Proposal Form For Addition And Revision Of Courses

1. Proposing College / School: Sciences and Mathematics
   Department: Geology and Geography

2. Course Prefix and Number: GEOG 5550/6550

3. Effective Term: Fall 2014

4. Course Title: Geography of Water Resources
   Abbreviated Title (30 characters or less): Geography of Water Resources

5. Requested Action:
   - [ ] Renumber a Course
   - [ ] Add a Course
   - [ ] Revise a Course
   Current Course Number:
   Proposed Course Number:
   Type of Revision:

6. Course Credit:

<table>
<thead>
<tr>
<th>Maximum Hours</th>
<th>Contact/Group Hours</th>
<th>Scheduled Type</th>
<th>Weekly or Per Term?</th>
<th>Credit Hours</th>
<th>Anticipated Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeatability:</td>
<td>3</td>
<td>Lecture</td>
<td>weekly</td>
<td>3</td>
<td>20</td>
</tr>
</tbody>
</table>

   Total Credit Hours: 3

7. Grading Type:
   - [ ] Regular (ABCDF)
   - [ ] Satisfactory/Unsatisfactory (S/U)
   - [ ] Audit

8. Prerequisites/Corequisites:
   Use “P:” to indicate a prerequisite, “C:” to indicate a corequisite, and “P/C:” to indicate a prerequisite with concurrency.
   None

9. Restrictions: List specific restriction in space above.
   - [ ] College
   - [ ] Major
   - [ ] Standing
   - [ ] Degree

10. Course Description:
    (20 Words or Less; exactly as it should appear in the Bulletin)
    Study of water use, management, law, and conflicts at local and international scales.

11. May Count Either: GEOG 5550 or GEOG 6550
    (Indicate if this particular course cannot be counted for credit in addition to another)
    Program Type (e.g.: minor, major, etc.)
    Program Title (e.g.: MS in Chemistry, Performance Option, Minor in Art)
    Requirement or Elective? (required or optional?)
    major
    BA in Geography
    elective
    major
    MS in Geography
    elective

12. Affected Program(s):
    (Respond “N/A” if not included in any program; attach memorandum if more space is required)

13. Overlapping or Duplication of Other Units’ Offerings:
    (If course is included in any other degree program, is used as an elective frequently by other unit(s), or is in an area similar to that covered by another college/school, attach correspondence with relevant unit)
    - [ ] Applicable
    - [ ] Not Applicable
14. Justification:

1) This course will provide students an opportunity to study fundamental concepts and issues in the use and management of a critical natural resource from a geographic perspective. 2) The focus on water use and management will complement the focus on physical processes provided by an existing course in the department (GEOL 5100/6100 Hydrogeology). 3) The course will also contribute to the growth of the new graduate program in geography, which was approved with the understanding that it would focus on the application of geographical concepts and methods in developing practical solutions to societal problems and the advancement of public policy.

(Include a concise, yet adequate rationale for the addition/revision of the course, citing accreditation, assessments (faculty, graduate, and/or external) where applicable)

15. Resources:

Not Applicable.

(Indicate whether existing resources such as library materials, classroom/laboratory space, and faculty appointments are adequate to support the proposed addition/revision; if additional resources are required, indicate how such needs will be met, referencing the appropriate level of authorization -- i.e.: Dean -- where necessary; if no additional resources or shifting of resources will be necessary, respond "Not Applicable")

16. Student Learning Outcomes:

Undergraduates:
By the end of the course, students will be able to:
1) Identify ancient and contemporary water management methods and technologies.
2) Understand fundamental concepts in global water supply and water use.
3) Identify standard measures and types/definitions of water scarcity.
4) Demonstrate knowledge of economic and legal principles in water use and management.
5) Understand contributing factors in U.S. and International water disputes.
6) Participate as an informed citizen in debates on water use and management issues at local, national, and global scales.

Graduate Students (in addition to above):
7) Demonstrate an advanced level of awareness of the relevant literature and related sources of information.
8) Critically analyze contemporary issues and debates in water use and management.
9) Disseminate results of analysis in written report acceptable for publication.

(State in measurable terms (reflective of course level) what students should be able to do when they have completed this course)

17. Course Content Outline:


Section 1: Introduction to Water Use and Management Concepts
Week 1: Introduction: A Brief History of Water Management
  • Course Overview
  • Global Water Crisis and Water Security: Population growth, Climate Change, Scarcity, Conflict
  • Methods and Technology: Shadoof, Archimedes' screw, Irrigation canals, Acequias, Qanats, Pipelines and Aqueducts, Dams and Mills

Week 2: Fundamental Concepts in Water Supply
  • Hydrologic cycle: Precipitation, Evapotranspiration, Percolation and Groundwater, Runoff and Streamflow
  • Watersheds: Stream networks, Rivers and Lakes, USGS Hydrologic Units

Week 3: Global Water Supply and Use
  • Global water distribution: Fresh water, Surface and Groundwater
  • Spatial and Temporal Variability in Water Availability: Continental and Country Scales, Seasons
  • Water use terms: Blue water, Green water, Grey water, In-stream, Off-
stream, Domestic, agricultural, industrial, Consumptive/Nonconsumptive
- Water Use at Global and Country Scales
- Water Use in the U.S.
- Water Footprints
Section 2: Water Shortage and Water Management Technologies
Week 4: Water scarcity
- Scarcity Definitions/Indicators: Falkenmark Indicator, Withdrawal to
  Availability Indicator, Palmer Drought Severity Index
- Water Scarcity at Spatial Scales
- Drought Definitions: Meteorological, Agricultural, Hydrological
- Drought Management: Techniques and Strategies
Week 5: Hard Technologies for Water Management
- Dams: Sizes and purposes, Water Storage, Safety, Social and Ecological
  Impacts, Dam Removal
- Canals and Interbasin Transfers: California, Central Arizona Project,
  China
Week 6: Soft Technologies for Water Management
- Virtual Water Trade: Concepts and Examples
- Desalination: Technology and Examples
- Wastewater reclamation: Direct reuse, Indirect reuse, water recycling
- Rainwater Harvesting: Tanks/Ponds, Barrels, and Examples
Mid-Term Exam
Section 3: Water Uses
Week 7: Water for Households and Health
- Household Consumption and Conservation: Types of use, Spatial
  Variability, Conservation techniques
- Health and Sanitation Issues: Waste treatment, Diseases, Natural
  contaminants
- The Bottled Water Phenomenon: Water Sources, Terms, Producers, and
  Controversy
Week 8: Water for Agriculture
- Water Uses in Agriculture: Rain-fed crops, Pastures, Irrigation
- Irrigation and The Green Revolution
- Water productivity: Diet, Footprints of major crops
- Irrigation Efficiency Techniques: Gravity, Sprinklers, Drip, Canal Lining
- Water Costs, Subsidies, and Competition
Week 9: Water for Industry
- Energy: Fossil Fuel Extraction, Thermoelectric Plants, Hydropower Dams,
  Bioenergy
- Industrial Production: Types of Industries and Uses
Week 10: Water for Navigation and Recreation
- Navigation: Navigable water, Inland waterways, Requirements and
  Maintenance
- Recreation: Boating, canoeing, fishing, swimming, sporting fields
Section 4: Water Economics, Law, and Conflicts
Week 11: Economic Approaches in Water Management
- Water Markets: Water rights, Efficiency, Equity, Australia Example
- Privatization: Private Ownership, Public-Private Partnerships, Bolivia
  Example
- Cost-Benefit Analysis: Equity, Unquantifiable factors, Politics, Tellico Dam
Week 12: Water Law Concepts in the U.S.
- Ancient Water Allocation Law: Code of Hammurabi, Babylonia/
  Mesopotamia, Justinian Code (Roman Empire), Spanish Water Law,
  English Common Law
- Surface Water: Riparian Doctrine, Prior Appropriation Doctrine, Regulated
  Riparian
- Variations: Hawaii, Louisiana, Pueblo Rights
- Federal Lands and Indian Reservations
- Groundwater
Week 13: Water Conflicts and Cooperation: U.S.
- Water Use Conflicts Issues in U.S.
- Interstate Compacts: TVA, Great Lakes, Delaware-Sus-Po,
- Case Studies: Klamath River, Columbia River, Colorado River, Alabama-
18. Assignments / Projects:

1) Mid-Term Exam: Exam covers lectures in weeks 1-6 (SLO 1-3, 6). Undergraduate exam will consist primarily of multiple choice and short-answer questions. Graduate student exam will follow the same format, but will also include essay questions requiring critical thinking skills.

2) Final Exam: Exam covers lectures in weeks 7-14 and class presentations (SLO 2, 4-6). Undergraduate exam will consist primarily of multiple choice and short-answer questions. Graduate student exam will follow the same format, but will also include essay questions requiring critical thinking.

3) Field Trips: Tours of facilities and discussions with water resource managers (SLO 1-6)

4A) Class Presentations for Undergraduate Students: Class presentation and written report about a water use/management topic. (SLO 1-6)

4B) Class Presentations for Graduate Students (Research paper and presentation): Class presentation and written report comprising an extensive critical analysis of a water use/management topic (SLO 7-9).

19. Rubric and Grading Scale:

Undergraduates:
Mid-Term Exam: 100 points
Final Exam: 100 points
Field Trips: 20 points
Class Presentation: 10 points
Research Paper: 30 points
Total Points: 260
A=234-260 points (90% and above)
B=208-233 points (80%-89.9%)
C=182-207 points (70% - 79.9%)
D=156-181 points (60% - 69.9%)
F= below 155 points (below 60%)

Graduate Students:
Mid-Term Exam: 100 points
Final Exam: 100 points
Field Trips: 20 points
Class Presentation: 10 points
Research Paper: 100 points
Total Points: 330
A=297-330 points (90% and above)
B=264-296 points (80%-89.9%)
C=231-263 points (70% - 79.9%)
D=198-230 points (60% - 69.9%)
F= below 198 points (below 60%)

20. Justification for Graduate Credit:

Graduate credit activities (exams and research project) require 1) advanced knowledge of subject matter, relevant academic literature
(Include a brief statement explaining how the course meets graduate educational standards (i.e.: rigorous standards for evaluation, development of critical thinking and analytical skills, etc.))

(Included below are standard statements regarding course policies. If necessary, a statement may be altered to reflect the academic policies of individual faculty members and/or the academic unit or department, provided that there is no conflict with the Student Policy eHandbook, Faculty Handbook, or any existing university policy.)

POLICY STATEMENTS

Attendance: Although attendance is not required, students are expected to attend all classes, and will be held responsible for any content covered in the event of an absence.

Excused Absences: Students are granted excused absences from class for the following reasons: illness of the student or serious illness of a member of the student's immediate family, the death of a member of the student's immediate family, trips for student organizations sponsored by an academic unit, trips for university classes, trips for participation in intercollegiate athletic events, subpoena for a court appearance, and religious holidays. Students who wish to have an excused absence from class for any other reason must contact the instructor in advance of the absence to request permission. The instructor will weigh the merits of the request, and render a decision. When feasible, the student must notify the instructor prior to the occurrence of any excused absences, but in no case shall such notification occur more than one week after the absence. Appropriate documentation for all excused absences is required. Please consult the Student Policy eHandbook for more information on excused absences.

Make-Up Policy: Arrangement to make up a missed major examination (e.g.: hour exams, mid-term exams) due to properly authorized excused absences must be initiated by the student within one week of the end of the period of the excused absence(s). Except in unusual circumstances, such as the continued absence of the student or the advent of university holidays, a make-up exam will take place within two weeks of the date that the student initiates arrangements for it. Except in extraordinary circumstances, no make-up exams will be arranged during the last three days before the final exam period begins.

Academic Honesty Policy: All portions of the Auburn University student academic honesty code (Title XII) found in the Student Policy eHandbook will apply to university courses. All academic honesty violations or alleged violations of the SGA Code of Laws will be reported to the Office of the Provost, which will then refer the case to the Academic Honesty Committee.

Disability Accommodations: Students who need accommodations are asked to electronically submit their approved accommodations through AU Access and to arrange a meeting during office hours the first week of classes, or as soon as possible if accommodations are needed immediately. If you have a conflict with my office hours, an alternate time can be arranged. To set up this meeting, please contact me by e-mail. If you have not established accommodations through the Office of Accessibility, but need accommodations, make an appointment with the Office of Accessibility, 1228 Haley Center, 844-2086 (VITT).
GEOG 5550/6550 Geography of Water Resources

Instructor:
Philip Chaney, Ph.D.
Phone: 844-3420
Email: chanepl@auburn.edu

Course Description

AU Bulletin Format: Study of water use, management, law, and conflicts at local and international scales.

This course investigates water use and management issues at local, national, and global scales. Topics include history of water management technology, types of water use and water scarcity, sustainable water management approaches and technologies, principles of international and U.S. water law, and international and U.S. water disputes and water security issues.

*Implications of degraded water quality are discussed at various points, but the science of water quality is not included in this course. Students interested in the science of water quality are advised to consider the many other courses on campus that cover that topic (e.g., GEOL 5100/6100 Hydrogeology, FISH 5220/6220 Water Science, and FORY 5240/6240 Forest Watershed Management).

Student Learning Objectives

The broader objective of this course is to provide students an understanding of the many ways that people use water, how water use can lead to scarcity and conflict, and how people can manage water resources in a more sustainable manner.

Undergraduate:

By the end of the course students will be able to:

1. Identify ancient and contemporary water management methods and technologies
2. Understand fundamental concepts in global water supply and water use
3. Identify standard measures and types/definitions of water scarcity
4. Demonstrate knowledge of economic and legal principles in water use and management
5. Understand contributing factors in U.S. and International water disputes
6. Participate as an informed citizen in debates on water use and management issues at local, national, and global scales.

Graduate:

7. Demonstrate an advanced level of awareness of the relevant literature and related sources of information
8. Critically analyze contemporary issues and debates about water use and management
9. Disseminate results of analysis in a report acceptable for publication

Primary Text Book


Supplemental Readings: Books
• Gleick, P.H. 2010. *Bottled and sold, the story behind our obsession with bottled water*. Island Press.

**Supplemental Readings: Journal Articles and Technical Reports**


**Exams**

Two exams will be administered in the class (mid-term and final).
• Exam format will consist primarily of multiple choice and short answer questions.
• Graduate student exams will also include essay questions requiring critical thinking.
• Make-up exams will use the same format.

**Research Project/Presentation**

• Each student is required to make a presentation in class on a water use or water management topic.
• Topics must be approved in advance.

**Undergraduate Student Requirements** (Research paper and class presentation):
• The project will be based on 3 journal articles, book chapters, or technical reports.
• The body of the paper should not exceed 2000 words (approximately 8 pages, double-spaced).
• The paper should include sufficient evidence (e.g., academic references, maps, data tables, drawings, photographs) to support the paper’s critical analysis positions or arguments, and should be acceptable for inclusion in the student’s AU ePortfolio.
• Presentations should be limited to 20 minutes or less.

**Graduate Student Requirements** (Research paper and class presentation):
• The project should consist of an extensive critical analysis of a water use/management topic, and should meet the SLOs for graduate students listed above.
• The body of the paper should not exceed 3000 words (approximately 12 pages, double-spaced).
• The paper should include sufficient evidence (e.g., academic references, maps, data tables, drawings, photographs) to support the paper’s positions or arguments.
• PowerPoint slide presentation, or similar product.
• Presentations should be limited to 20 minutes or less.

**Field Trips**

Field trips to investigate water use and management issues in the region will be conducted on various dates during the semester. Potential field trip destinations include:

• Office of Water Resources, Alabama Department of Economic and Community Affairs, Montgomery, AL.
• Lake Martin Dam; West Point Lake Dam
• Columbus Water Works, Columbus, GA. (Dam Removal and Water Park Development)
• Auburn Water Works, Auburn, AL.
The number of field trips per semester will vary based on scheduling issues such as availability of water resource managers to serve as guides. Assessment for grades will be based on participation only. Students who are unable to attend for legitimate reasons can make-up the assignment by submitting a written report (1-2 pages) on a related subject.

**Final Grades:**

Final grades will be determined by relating the total number of points possible to a standard 10% scale.

**Undergraduate Students**

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid-Term Exam</td>
<td>100</td>
</tr>
<tr>
<td>Final Exam</td>
<td>100</td>
</tr>
<tr>
<td>Class Presentation</td>
<td>10</td>
</tr>
<tr>
<td>Research Paper</td>
<td>30</td>
</tr>
<tr>
<td>Field Trips</td>
<td>20</td>
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</table>

Total: 260

*Failure to make the class presentation will result in a 10-point deduction.

**Graduate Students**

Final grades will be determined by relating the total number of points possible to a standard 10% scale.

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid-Term Exam</td>
<td>100</td>
</tr>
<tr>
<td>Final Exam</td>
<td>100</td>
</tr>
<tr>
<td>Class Presentation</td>
<td>10</td>
</tr>
<tr>
<td>Research Paper</td>
<td>100</td>
</tr>
<tr>
<td>Field Trips</td>
<td>20</td>
</tr>
</tbody>
</table>

Total: 330

*Failure to make the class presentation will result in a 10-point deduction.

How to compute your final grade:

- Add all your exam, project, and field trip points to compute your total points accumulated.
- Divide your total points accumulated by the total points possible for the entire course (undergrad = 260; grad students = 330).
- Compare your results to a standard 10% scale:
  - A = 90%-100%
  - B = 80%-89%
  - C = 70%-79%
  - D = 60%-69%
  - F = below 60%

**AU POLICY STATEMENTS (2013)**

**Excused Absences:** Students are granted excused absences from class for the following reasons: illness of the student or serious illness of a member of the student's immediate family, the death of a member of the student's immediate family, trips for student organizations sponsored by an academic unit, trips for university classes, trips for participation in intercollegiate athletic events, subpoena for a court appearance, and religious holidays. Students who
wish to have an excused absence from class for any other reason must contact the instructor in advance of the
absence to request permission. The instructor will weigh the merits of
the request, and render a decision. When feasible, the student must notify the instructor prior to the occurrence of
any excused absences, but in no case shall such notification occur more than one week after the absence.
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alternate time can be arranged. To set up this meeting, please contact me by e-mail. If you have not established
accommodations through the Office of Accessibility, but need accommodations, make an appointment with the
Office of Accessibility, 1228 Haley Center, 844-2096 (V/TT).

Course Outline

Section 1: Introduction to Water Use and Management Concepts

1: Introduction: A Brief History of Water Management

- Course Overview
- Methods and Technology: Shadouf, Archimedes’ screw, Irrigation canals, Acequias, Qanats, Pipelines and
  Aqueducts, Dams and Mills
- Sustainable Water Management Approaches: Soft Path, Integrated Water Resource Management, and
  Watershed Approach

2: Fundamental Concepts in Water Supply

- Hydrologic cycle: Precipitation, Evapotranspiration, Percolation and Groundwater, Runoff and Streamflow
- Watersheds: Stream networks, Rivers and Lakes, USGS Hydrologic Units, Water budget
- Water Quality: Pollutants, Clean Water Act

3: Global Water Supply and Use

- Global water distribution: Fresh water, Surface and Groundwater
- Spatial and Temporal Variability in Water Availability: Continental and Country Scales, Seasons
Water use terms: Blue water, Green water, Grey water, In-stream, Off-stream, Domestic, agricultural, industrial, Consumptive/Nonconsumptive

Water Use at Global and Country Scales
Water Use in the U.S.
Water Footprints

Section 2: Water Shortage and Water Management Technologies

4: Water scarcity
- Scarcity Definitions/Indicators: Falkenmark Indicator, Withdrawal to Availability Indicator, Palmer Drought Severity Index
- Water Scarcity at Spatial Scales
- Drought Definitions: Meteorological, Agricultural, Hydrological
- Drought Management: Techniques and Strategies

5: Hard Technologies for Water Management
- Dams: Sizes and purposes, Water Storage, Safety, Social and Ecological Impacts, Dam Removal
- Canals and Interbasin Transfers: California, Central Arizona Project, China

6: Soft Technologies for Water Management
- Virtual Water Trade: Concepts and Examples
- Desalination: Technology and Examples
- Wastewater reclamation: Direct reuse, Indirect reuse, water recycling
- Rainwater Harvesting: Tanks/Ponds, Barrels, and Examples

--- Mid-Term Exam ---

Section 3: Water Uses

7: Water for Households and Health
- Household Consumption and Conservation: Types of use, Spatial Variability, Conservation techniques
- Health and Sanitation Issues: Waste treatment, Diseases, Natural contaminants
- The Bottled Water Phenomenon: Water Sources, Terms, Producers, and Controversy

8: Water for Agriculture
- Water Uses in Agriculture: Rain-fed crops, Pastures, Irrigation
- Irrigation and The Green Revolution
- Water productivity: Diet, Footprints of major crops
- Irrigation Efficiency Techniques: Gravity, Sprinklers, Drip, Canal Lining
- Water Costs, Subsidies, and Competition

9: Water for Industry
- Energy: Fossil Fuel Extraction, Thermoelectric Plants, Hydropower Dams, Bioenergy
- Industrial Production: Types of Industries and Uses

10: Water for Navigation and Recreation
- Navigation: Navigable water, Inland waterways, Requirements and Maintenance
• Recreation: Boating, canoeing, fishing, swimming, sporting fields

Section 4: Water Economics, Law, and Conflicts

11: Economic Approaches in Water Management
• Water Markets: Water rights, Efficiency, Equity, Australia Example
• Privatization: Private Ownership, Public-Private Partnerships, Bolivia Example
• Cost-Benefit Analysis: Equity, Unquantifiable factors, Politics, Tellico Dam

12: Water Law Concepts in the U.S.
• Ancient Water Allocation Law: Code of Hammurabi, Babylonia/Mesopotamia, Justinian Code (Roman Empire), Spanish Water Law, English Common Law
• Surface Water: Riparian Doctrine, Prior Appropriation Doctrine, Regulated Riparian
• Variations: Hawaii, Louisiana, Pueblo Rights
• Federal Lands and Indian Reservations
• Groundwater

13. Water Conflicts and Cooperation: U.S.
• Water Use Conflicts Issues in U.S.
• Interstate Compacts: TVA, Great Lakes, Delaware-Sus-Po,
• Case Studies: Klamath River, Columbia River, Colorado River, Alabama-Georgia-Florida

14: Water Conflicts and Cooperation: International
• Transboundary Rivers of the World
• International Water Law: Absolute Sovereignty, Absolute Integrity
• Factors in Water Interactions: Scarcity, Politics, Development, Change
• Conflict Resolution and Game Theory: Prisoner’s Dilemma, Chicken
• International Treaties
• Case Studies: Jordan River, Nile River, Ganges-Brahmaputra

15: Class Presentations

--- Final Exam ---