student is obligated to adhere to the Mutual Respect policy for the course (available on Blackboard).

• Attendance to lectures is crucial to success in this course, and as such, attendance is mandatory.

• Attendance to exams is mandatory. If you miss an exam you must provide me with a written excuse and supporting documentation immediately. If your excuse is approved by the instructor, you will take a comprehensive make-up exam on Monday, 22 November (the Monday of Thanksgiving week). Your score on this exam will be substituted for the score on the missed exam(s). If you fail to take the make-up exam you will receive a zero (0) for any missed exams. NO EXCEPTIONS TO THIS POLICY UNDER ANY CIRCUMSTANCES!

• Pop Quizzes will be short and will cover the assigned reading. You will need to provide a Scantron (Form No. 882-E) for the quizzes. Quizzes may not be made up. The lowest quiz score will be dropped. Your first absence, excused or unexcused, will be your drop score. No other allowance will be made for excused or unexcused absences except under extreme circumstances. Extreme circumstances do NOT include illness, weddings, job interviews, etc.

• Late assignments will be penalized 15% per day, including the day it was originally due.

• Any cheating will be referred to the proper campus authorities and will result in a zero (0) for that assignment, test, etc. Egregious or multiple violations (at the determination and discretion of the instructor) will result in failure of the course.

• If you need to contact me outside of class for any reason the burden of communication is upon you. If we are playing “phone tag” you are always “it”. I will respond to e-mails promptly through the week, and on Monday morning if received over the weekend.
Disabilities:
If you have a physical or cognitive disability, please come talk to me as soon as possible so that we can discuss how best to accommodate your needs.

Lecture Outline
This course will cover the geology of large river basins. Primarily we will focus on the Mississippi River and its watershed. However, we will also compare the Mississippi River to other large rivers in the world.

1) Introduction to the Mississippi Rivers
   a) Brief geographic setting
      i) Watershed size
      ii) Demographics
         (1) Human interactions with the river
   b) Brief geologic setting
      i) Age of the river
      ii) Pre-glacial history
         (1) Geology of the mid-continent
            (a) Rifting in the Mississippi Embayment
      iii) Post-glacial history
         (1) The modern river valley
            (a) Investigation of the Winona-area geology and stratigraphy

2) Watershed Fundamentals
   a) What is a drainage basin?
   b) Relationship between river, soils, groundwater, lakes, and humans

3) Hydrologic cycle
   a) Climate of the Mississippi River watershed
      i) Where the water comes from
         (1) Where the water might go??
            (a) Water as a commodity
   b) Residence Times
   c) Water Quantity
   d) Comparison to other large rivers

4) How Rivers Work
   a) River morphology
      i) Longitudinal profile
      ii) Channel forms
         (1) Braided, Meandering, etc.
      iii) Drainage networks
   b) River dynamics
      i) Equilibrium
      ii) Floodplain processes
         (1) Meandering
   c) Depositional processes
      i) Fluvial sediments
         (1) Composition
         (2) Sorting
         (3) Structures
         (4) Environments
      e) Fluid mechanics
         i) Shear stress

5) Resource Management
   a) Environmental Issues
      i) Water Quality
      ii) Sediment contaminants
   b) River Engineering
      i) Corp of Engineers
         (1) Congressional Charge
         (2) History
      ii) Strategies
      iii) Structures
         (1) Advantages/Disadvantages
      iv) Large River engineering in other countries
         (1) How has US policy influenced or guided Chinese (Three Gorges project) and Bangladeshi policies
      v) Policy and long-term planning

University Studies Outcomes:
The purpose of the Science and Social Policy requirement in the University Studies program is to promote students' understanding of the interrelated concerns of society and the sciences. These courses should integrate issues related to one of the sciences with the social and government policy decisions that stem from these issues. Issues might include the environment, genetic testing and mapping, applications of technology, etc. They should be treated from the perspective of the scientific foundations of the problem and address ethical, social, historical, and/or political implications of the issue.

These courses must include requirements and learning activities that promote students' abilities to...
   a. understand the scientific foundation of the topic;
   b. understand the social, ethical, historical, and/or political implications;
   c. understand and articulate the need to integrate issues of science with social policy;
   d. evaluate the various policy options relevant to the social dilemmas posed by the science; and
e. articulate, choose among, and defend various policy and/or scientific options to cope with the challenges created.

Course activities described throughout the remainder of this syllabus will be coded to the above list of outcomes by the corresponding letter.

Course Goals and Assignments:
In addition to readings and lectures designed to enhance your understanding of basic geologic and river processes (outcome a) and how they inform public policy decisions (i.e., the recurrence interval of floods assignment), we will be doing a series of skill-building activities and discussions. You will be asked to research and write position statements (including the Letter to the Editor assignment) on various river-related issues which we will then discuss in class (outcomes b, c, d, e). These assignments and in-class activities are designed to help you acquire or enhance your ability to:

1. read and interpret different types of scientific graphs, charts, and tables (outcome a),
2. locate reliable sources of information about environmental issues on the web and in the library and to summarize and interpret your findings (outcomes c, d, e), and
3. integrate your knowledge of science and other subjects to evaluate how people's perspectives (scientific, economic, political, etc.) affect the way they react to and handle environmental problems (outcome b).
### Routing form for University Studies Course approval.

**Course:**

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*In the case of a dean’s recommendation to disapprove a proposal, a written rationale for the recommendation to disapprove shall be provided to the University Studies Subcommittee.

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Please forward to Registrar.

**Registrar**

Date entered

Please notify department chair via e-mail that curricular change has been recorded.