TO: Conseula Francis, Associate Provost  
Brian McGee, Provost  

FROM: Tim Callahan, Program Director  

CC: Marry Bergstrom, Interim Registrar  
Mike Auerbach, Dean of SSM  
Jerry Hale, Dean of HSS  
Amy McCandless, Dean of Graduate School  
Jo Ann Ewal, Chair of Faculty Committee for Graduate Education  

DATE: Jan. 21, 2016  
Revised Feb. 29, 2016  
Revised Mar. 17, 2016  

SUBJECT: Course Change Proposal, Renumbering for Cross-Listing

This memo serves to address the new policy that graduate courses only at the 500 level may be cross-listed with undergraduate course at the 400 level. The M.S. in Environmental Studies (MES) program (course prefix: EVSS) has several courses currently at the 600 level that are regularly cross-listed with GEOL 4xx, BIOL 4xx, and PHYS 4xx courses. Below is the slate of courses that we request to be renumbered from 6xx to the equivalent 5xx number. Some EVSS courses are also cross-listed with the Marine Biology graduate program and thus we have course taught under the EVSS 6xx and BIOL 6xx labels.

These courses developed out of a mutual interest and need to serve upper-level undergraduate students in GEOL, BIOL, PHYS, and MES program. Syllabi show the student learning outcomes and course expectations have been developed to serve the multiple groups. To offer each of these courses separately to the different student groups, we would need double (or in some cases triple) the number of faculty to meet the need, or alternatively, either undergraduate or graduate students would not have as many opportunities to take these courses. In my opinion, the large diversity of upper-level undergraduate and graduate courses is a major selling point for the MES program the Marine Biology program, and the Biology and Geology departments.

Currently, there are no EVSS courses at the 500 level. For undocumented reasons, all EVSS courses were numbered at the 600 level when the MES program was established in 1994. We speculate that this was to satisfy a request by the Medical University; the MES program began as a join program with MUSC but this relationship was ended in the year 2000.

Notes: (1) We have corrected errors on the syllabi as requested by the Faculty Committee for Graduate Education, Continuing Education and Special Programs, and (2) we have withdrawn the proposed renumbering and cross-listing of EVSS 695: Special Topics.

Sincerely,

Tim Callahan
<table>
<thead>
<tr>
<th>Current Number</th>
<th>Title</th>
<th>Instructor</th>
<th>Grad</th>
<th>Undergrad</th>
<th>New EVSS Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVSS 619</td>
<td>Coral Reef Biology</td>
<td>P. Dustan</td>
<td>BIOL 619</td>
<td>BIOL 449</td>
<td>EVSS 519</td>
</tr>
<tr>
<td>EVSS 628/628L</td>
<td>Plant Ecology &amp; Lab</td>
<td>C. Murren</td>
<td>BIOL 628</td>
<td>BIOL 444/444L</td>
<td>EVSS 544/544L</td>
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<tr>
<td>EVSS 629</td>
<td>Conservation Biology</td>
<td>D.A. McCallum</td>
<td>BIOL 629</td>
<td>BIOL 406</td>
<td>EVSS 506</td>
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<tr>
<td>EVSS 631/631L</td>
<td>Pollution in Environment &amp; Lab</td>
<td>V. Vulava</td>
<td>N/A</td>
<td>GEOL 441/441L</td>
<td>EVSS 541.541L</td>
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<tr>
<td>EVSS 638/638L</td>
<td>Introductory Hydrogeology &amp; Lab</td>
<td>T. Callahan</td>
<td>N/A</td>
<td>GEOL 438/438L</td>
<td>EVSS 538/538L</td>
</tr>
<tr>
<td>EVSS 649/649L</td>
<td>Geographic Information Systems (GIS)</td>
<td>N. Levine or K.A. Ali</td>
<td>N/A</td>
<td>GEOL 449/448L</td>
<td>EVSS 549/549L</td>
</tr>
<tr>
<td>EVSS 669/669L</td>
<td>Advanced GIS &amp; Lab</td>
<td>N. Levine</td>
<td>N/A</td>
<td>GEOL 469/469L</td>
<td>EVSS 569/569L</td>
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<tr>
<td>EVSS 642/642L</td>
<td>Fundamentals of Remote Sensing</td>
<td>D.J. Chadwick</td>
<td>N/A</td>
<td>GEOL 442/442L</td>
<td>EVSS 542/542L</td>
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<tr>
<td>EVSS 657</td>
<td>Satellite Meteorology</td>
<td>B.L. Lindner</td>
<td>N/A</td>
<td>PHYS 457</td>
<td>EVSS 557</td>
</tr>
</tbody>
</table>

N/A: Not applicable.
APPROVAL AND SIGNATURES.

1. Signature of Department Chair or Program Director: 
   Signature: __________________________ Date: 1/28/16

2. Signature of Academic Dean: 
   Signature: __________________________ Date: 2/19/14

3. Signature of Provost: 
   Signature: __________________________ Date: 2/22/14

4. Signature of Business Affairs (only for course fees): 
   Signature: __________________________ Date: ________________
   □ fee approved on __________
   □ BOT approval pending

5. Signature of Curriculum Committee Chair: 
   Signature: __________________________ Date: 3/25/15

6. Signature of Faculty Senate Secretary: 
   Signature: __________________________ Date: ________________

Date Approved by Faculty Senate: Grad Council Chair: 
Graduate announce 3/28/14
Contact Name: Timothy Callahan

Email: CallahanT@cofc.edu  Phone: 953-8278

Department/Program: Environmental Studies  School: Graduate School

Catalog Year in Which Change Will Take Effect: 2016-2017

Does this proposal include:
- [ ] Course title change*
- [x] Course number change*
- [ ] Course description change*
- [x] Undergraduate/Graduate cross-listing

*complete Existing Course/New Course Information

A. If you are proposing to cross-list **two existing courses at the same level**, list the courses (acronym, title, number, course description) and provide a reason for cross-listing.

B. If you are proposing to cross-list **an existing undergraduate course with an existing graduate course**, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and **attach a syllabus** (or separate syllabi) that clearly indicates student learning outcomes, assignments, and rigor appropriate for each level.

C. If you are proposing to cross-list **an existing course with a new course at the same level**, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach the appropriate new course proposal form.

D. If you are proposing to cross-list **an existing course with a new course at a different level**, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach the appropriate new course proposal form(s). Also **attach a syllabus** (or separate syllabi) that clearly indicates student learning outcomes, assignments, and rigor appropriate for each level.
Proposed Cross-listed Courses
(course acronyms, numbers, titles, and descriptions)

Biology of Coral Reefs: BIOL 449, BIOL 619, EVSS 619

An introduction to the biology and ecology of reef-building corals and coral reefs. Topics to be covered include coral ecology (nutrition, reproduction, population structure, and distribution), taxonomy and systematics, biogeography and reef-building processes. The course will also cover natural and human induced disturbances on coral reefs and discuss exploitation and coral reef management options.

Reason for Cross-listing

This course is offered for both undergraduate and graduate students. This course is also offered for graduate students in two programs: Environmental Studies and Marine Biology. There is sufficient overlap in the topics covered that sharing resources makes sense. However, there is a distinct difference in assignments and expectations that allows different learning outcomes to be obtainable. Topics covered in Biology of Coral Reefs are beneficial for upper level undergraduate students pursuing a degree in Biology or Marine Biology, and at the same time, are beneficial for graduate students pursuing a thesis or internship in a related field.

Please see attached syllabi for specific learning objectives.

Changes to Existing Course Numbers/Titles/Descriptions

Existing Course:
EVSS 619

Proposed Course Change:
EVSS 519

No changes to course title or description.
Biology of Coral Reefs (BIOL 449)  
Syllabus Spring 2016  
Phillip Dustin, Department of Biology

Among the most spectacular of all ecosystems, coral reefs form in the world’s tropical oceans through the action of animals and plants. They are the largest and most complex biological structures on earth. Although they cover less than one percent of the earth’s surface, they are reservoirs for much of the ocean’s biodiversity, housing some of nature’s most intricate ecological secrets and treasures.

Coral reefs are also the most productive ecosystems in the sea and provide significant ecological goods and services, estimated at about $375 billion annually (1997 dollars) with more recent estimates topping 9 trillion dollars in 2015. Their physical structures protect thousands of miles of coastline from the fury of tropical storms, tsunamis, and many low-lying islands threatened by rising seas.

The intricate adaptations for survival that have evolved over an immense span of time make reefs vulnerable to human activities. For example, excess nutrients support algal overgrowth, while over-fishing alters the food web. The extent to which reefs in remote locations are now showing signs of stress, especially bleaching and disease, points to the critical role that coral reefs play as indicators of declining ocean health.

This course will be an introduction to tropical coral reefs and the organisms and processes responsible for their formation. We will begin with an overview of reefs and their tropical marine environment. The course will then move into the evolution, systematics, and physiology, ecology and symbiosis of reef-building corals. These subjects will set the stage for learning about coral reef community structure and ecological dynamics. The course will close by taking a critical look at natural and human disturbances to reefs with an emphasis on current models of management and conservation.

There will be an optional Laboratory (1 credit) one-week field trip to explore the reefs of Glover’s Atoll, Belize during March Spring Break. We will stay at the Isla Marisol Resort (http://islamarisolresort.com/) on Southwest Caye, Glover’s Atoll Belize. Glover’s is one of the few offshore atolls in the Caribbean and is an excellent location to introduce you to the ecology and conservation of Caribbean reefs. The cost of the trip will be approximately $2400-2700, including all accommodations, diving, and travel from the US. You must be a certified SCUBA diver to participate. If you are a foreign student you must secure the appropriate visa documentation if necessary.

The learning goals of this class include gaining an appreciation and understanding of:
1. How abiotic forcing functions control the ecology of coral reefs including reef morphology and coral distribution.
2. The principles of carbonate biogeochemistry; the reef as a biogenic structure.
3. The flow of energy and molecules through coral reef ecosystems, reef trophodynamics.
4. The role density dependent vs. density independent control in the growth and regulation of coral reef populations.
5. The impact of natural and anthropogenic forcing functions on coral reef ecology.

Critical Thinking:
Critical thinking is the common denominator between all forms of analysis. As a graduate student, there is no more important goal than that of developing your mind, as everything you do in your life will be affected by your mind and how it operates. The quality of your learning is affected by the quality of your thinking about learning. The quality of your personal relationships is affected by the quality of your thinking about those relationships. To take command of the thinking that controls your life, you must cultivate your intellect. (Refer to www.criticalthinking.org)

Prerequisites: General Biology (BIOL 111, 112, 211, 212) and Ecology (BIOL 341 or equivalent), or permission of the instructor. Supplemental materials will be provided to students without such a background.

Requirements:
Midterm and Final exams = 50%  
Term paper, presentations and participation. = 50%
Honor Code: All class work must be your own original work and must not have been submitted for a grade in any other class while at the College of Charleston or elsewhere. Furthermore, no project done in this class can be submitted for grading in any other future or present course. To do so will be construed as a clear violation of the Honor Code.

Internet Materials: Any information you quote for a paper or presentation must come from the peer-reviewed scientific literature and not a website. Use search engines such as the Web of Science or Google Scholar. Search journals such as Coral Reefs, Limnology and Oceanography, Marine Biology, Marine Ecology Progress series, etc.

Grading Policy:

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<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>92-100 excellent and creative</td>
<td>89-92</td>
</tr>
<tr>
<td>A+</td>
<td>86-91 good</td>
<td>82-86</td>
</tr>
<tr>
<td>B+</td>
<td>80-85 very good</td>
<td>79-82</td>
</tr>
<tr>
<td>B</td>
<td>76-79 fair</td>
<td>72-76</td>
</tr>
<tr>
<td>C+</td>
<td>70-75 acceptable</td>
<td>69-72</td>
</tr>
<tr>
<td>C</td>
<td>68-69 passing</td>
<td>65-68</td>
</tr>
<tr>
<td>D</td>
<td>63-65</td>
<td>63-65</td>
</tr>
<tr>
<td>F</td>
<td>Failure due to Academic Dishonesty</td>
<td>&gt;63</td>
</tr>
</tbody>
</table>

Final grades are supposed to reflect how much you have progressed and/or learned in the time span of a course. With this in mind, one could suggest that an average student receives an average grade, a very good student a higher grade, and an excellent and creative student the highest grade.

Sidebar Knowledge

This course will focus on the corals and the coral reef ecosystem. Within the context of the course students will be required to draw on knowledge from earlier classes. Since this course will be taught at the undergraduate and graduate levels it is expected that students will have varied educational backgrounds. I will help you with sidebar information (selected readings, lectures, websites, etc.) on selected topics to help students will become knowledgeable in areas that are important framework fundamentals to the study of coral reefs. A partial list follows:

- Geological time line of Earth history and the fossil record
- Principles of general oceanographic circulation
- Theories on the origin of life and biodiversity
- Theory of Evolution by Natural Selection
- Photosynthesis and the pathways of carbon
- Density dependence and the growth and regulation of populations

Reference Texts:


Supplemental texts include:

Life and death of coral reefs, Charles Birkland. (out of print and expensive but very good)
Aquarium Corals by Eric Borneman, T.E.H Publications 2004
The Great Barrier Reef Expedition https://archive.org/details/GreatBarrierReefYong

Office Hours:

9-10 Tues/Thurs or by appointment.
Room 210/114 Harbor Walk West Telephone 953-8086
Email dustanp@cofc.edu
Biology of Coral Reefs (BIOL 449)
Course Syllabus Spring 2016  P. Dustan

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Jan 13</td>
<td>Introduction to Biology of Coral Reefs</td>
</tr>
</tbody>
</table>
| 2 Jan 20 | The tropical marine environment and climate: sun, sea, waves  
Fundamentals of oceanography, global ecology.  
Depth gradients of sunlight and wave action  
Reef morphology, distribution of reef systems  
Coral Reefs, John Wells, GSA Memoir 67  
*Climates on a Rotating Earth, Robert MacArthur*  
*The biological control of chemical factors in the environment, American Scientist, A.C. Redfield 1958*  
*Adjustment of Bikini Atoll to Ocean Waves, Munk and Sargent 1948*  
Goldberg Chapter 1 |
The Ecology of Jamaican Coral Reefs I. Species Composition and Zonation Thomas F. Goreau,  
The Zonation of West Indian Gorgonians, Robert A. Kinzie, Bull Mar Sci 28(1)  
Deep Fore reef slope depositional processes, Goreau and Land,  
Reefs in Time and Space, SEPM 1974 Special Pub #18.  
Deep Forereef and Upper Island Slope, Lynton Land and Clyde More,  
Sclerosponges primary framework constructors on the Jamaican deep fore reef Judith Lang, Willard  
Biological zonation at the base of the reef. Judith Lang,  
Goldberg Chapters 1 and 2. |
| 4. Feb 3 | The Evolution of Coral Reefs through the Phanerozoic  
Clonal Growth, Algal Symbiosis, and Reef Formation by Corals, Coates, A.G. and Jackson, J.B.C.  
*Paleobiology*, 13(4)363-378. 1987  
Goldberg Chapter 13 |
| 5. Feb 10 | **Exam first hour of class.**  
Limiting factors and concept of polytroph  
| 6. Feb 17 | Anthozoan corals: morphology, evolution, systematics, and identification  
**Hermatypic corals I:** Coral-algal symbiosis: nutrition, calcification, photobiology  
Henretta Hyman, The Invertebrates. |
| 7. Feb 24 | Film and/or guest lecture. Dr. Dustan at Ocean Science 2016 meeting |
| 8. Mar 2 | Hermatypic corals II: reproduction and settling  
The coral holobiont and genomics |
| 9. Mar 5-12 | **Study Abroad Spring Break Excursion to Grovers Atoll, Belize** |
| 10. Mar 16 | Biodiversity: invertebrates and vertebrates  
Goldberg Ch 14 |
11. Mar 23  
Trophodynamics: Biomass, primary production and metabolism
Ecological dynamics: competition, predation, grazing
Goldberg Chapter 12, HSS and Charles Birkland on fish

12. Mar 30  
Natural and human disturbances weather, climate, and global change
Overharvesting and mass mortalities
Goldberg Chapter 15
Future of Coral Reefs, Knowlton, 2001 PNAS 98:10 pp 5419-5425

13. Apr 6  
Natural and human impacts: physical damage, pollution, disease
Term papers due

14. Apr 13  
Management of Coral Reefs
Goldberg Ch 16

15. Apr 20  
Last Day of Class
Apr 27  Final Exam (4-7pm)

Term paper assignment:

You may not write a term paper on global warming, coral bleaching, ocean acidification, lionfish or any other topic dealing with pollution or man's impact on reefs. Start your project by finding a paper in the recent peer-reviewed scientific literature that is central to your interest. Then research the topic using other papers from the literature. After you have done some reading on your chosen topic make an appointment to discuss it with me. The paper should be at least 2500 words of text, cite a minimum of 10 peer-reviewed papers from 2000 or later plus any other references you choose to use, and must be typed (Times Roman font, 11 or 12 pica, double spaced). Submit both paper copy and email electronic copy.
Filename = YOUR LAST NAME_PAPER_BIOL449_S2016.DOC.

Term Paper Topic:
1. Research themes in coral reef science
Coral biologists have tended to use a selection of coral species for experimental purposes to develop and examine themes in coral reef biology. Examples of this are calcification, endosymbiosis, reproduction, systematics and the species problem, and life history strategies. The reasons for this usually focus around the availability of specimens, habitat distribution, or some peculiar aspect of a species' biology. For example, Stylophora pistillata has become the experimental organism of choice for Red Sea biologists, the Montastrea annularis species complex in the Caribbean, and Pocillopora damicornis in the Hawaiian Islands. Your assignment is to select a well-used species of fish, coral or other invertebrate from the literature and report on how research centered on your selected species has contributed to a particular "niche of understanding" of coral reef ecology.
Or
2. Reef Processes: Our understanding of coral reefs has come from curious individuals. Your assignment is to report on the current state of knowledge of an ecological or evolutionary reef process of your choosing, NOT a thing or an organism, but an actual Ecological or Evolutionary Process.

Presentations and class reports: Materials other than simple introductory information should be gleaned from the peer-reviewed literature, NOT website information.

Underwater Photography Research Techniques:
Underwater photography is essential to coral reef studies. Interested students will be exposed to a wide variety of underwater cameras and techniques including film and digital still photography and underwater video.

Honor Code: All class work must be your own original work and must not have been submitted for a grade in any other class while at the College of Charleston or elsewhere. Furthermore, no project done in this class may be submitted for grading in any other present or future course. To do so will be construed as a clear violation of the Honor Code. More information is available in the Student Handbook at http://www.cofe.edu/general/documents/handbook.pdf.
# Grading Rubric:

<table>
<thead>
<tr>
<th></th>
<th>Excellent 4</th>
<th>Above Average 3</th>
<th>Average 2</th>
<th>Below Average 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Question selection</strong></td>
<td>Identifies a creative, focused, and manageable topic that addresses potentially significant yet previously less explored aspects of the topic.</td>
<td>Identifies a focused and manageable/daileable topic that appropriately addresses relevant aspects of the topic.</td>
<td>Identifies a topic that while manageable/daileable, is too narrowly focused and leaves out relevant aspects of the topic.</td>
<td>Identifies a topic that is far too general and wide-ranging as to be manageable and doable.</td>
</tr>
</tbody>
</table>

| **Existing knowledge, research, and/or views** | Synthesizes in depth information from relevant sources representing various points of view/approaches. | Presents in depth information from relevant sources representing various points of view/approaches. | Presents information from relevant sources representing limited points of view/approaches. | Presents information from irrelevant sources representing limited points of view/approaches. |

| **Methods** | All elements of the methodology or theoretical framework are skillfully developed. | Critical elements of the methodology or theoretical framework are appropriately developed however more subtle elements are ignored or unaccounted for. | Critical elements of the methodology or theoretical framework are missing, incorrectly developed or unfocused. | Inquiry design demonstrates a misunderstanding of the methodology or theoretical framework. |

| **Analysis** | Organizes and synthesizes evidence to reveal insightful patterns, differences, or similarities related to focus. | Organizes evidence to reveal important patterns, differences, or similarities related to focus. | Organizes evidence but the organization is not effective in revealing important patterns, differences or similarities. | No apparent organization. Evidence is not used to support assertions. |

| **Organization** | The presentation is carefully organized and provides convincing evidence to support conclusions. | The presentation has a focus and provides some reasonable evidence to support conclusions. | There is some organization, but the speaker occasionally goes off topic. Evidence used to support conclusions is weak. | No apparent organization. Evidence is not used to support assertions. |

| **Content** | The content is accurate and comprehensive. Listeners are likely to gain new insights about the topic. Clear and creative graphics | The content is generally accurate and reasonably complete. Listeners may develop a few insights about the topic. Interesting graphics | The content is sometimes inaccurate or incomplete. Listeners may learn some isolated facts, but they are unlikely to gain new insights about the topic. Acceptable graphics | The content is inaccurate or overly general. Listeners are unlikely to learn anything or may be misled. Poor graphics |

| **Delivery** | The speaker is professional, relaxed, and comfortable and interacts effectively with listeners. | The speaker is generally relaxed and comfortable. Listeners are generally recognized and understood. | The speaker occasionally appears anxious or uncomfortable, and may occasionally read notes, rather than speak. Listeners are often ignored or misunderstood. | The speaker appears anxious and uncomfortable and reads notes, rather than speaks. Listeners are ignored. |
Biology of Coral Reefs (EVSS 619)
Syllabus Spring 2016
Phillip Dustan, Department of Biology

Among the most spectacular of all ecosystems, coral reefs form in the world’s tropical oceans through the action of animals and plants. They are the largest and most complex biological structures on earth. Although they cover less than one percent of the earth’s surface, they are reservoirs for much of the ocean’s biodiversity, housing some of nature’s most intricate ecological secrets and treasures.

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The intricate adaptations for survival that have evolved over an immense span of time make reefs vulnerable to human activities. For example, excess nutrients support algal overgrowth, while over-fishing alters the food web. The extent to which reefs in remote locations are now showing signs of stress, especially bleaching and disease, points to the critical role that coral reefs play as indicators of declining ocean health.

This course will be an introduction to tropical coral reefs and the organisms and processes responsible for their formation. We will begin with an overview of reefs and their tropical marine environment. The course will then move into the evolution, systematics, and physiology, ecology and symbiosis of reef-building corals. These subjects will set the stage for learning about coral reef community structure and ecological dynamics. The course will close by taking a critical look at natural and human disturbances to reefs with an emphasis on current models of management and conservation.

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The learning goals of this class include gaining an appreciation and understanding of:
1. How abiotic forcing functions control the ecology of coral reefs including reef morphology and coral distribution.
2. The principles of carbonate biogeochemistry; the reef as a biogenic structure.
3. The flow of energy and molecules through coral reef ecosystems, reef trophodynamics.
4. The role density dependent vs. density independent control in the growth and regulation of coral reef populations.
5. The impact of natural and anthropogenic forcing functions on coral reef ecology.
6. The open-source peer reviewed literature.
7. Experimental design, data analysis, and limitations of underwater ecological experiments

Additional, more rigorous Student Learning Outcomes for graduate students in this cross-listed course:

Environmental Studies graduate students demonstrate a comprehension of environmental issues beyond general knowledge and understanding by:

- Obtaining, explaining, and applying scholarly information related to environmental issues
- Integrating facts, concepts, and methods from multiple disciplines
- Effectively communicating environmental facts, concepts, and methods
- Analyzing and synthesizing environmental facts, concepts, and methods to design and evaluate strategies, technologies, and methods to solve problems
- Demonstrating leadership in the classroom in both discussion and group projects
**Critical Thinking:**

Critical thinking is the common denominator between all forms of analysis. As a graduate student, there is no more important goal than that of developing your mind, as everything you do in your life will be affected by your mind and how it operates. The quality of your learning is affected by the quality of your thinking about learning. The quality of your personal relationships is affected by the quality of your thinking about those relationships. To take command of the thinking that controls your life, you must cultivate your intellect". (Refer to www.criticalthinking.org)

**Prerequisites:** Open to EVSS graduate students with general knowledge background of an undergraduate biology major (General Biology, Ecology, Chemistry and Physics). Supplemental materials will be provided to students without such a background.

**Requirements:**
Midterm and Final exams = 50% Term paper, presentations and participation. = 50%

**Graduate Student higher-level learning outcomes and additional workload:**
The Biology of Coral Reefs is a combined undergraduate and graduate course to provide a synthetic capstone-type course at the ecosystem level. Graduate students will have additional educational requirements placed on them in the form of a more in-depth research paper culminating in a class presentation as well as a written document. They will be expected to lead group discussions of assigned peer-reviewed literature to improve their critical learning skills and understanding of experimental design and statistical analysis.

**Honor Code:** All class work must be your own original work and must not have been submitted for a grade in any other class while at the College of Charleston or elsewhere. Furthermore, no project done in this class can be submitted for grading in any other future or present course. To do so will be construed as a clear violation of the Honor Code.

**Internet Materials:** Any information you quote for a paper or presentation must come from the peer-reviewed scientific literature and not a website. Use search engines such as the Web of Science or Google Scholar. Search journals such as Coral Reefs, Limnology and Oceanography, Marine Biology, Marine Ecology Progress series, etc.

**Grading Policy:**

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</tr>
<tr>
<td>B+</td>
<td>87-91</td>
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</tr>
<tr>
<td>F</td>
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<tr>
<td>XF</td>
<td>Failure due to Academic Dishonesty</td>
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**Sidebar Knowledge**

This course will focus on the corals and the coral reef ecosystem. Within the context of the course students will be required to draw on knowledge from earlier classes. Since this course will be taught at the undergraduate and graduate levels it is expected that students will have varied educational backgrounds. I will help you with sidebar information (selected readings, lectures, websites, etc.) on selected topics to help students will become knowledgeable in areas that are important framework fundamentals to the study of coral reefs. A partial list follows:

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- Theory of Evolution by Natural Selection
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The Ecology of Jamaican Coral Reefs I. Species Composition and Zonation Thomas F. Goreau,
The Zonation of West Indian Gorgonians, Robert A. Kinzie, Bull Mar Sci 28(1)
Deep Fore reef slope depositional processes, Goreau and Land,
Reefs in Time and Space, SEPM 1974 Special Pub #18.
Deep Forereef and Upper Island Slope, Lynton Land and Clyde More,
Sclerosponges primary framework constructors on the Jamaican deep fore reef Judith Lang, Willard
Biological zonation at the base of the reef. Judith Lang,
*Goldberg Chapters 1 and 2.*
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*Future of Coral Reefs, Knowlton, 2001 PNAS 98:10 pp 5419-5425*

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**Term papers due**

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Management of Coral Reefs
*Goldberg Ch 16*

15. Apr 20  
**Last Day of Class**

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**Final Exam (4-7pm)**

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**Term paper assignment:**
You may not write a term paper on global warming, coral bleaching, ocean acidification, lionfish or any other topic dealing with pollution or man's impact on reefs. Start your project by finding a paper in the recent peer-reviewed scientific literature that is central to your interest. Then research the topic using other papers from the literature. After you have done some reading on your chosen topic make an appointment to discuss it me. The paper should be at least **2500 words of text**, cite a minimum of **15 peer-reviewed papers** from 2000 or later plus any other references you choose to use, and must be typed (Times Roman font, 11 or 12 pica, double spaced). Submit both paper copy and email electronic copy.

**Filename = YOUR LAST NAME_PAPER_EVSS619_S2016.DOC.**

**Term Paper Topic:**
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Biology of Coral Reefs (BIOL 619)
Syllabus Spring 2016
Phillip Dustan, Department of Biology

Among the most spectacular of all ecosystems, coral reefs form in the world’s tropical oceans through the action of animals and plants. They are the largest and most complex biological structures on earth. Although they cover less than one percent of the earth’s surface, they are reservoirs for much of the ocean’s biodiversity, housing some of nature’s most intricate ecological secrets and treasures.

Coral reefs are also the most productive ecosystems in the sea and provide significant ecological goods and services, estimated at about $375 billion annually (1997 dollars) with more recent estimates topping 9 trillion dollars in 2015. Their physical structures protect thousands of miles of coastline from the fury of tropical storms, tsunamis, and many low-lying islands threatened by rising seas.

The intricate adaptations for survival that have evolved over an immense span of time make reefs vulnerable to human activities. For example, excess nutrients support algal overgrowth, while over-fishing alters the food web. The extent to which reefs in remote locations are now showing signs of stress, especially bleaching and disease, points to the critical role that coral reefs play as indicators of declining ocean health.

This course will be an introduction to tropical coral reefs and the organisms and processes responsible for their formation. We will begin with an overview of reefs and their tropical marine environment. The course will then move into the evolution, systematics, and physiology, ecology and symbiosis of reef-building corals. These subjects will set the stage for learning about coral reef community structure and ecological dynamics. The course will close by taking a critical look at natural and human disturbances to reefs with an emphasis on current models of management and conservation.

There will be an optional Laboratory (1 credit) one-week field trip to explore the reefs of Glover’s Atoll, Belize during March Spring Break. We will stay at the Isla Marisol Resort (http://islamarisolresort.com) on Southwest Caye, Glover’s Atoll Belize. Glover’s is one of the few offshore atolls in the Caribbean and is an excellent location to introduce you to the ecology and conservation of Caribbean reefs. The cost of the trip will be approximately $2400-2700, including all accommodations, diving, and travel from the US. You must be a certified SCUBA diver to participate. If you are a foreign student you must secure the appropriate visa documentation if necessary.

The learning goals of this class include gaining an appreciation and understanding of:
1. How abiotic forcing functions control the ecology of coral reefs including reef morphology and coral distribution.
2. The principles of carbonate biogeochemistry; the reef as a biogenic structure.
3. The flow of energy and molecules through coral reef ecosystems, reef trophodynamics.
4. The role density dependent vs. density independent control in the growth and regulation of coral reef populations.
5. The impact of natural and anthropogenic forcing functions on coral reef ecology.
6. The open-source peer reviewed literature.
7. Experimental design, data analysis, and limitations of underwater ecological experiments

Critical Thinking:
Critical thinking is the common denominator between all forms of analysis. As a graduate student, there is no more important goal than that of developing your mind, as everything you do in your life will be affected by your mind and how it operates. The quality of your learning is affected by the quality of your thinking about learning. The quality of your personal relationships is affected by the quality of your thinking about those relationships. To take command of the thinking that controls your life, you must cultivate your intellect”. (Refer to www.criticalthinking.org)

Prerequisites: Open to MBGP graduate students with general knowledge background of an undergraduate biology major (General Biology, Ecology, Chemistry and Physics). Supplemental materials will be provided to students without such a background.

Requirements:
Midterm and Final exams = 50% Term paper, presentations and participation = 50%
Graduate Student higher-level learning outcomes and additional workload:
The Biology of Coral Reefs is a combined undergraduate and graduate course to provide a synthetic capstone-type course at the ecosystem level. Graduate students will have additional educational requirements placed on them in the form of a more in-depth research paper culminating in a class presentation as well as a written document. They will be expected to lead group discussions of assigned peer-reviewed literature to improve their critical learning skills and understanding of experimental design and statistical analysis.

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Internet Materials: Any information you quote for a paper or presentation must come from the peer-reviewed scientific literature and not a website. Use search engines such as the Web of Science or Google Scholar. Search journals such as Coral Reefs, Limnology and Oceanography, Marine Biology, Marine Ecology Progress series, etc.

Grading Policy:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>A: 92-100 excellent and creative</th>
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<tr>
<td>B:</td>
<td>86-89 very good</td>
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<td>B: 79-82</td>
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<tr>
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<td>C: 72-76 acceptable</td>
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<td>F:</td>
<td>&gt;= 63</td>
<td>XF Failure due to Academic Dishonesty</td>
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Final grades are supposed to reflect how much you have progressed and/or learned in the time span of a course. With this in mind, one could suggest that an average student receives an average grade, a very good student a higher grade, and an excellent and creative student the highest grade.

Sidebar Knowledge

This course will focus on the corals and the coral reef ecosystem. Within the context of the course students will be required to draw on knowledge from earlier classes. Since this course will be taught at the undergraduate and graduate levels it is expected that students will have varied educational backgrounds. I will help you with sidebar information (selected readings, lectures, websites, etc.) on selected topics to help students will become knowledgeable in areas that are important framework fundamentals to the study of coral reefs. A partial list follows:

- Geological time line of Earth history and the fossil record
- Principles of general oceanographic circulation
- Theories on the origin of life and biodiversity
- Theory of Evolution by Natural Selection
- Photosynthesis and the pathways of carbon
- Density dependence and the growth and regulation of populations

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Contact Name    Timothy Callahan

Email    CallahanT@cofc.edu    Phone    953-8278

Department/Program    Environmental Studies    School    Graduate School

Catalog Year in Which Change Will Take Effect    2016-2017

Does this proposal include:  □ Course title change*
  ✔ Course number change*
  □ Course description change*
  ✔ Undergraduate/Graduate cross-listing

*complete Existing Course/New Course Information

A. If you are proposing to cross-list two existing courses at the same level, list the courses (acronym, title, number, course description) and provide a reason for cross-listing.

B. If you are proposing to cross-list an existing undergraduate course with an existing graduate course, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach a syllabus (or separate syllabi) that clearly indicates student learning outcomes, assignments, and rigor appropriate for each level.

C. If you are proposing to cross-list an existing course with a new course at the same level, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach the appropriate new course proposal form.

D. If you are proposing to cross-list an existing course with a new course at a different level, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach the appropriate new course proposal form(s). Also attach a syllabus (or separate syllabi) that clearly indicates student learning outcomes, assignments, and rigor appropriate for each level.
Proposed Cross-listed Courses
(course acronyms, numbers, titles, and descriptions)

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<th>Plant Ecology: BIOL 444, BIOL 628, EVSS 628</th>
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<td>Plant Ecology Lab: BIOL 444L, BIOL 628L, EVSS 628L</td>
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Plant ecology will explore the population ecology of plants covering the genetic, spatial, age, and size structure of plant populations. The focus will be on understanding the origin of these different kinds of structures, understanding how they influence each other, and understanding why they change with time.
Prerequisite: General Ecology (BIOL 341) or permission of the instructor.

Reason for Cross-listing

This course is offered for both undergraduate and graduate students. This course is also offered for graduate students in two programs: Environmental Studies and Marine Biology. There is sufficient overlap in the topics covered that sharing resources makes sense. However, there is a distinct difference in assignments and expectations that allows different learning outcomes to be obtainable. Topics covered in Plant Ecology are beneficial for upper level undergraduate students pursuing a degree in Biology, and at the same time, are beneficial for graduate students pursuing a thesis or internship in a related field.

Please see attached syllabi for specific learning objectives.

Changes to Existing Course Numbers/Titles/Descriptions

Existing Course:

EVSS 628, EVSS 628L

Proposed Course Change:

EVSS 544, EVSS 544L

No changes to course title or description.
Plant Ecology

Syllabus Lecture and Lab

Fall 2013

BIOL 444,
BIOL LAB 444

Dr. Courtney Murren
Dept of Biology, CofC
murrenc@cofc.edu
Office: Science Center Room 216C
My office is in the way back of the lab
Phone: 953-8077
Office Hours: by appointment via email

Class hours: 1-2:14 M and W
Old Science Center room 317
Lab W 2:15-5:15 Old Science Center Room 204, Field, and Greenhouse

Description of Course: Plant ecology is an advanced course for undergraduates and graduate students which will combine lecture, lab and discussion. We will be exploring a range of topics, will be examining theoretical foundations and current controversies in plant ecology. Our emphasis is on terrestrial plant ecology, but with some marine and coastal systems thrown in. We will gain an understanding of ecological theory, links to evolutionary and conservation biology and familiarize you with some experimental, methodological, and statistical techniques, and literature. Each week will be a different topic, although you will notice as time passes, that many topics are inter-related. Each class we will have half for lecture of a topic, and half for paper discussion. For each discussion, I will choose a classic or very recent paper on the topic (although some topics will have only recent papers). Each student will be asked to lead discussions during the semester (either alone or in pairs).

Undergraduate Learning Objectives:

- Learn fundamental theory of plant ecology, including aspects of evolutionary ecology and conservation ecology, with a particular focus on population ecology and community ecology.
- Learn techniques of how plant ecologists do their work, methods employed, interface with other sub-disciplines,
• Experience in field techniques of plant ecology, implement guided inquiry in greenhouse techniques in plant ecology. Experience observational, natural and manipulative experiment techniques.
• develop critical thinking, analysis, and writing skills as they apply to plant ecology
  o develop skills in reviewing literature and communicating published material with others.
  o discussing literature with classmates
• develop skills in oral presentation of both reviewing topics in plant ecology and data gathered in laboratory setting.

For graduate credit, students will be required to write a short review paper employing some primary literature in plant ecology.


Discussion readings: Check out OAKS for PDFS

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<th>Habitat Heterogeneity</th>
<th>Written Work Due Dates</th>
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<tbody>
<tr>
<td>W, Aug. 21</td>
<td>Intro to Plant Ecology and plant responses to environment</td>
<td>Ch 1. pp. 9-11, 36-41, 71-80</td>
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<tr>
<td>W,</td>
<td>No lab this week</td>
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<table>
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<tr>
<th>Week 2</th>
<th>Process of Evolution in an Ecological Context</th>
<th>Written Work Due Dates</th>
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<tbody>
<tr>
<td>M, Aug 26</td>
<td>Ecotypes &amp; Structured populations Discussion 1.</td>
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<td>W, Aug 28</td>
<td>Urban Ecology &amp; Discussion 2</td>
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<th>Outcomes of Evolution</th>
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<td>M, Sept. 2</td>
<td>Adaptive Phenotypic Plasticity &amp; Discussion 3</td>
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<td>W, Sept. 4</td>
<td>Processes of Evolution &amp; Discussion 4</td>
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<td>Paper topics due subject to approval</td>
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<th>Population Structure, Growth &amp; Decline</th>
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<td>Life Cycle Demography &amp; Discussion 6</td>
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<td>W, Sept. 18</td>
<td>Mutualism &amp; Discussion 8</td>
<td>Chapter 7 &amp;</td>
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<td>Bibliography &amp; Outline Due Pollination/morphology Field</td>
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<tr>
<td>W, Lab</td>
<td>Field/Campus</td>
<td>pp. 92-96 results due</td>
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<td>Chapter 7</td>
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<td>Population biology of marine Algae &amp; Discussion 10</td>
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<td>Life History</td>
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<td>Life history strategies &amp; Discussion 12</td>
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<td>GH</td>
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<td><strong>Week 8</strong></td>
<td>Species Interactions</td>
<td>No Extensions (your classmates you’re your work! Think of them)</td>
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<td>M, Oct. 7</td>
<td>Competition &amp; Discussion 13</td>
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<td>Midterm Exam</td>
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<td><strong>Week 9</strong></td>
<td>Species Interactions</td>
<td>Reviewer’s comments due</td>
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<td>M Oct. 14</td>
<td>Fall Break -- No Class</td>
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<td>W, Oct. 16</td>
<td>Herbivory &amp; Discussion 14</td>
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<td>W, Lab</td>
<td>Mixed Field/GH/Computer room</td>
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<td><strong>Week 10</strong></td>
<td>Communities</td>
<td>Solidago results due</td>
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<td>M, Oct. 21</td>
<td>Species interactions &amp; Discussion 15</td>
<td>Chapter 10</td>
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<td>W, Oct. 23</td>
<td>What is a community? Discussion 16</td>
<td>Chapter 9; 19</td>
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<td>Field</td>
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<td><strong>Week 11</strong></td>
<td>Disturbance and Succession</td>
<td>Germination report due</td>
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<td>M, Oct 28</td>
<td>Succession &amp; Discussion 17</td>
<td>Chapter 12</td>
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<td>W, Oct 30</td>
<td>Disturbance &amp; Discussion 18</td>
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<td><strong>Week 12</strong></td>
<td>Conservation Ecology</td>
<td>Final Paper Due</td>
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<td>M, Nov. 4</td>
<td>Endangered Species &amp; Discussion 19</td>
<td>Chapter 13</td>
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<tr>
<td>W, Nov. 6</td>
<td>Ecology of Invasive Species &amp; Discussion 20</td>
<td>Chapter 13</td>
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<td>Field</td>
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<td><strong>Week 13</strong></td>
<td>Landscapes</td>
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<td>M, Nov. 11</td>
<td>Restoration ecology Discussion 21</td>
<td>Chapter 13</td>
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<td>W, Nov. 13</td>
<td>Communities in Landscapes</td>
<td>Chapter 15</td>
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<td>W, Lab</td>
<td>GH</td>
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<tr>
<td><strong>Week 14</strong></td>
<td>Student Presentations</td>
<td>Final Exam Hand Out</td>
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<td>M, Nov. 18</td>
<td>Presentations</td>
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<td>W, Nov 20</td>
<td>Presentations</td>
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<tr>
<td>W, Lab</td>
<td>Computer room</td>
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</tbody>
</table>

**Week 15 & 16**
- **Presentations and Global Patterns**
- **M, Nov 25**
  - Presentations
  - Semester wrap up and global patterns
- **W, Nov 28**
  - Thanksgiving Break Nov 28 – Dec 1
- **M, Dec 2**
  - Student review study session
- **Tu, Dec 3**
  - Reading Day
- **W, Dec 4, 12-3 pm**
  - Final Exam – same room as lecture

Arabidopsis lab due
Urban Ecology lab due

*The syllabus is **subject to change**, any changes will be announced in lecture. See below for tentative lab schedule – assignment due dates are listed above.

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**Grades will be based on the following work:**


The grading system:
Grades for Undergraduate Students: 95% A (4), 92-94% A- (3.7), 88-91% B+ (3.3), 84-87% B (3.0), 80-83% B- (2.7), 77-79% C+ (2.3), 74-76% C (2.0), 70-73% C- (1.7), 67-69% D+ (1.3), 64-66% D (1.0), 60-63% D- (0.7), below 60% F (0.0)

**Components of the Course:**

Lecture: This is self explanatory. I will lecture on topics relating to the theme for the week including theoretical underpinnings of ideas, history of ideas, and current controversies. Come prepared having read the text for background.

Discussion: During the semester, we will discuss primary literature. These are journal articles that I have chosen in advance. For each discussion, we will examine a pair of papers from the primary literature. Each student will lead discussion during the semester. **On the week that you lead, you will prepare a one page type-written (10 or 12 pt font, double spaced) essay.** This brief essay will include four main elements/paragraphs: 1 & 2) your own brief summary one paragraph for each paper, 3) how the recent paper relates to the classic paper, and 4) your view of the papers. You should copy your summaries for other members of the class and hand them out at the beginning of class.

For every discussion, all students (including presenter) will prepare three (3) thoughtful questions with associated text, and type them, print them, and bring them to class. You will use them in class as points of discussion, and I will collect them at the end of class. By thoughtful question and associated text, I mean: Example 1: “How does the split block design affect this
experiment? I understand that the author set up two treatments, water and light, but I don’t understand how the split block is set up. Is it that each tray of plants either receives a specific level of the water treatment rather than an individual plant receiving the treatment?” Example 2: “Does the author actually detect selection? I note on page 100 that the author asserts that they find directional selection. However in Table 1 on page 98, there is no significant term suggesting natural selection”.

Exams: There will be a Mid-Term exam and a Final Exam. The mid-term exam will be related to the lecture and discussions for that section of the course. The final exam will be cumulative and will also include material from the laboratory exercises. The exams will be essay type, and the questions are intended to be thought provoking, and not regurgitation of facts. They are intended to be a fun thought exercise as well as a way to assess your understanding of the material.

Lab participation and Written Labs: Wear appropriate attire to lab: including closed toe shoes. Bring appropriate anti-insect medical needs and water for field trips. Do not miss lab, you cannot make it up. No smoking on field trips. Please turn silent cell phones during lab and do not use text messaging capabilities during instruction/work times.

Labs will involve field work, greenhouse work, lab measurements, statistical analyses, and write ups. Labs will focus on hypothesis testing. We will plan to do two manipulative experiments, one natural experiment and one observational experiment. We will have formal lab exercises each requiring written work. Some lab exercises will have a written report that will be in the form of a journal article. More details on this in lab. On the writing assignments, I’ll give more details on group lab reports in lab. Other computer exercises or field trips may be included to see locally interesting ecosystems.

Lab participation and peer review will factor into your final grade.

Final Paper: Undergraduates will write a short review type paper, and graduate students will write a longer perspectives paper. Formal details to follow.

Final papers will be subject to “peer review”. Three weeks before the final paper is due, I will assign student partners who will review papers. The reviewer takes the paper for one week. Students will edit the paper carefully for typos, grammatical problems, etc. The reviewer will write a formal review (in the same manner that all scientists do for journal articles of their peers). A formal review will summarize the logic of the paper (if the summary departs significantly from the author’s intent, the author will have a strong message that his/her point was not clear). The review will address quality of writing, logic of argument, will highlight both good and weak points, and summarize the message of the paper in a single sentence. The reviewer will make specific recommendations for improvements. After a week, all students will get their drafts back, with the reviewer’s comments. Students should feel free to meet with each other to discuss if the review is unclear. The final draft will be due two weeks later, at which point the original draft and the review will also be handed in together with the final
paper. I will look over the review for thoroughness, thoughtfulness and professionalism. The writer will be evaluated on the quality of the paper, as well as the responses to the peer review editor's comments (incorporating suggestions and corrections). Any major objections to the reviewer's comments should be discussed with the reviewer and me. This process is intended both to encourage students to interact without competition, as well as expose students to the process that professional scientists follow for editing and communicating suggestions. You will also benefit by reading a paper in another subject, as well as the process of examining a topic in depth. As a way to share what you have learned in your written paper with the class, we will dedicate time to brief presentations.

As is the tradition at the College of Charleston, the honor code applies in this course, as well as other components of the student handbook.

If there is a student in this class who has a documented disability and has been approved to receive accommodations through SNAP Services, please feel free to come and discuss this with me during my office hours.
Tentative Lab Schedule:
(Subject to change: Dependent on plant phenology, and sometimes weather)


Sept 4, 2013 Manipulative Experiment: Transplant Arabidopsis: Greenhouse

Sept 11, 2013 Observational Experiment: Pollination Plant Morphological Ecology: Grice Field

Sept. 18, 2013 Observational Experiment: Urban Ecology: Campus

Sept. 25, 2013 Manipulative Experiment: Germination week 1: Greenhouse


Oct. 9, 2013 Observational Experiment: Solidago Caw Caw : Field


Oct. 23, 2013 Germination Experiment – week 3


Nov. 6, 2013 Urban Ecology: Campus/Grice

Nov. 13, 2013 Arabidopsis finalizing experiment – lab/GH

Nov. 20, 2013 Computer lab – last lab
Plant Ecology

Syllabus Lecture and Lab
Fall 2013

BIOL 628, EVSS 628
BIOL LAB 628, EVSS LAB 628

Dr. Courtney Murren
Dept of Biology, CofC
murrenc@cofc.edu
Office: Science Center Room 216C
My office is in the way back of the lab
Phone: 953-8077
Office Hours: by appointment via email

Class hours: 1-2:14 M and W
Old Science Center room 317
Lab W 2:15-5:15 Old Science Center Room 204, Field, and Greenhouse

Description of Course: Plant ecology is an advanced course for graduate students which will combine lecture, lab and discussion. We will be exploring a range of topics, will be examining theoretical foundations and current controversies in plant ecology. Our emphasis is on terrestrial plant ecology, but with some marine and coastal systems thrown in. We will gain an understanding of ecological theory, links to evolutionary and conservation biology and familiarize you with some experimental, methodological, and statistical techniques, and literature. Each week will be a different topic, although you will notice as time passes, that many topics are inter-related. Each class we will have half for lecture of a topic, and half for paper discussion. For each discussion, I will choose a classic or very recent paper on the topic (although some topics will have only recent papers). Each student will be asked to lead discussions during the semester (either alone or in pairs).

Learning Objectives:

- build upon the theoretical framework of general ecology as it pertains to plants, including evolutionary ecology and conservation ecology, with a particular focus on population ecology and community ecology.
- to gain an understanding of the main aspects of how plant ecologists do their work, methods employed, interface with other sub-disciplines,
- gain hands on experience in field techniques of plant ecology, gain hands on experience with greenhouse techniques in plant ecology. Implement observational, natural and manipulative experiments
- develop critical thinking, analysis, and writing skills as they apply to plant ecology
- develop hypotheses based on reading and discussing literature with classmates
- test hypotheses through experimental work as professional plant ecologists
- synthesize primary literature and develop skills in writing based on background review, and writing to provide evidence for a hypothesis/point of view based on literature.
- develop skills in oral presentation of both synthetic topics and newly acquired data
- develop leadership in discussion of primary literature and in experimental settings.

**Additional, more rigorous Student Learning Outcomes for graduate students in this cross-listed course:**

Environmental Studies graduate students demonstrate a comprehension of environmental issues beyond general knowledge and understanding by:

- Obtaining, explaining, and applying scholarly information related to environmental issues
- Integrating facts, concepts, and methods from multiple disciplines
- Effectively communicating environmental facts, concepts, and methods
- Analyzing and synthesizing environmental facts, concepts, and methods to design and evaluate strategies, technologies, and methods to solve problems
- Demonstrating leadership in the classroom in both discussion and group projects


Discussion readings: Check out OAKS for PDFS

<table>
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<tr>
<th>Week 1</th>
<th>Habitat Heterogeneity</th>
<th>Written Work Due Dates</th>
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<tbody>
<tr>
<td>W, Aug. 21</td>
<td>Intro to Plant Ecology and plant responses to environment</td>
<td>Ch 1. pp. 9-11, 36-41, 71-80</td>
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<th>Process of Evolution in an Ecological Context</th>
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<td>Ecotypes &amp; Structured populations</td>
<td>Chapter 6</td>
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<td>Urban Ecology &amp; Discussion 2 Field</td>
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<td>Adaptative Phenotypic Plasticity &amp; Discussion 3</td>
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<td>Population Structure, Growth &amp; Decline</td>
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<td>Population Growth &amp; Discussion 5</td>
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<td>Week 5</td>
<td>M, Sept. 16</td>
<td>Reproduction and Mutualism</td>
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<td>Population biology of marine Algae &amp; Discussion 10</td>
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<td>Life History Dispersal &amp; Discussion 11</td>
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<td>Herbivory &amp; Discussion 14</td>
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<td>Conservation Ecology</td>
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<td>W, Nov. 6</td>
<td>Endangered Species &amp; Discussion 19. Ecology of Invasive Species &amp; Discussion 20</td>
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<td>Field</td>
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<td><strong>Week 13</strong></td>
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<td>M, Nov. 11</td>
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<td>Restoration ecology Discussion 21 Communities in Landscapes Discussion 22</td>
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<td><strong>Week 14</strong></td>
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<tr>
<td>M, Nov. 18</td>
<td>Student Presentations</td>
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<td>W, Nov 20</td>
<td>Presentations</td>
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<td>W, Lab</td>
<td>Computer room</td>
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<td><strong>Week 15 &amp; 16</strong></td>
<td>Presentations and Global Patterns</td>
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<td>M, Nov 25</td>
<td>Presentations</td>
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<td>W, Nov 28</td>
<td>Semester wrap up and global patterns</td>
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<td>M, Dec 2</td>
<td>Thanksgiving Break Nov 28 – Dec 1</td>
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<td>Tu, Dec 3</td>
<td>Student review study session</td>
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<tr>
<td>W, Dec. 4,</td>
<td>Reading Day</td>
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<tr>
<td>12-3 pm</td>
<td>Final Exam – same room as lecture</td>
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</tbody>
</table>

*The syllabus is subject to change, any changes will be announced in lecture. See below for tentative lab schedule – assignment due dates are listed above.*

**Grades will be based on the following work:**

**Graduate students:** Final paper will be worth 150 pts and Lab participation and written lab work will be worth 100 pts. Other point structure remains the same. : Midterm Exam, 50 Pts. Final Exam, 100 Pts. Presentation/Participation in Class Discussions, 100 Pts. Lab Participation/Lab peer review and Written Lab work, 100 Pts. Review of Colleague’s Paper, 50 Pts. Final paper 150 points.

The grading system:
Grades for Graduate Students: 92% A (Quality points: 4), 88-91% B+ (3.5), 80-87% B (3.0), 77-83% C+ (2.7), 70-76 C (2.0), below 70% F (0.0), XF Failure due to academic dishonesty

**Components of the Course:**
Lecture: This is self explanatory. I will lecture on topics relating to the theme for the week including theoretical underpinnings of ideas, history of ideas, and current controversies. Come prepared having read the text for background.

Discussion: During the semester, we will discuss primary literature. These are journal articles that I have chosen in advance. For each discussion, we will examine a pair of papers from the primary literature. Each student will lead discussion during the semester. On the week that you lead, you will prepare a one page type-written (10 or 12 pt font, double spaced) essay. This brief essay will include four main elements/paragraphs: 1 & 2) your own brief summary one paragraph for each paper, 3) how the recent paper relates to the classic paper, and 4) your view of the papers. You should copy your summaries for other members of the class and hand them out at the beginning of class.

For every discussion, all students (including presenter) will prepare three (3) thoughtful questions with associated text, and type them, print them, and bring them to class. You will use them in class as points of discussion, and I will collect them at the end of class. By thoughtful question and associated text, I mean: Example 1: “How does the split block design affect this experiment? I understand that the author set up two treatments, water and light, but I don’t understand how the split block is set up. Is it that each tray of plants either receives a specific level of the water treatment rather than an individual plant receiving the treatment?” Example 2: “Does the author actually detect selection? I note on page 100 that the author asserts that they find directional selection. However in Table 1 on page 98, there is no significant term suggesting natural selection”.

Exams: There will be a Mid-Term exam and a Final Exam. The mid-term exam will be related to the lecture and discussions for that section of the course. The final exam will be cumulative and will also include material from the laboratory exercises. The exams will be essay type, and the questions are intended to be thought provoking, and not regurgitation of facts. They are intended to be a fun thought exercise as well as a way to assess your understanding of the material.

Lab participation and Written Labs: Wear appropriate attire to lab: including closed toe shoes. Bring appropriate anti-insect medical needs and water for field trips. Do not miss lab, you cannot make it up. No smoking on field trips. Please turn silent cell phones during lab and do not use text messaging capabilities during instruction/work times.

Labs will involve field work, greenhouse work, lab measurements, statistical analyses, and write ups. Labs will focus on hypothesis testing. We will plan to do two manipulative experiments, one natural experiment and one observational experiment. We will have formal lab exercises each requiring written work. Some lab exercises will have a written report that will be in the form of a journal article. More details on this in lab. On the writing assignments, I’ll give more details on group lab reports in lab. Other computer exercises or field trips may be included to see locally interesting ecosystems.

Lab participation and peer review will factor into your final grade.
Final Paper: Graduate students will write a long *perspectives* paper. Formal details to follow.

Final papers will be subject to “peer review”. Three weeks before the final paper is due, I will assign student partners who will review papers. The reviewer takes the paper for one week. Students will edit the paper carefully for typos, grammatical problems, etc. The reviewer will write a formal review (in the same manner that all scientists do for journal articles of their peers). A formal review will summarize the logic of the paper (if the summary departs significantly from the author’s intent, the author will have a strong message that his/her point was not clear). The review will address quality of writing, logic of argument, will highlight both good and weak points, and summarize the message of the paper in a single sentence. The reviewer will make specific recommendations for improvements. After a week, all students will get their drafts back, with the reviewer’s comments. Students should feel free to meet with each other to discuss if the review is unclear. The final draft will be due two weeks later, at which point the original draft and the review will also be handed in together with the final paper. I will look over the review for thoroughness, thoughtfulness and professionalism. The writer will be evaluated on the quality of the paper, as well as the responses to the peer review editor’s comments (incorporating suggestions and corrections). Any major objections to the reviewer’s comments should be discussed with the reviewer and me. This process is intended both to encourage students to interact without competition, as well as expose students to the process that professional scientists follow for editing and communicating suggestions. You will also benefit by reading a paper in another subject, as well as the process of examining a topic in depth. As a way to share what you have learned in your written paper with the class, we will dedicate time to brief presentations.

As is the tradition at the College of Charleston, the honor code applies in this course, as well as other components of the student handbook.

If there is a student in this class who has a documented disability and has been approved to receive accommodations through SNAP Services, please feel free to come and discuss this with me during my office hours.
Tentative Lab Schedule:
(Subject to change: Dependent on plant phenology, and sometimes weather)


Sept 4, 2013 Manipulative Experiment: Transplant Arabidopsis: Greenhouse

Sept 11, 2013 Observational Experiment: Pollination Plant Morphological Ecology: Grice Field

Sept. 18, 2013 Observational Experiment: Urban Ecology: Campus

Sept. 25, 2013 Manipulative Experiment: Germination week 1: Greenhouse


Oct. 9, 2013 Observational Experiment: Solidago Caw Caw: Field


Oct. 23, 2013 Germination Experiment – week 3


Nov. 6, 2013 Urban Ecology: Campus/Grice

Nov. 13, 2013 Arabidopsis finalizing experiment – lab/GH

Nov. 20, 2013 Computer lab – last lab
Contact Name  Timothy Callahan

Email  CallahanT@cofc.edu  Phone  953-8278

Department/Program  Environmental Studies  School  Graduate School

Catalog Year in Which Change Will Take Effect  2016-2017

Does this proposal include:  
☐ Course title change*  
☒ Course number change*  
☐ Course description change*  
☒ Undergraduate/Graduate cross-listing  
*complete Existing Course/New Course Information

A. If you are proposing to cross-list **two existing courses at the same level**, list the courses (acronym, title, number, course description) and provide a reason for cross-listing.

B. If you are proposing to cross-list **an existing undergraduate course with an existing graduate course**, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and **attach a syllabus** (or separate syllabi) that clearly indicates student learning outcomes, assignments, and rigor appropriate for each level.

C. If you are proposing to cross-list **an existing course with a new course at the same level**, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach the appropriate new course proposal form.

D. If you are proposing to cross-list **an existing course with a new course at a different level**, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach the appropriate new course proposal form(s). Also **attach a syllabus** (or separate syllabi) that clearly indicates student learning outcomes, assignments, and rigor appropriate for each level.
**Proposed Cross-listed Courses**

(courses acronyms, numbers, titles, and descriptions)

**Conservation Biology:** BIOL 406, BIOL 629, EVSS 629

A course exploring the origin, maintenance, and preservation of biodiversity at all levels: genetic, population, community, ecosystem and biosphere. The focus will be on applying ecological, genetic, and evolutionary principles to problems of conservation. Optional field trips will make use of the rich biota of the Charleston area.

Prerequisites: BIOL 341 (General Ecology) and either BIOL 305 (Genetics) or BIOL 350 (Evolution), or permission of the instructor.

**Reason for Cross-listing**

This course is offered for both undergraduate and graduate students. This course is also offered for graduate students in two programs: Environmental Studies and Marine Biology. There is sufficient overlap in the topics covered that sharing resources makes sense. However, there is a distinct difference in assignments and expectations that allows different learning outcomes to be obtainable. Topics covered in Conservation Biology are beneficial for upper level undergraduate students pursuing a degree in Biology or Marine Biology, and at the same time, are beneficial for graduate students pursuing a thesis or internship in a related field.

Please see attached syllabi for specific learning objectives.

**Changes to Existing Course Numbers/Titles/Descriptions**

**Existing Course:**

EVSS 629

**Proposed Course Change:**

EVSS 506

No changes to course title or description.
College of Charleston, Department of Biology, Fall 2015

Lecture: 8:30-9:20 M, W, and F. HWWE 307

Final: 8:00-11:00 AM, Friday, December 11, 2015

Instructor: Dr. Arch McCallum
Office: one of the faculty offices on 3rd floor of HWWE
Email: mccallumd@cofc.edu

Office hours: by appointment, usually available after class

Course Description: Biologists study the natural world at many levels of a hierarchy. This course focuses on biology at the level of the whole organism and above, in the context of a planetary environment that is over-exploited by humans. What explains the abundance and distribution of different organisms? How does human activity influence their abundance and distribution? How have groups of organisms diverged over time? Are we in the midst of a mass extinction, and what should we do about it? How does science aid our ability to conserve biodiversity? This dual emphasis on action and understanding derives from conservation biology’s unique role as a value-laden science. Whether the values of conservation biology should include intrinsic valuation of nature is now being discussed vigorously within the field. We will join that debate.

Our study of conservation biology will have three focal questions: (1) What has gone wrong? (2) What can we do to correct it? (3) Why should we correct it? Is it a simple matter of enlightened self-interest, or do we have a deeper obligation to nature that derives from outside humanity? To establish context, we will review the current and past glories of biodiversity. Our study of the decline of biodiversity will be informed by our foundation in ecology and genetics. The solutions, though, are political and cultural as well as scientific. We will explore all avenues to conserving and restoring biodiversity. Finally, we will search our own minds, hearts, and souls to understand the need, if any, for conservation biology.

This course is taught concurrently to graduate students as BIOL/EVSS 629. Undergraduates are encouraged to seek out the graduate students in the class for help with academics and advice on making the transition from college to graduate school. Some graduate students may be able to use volunteer assistants for collecting or analyzing data. Undergraduates are encouraged to gain research experience to have a clearer picture of their options after graduation.
Learning Objectives:

- understand and practice science as a way of knowing.
- understand how ecosystems function and sustain life on earth
- learn to apply ecological and evolutionary principles to the conservation of biodiversity
- be able to recognize and to classify signature species of local ecosystems and representative species from all branches of the tree of life
- know where to find major biomes and signature species locally and on planet earth
- gain confidence reading about and discussing the population genetics of small populations, population viability analysis (PVA), and evolutionarily significant units (ESUs)
- understand the pros and cons of contemporary species concepts, and how each affects the success of the U.S. Endangered Species Act (ESA).
- enhance appreciation of the severity of the contemporary anthropogenic extinction crisis by learning about post-Pleistocene megafaunal extinctions
- consider the ethical dimensions of human-caused extinction of other species, and practice making ethical arguments against extinction and the depauperization of ecosystems
- understand the political dimensions of conservation and the inadequacy of purely technical solutions to conservation problems

Course Structure: Different people learn in different ways. This course features a variety of learning activities to achieve redundancy, and hence success, in transmitting the core values and information of Conservation Biology from the academic establishment to the students.

Lecture: Lecture periods are thrice a week for 50 minutes each. Lectures will cover the basics of macro-evolution, ecology, and population genetics, as well as the applications of these fields to understanding the problems of populations and ecosystems at risk. In addition, conservation ethics, economics, and policy will be summarized. Two high-weight exams will encourage students to make the most of lecture.

Lowcountry Natural History: There is no substitute for knowing and being able to name the species we are trying to save. We are blessed to have a wide variety of biomes, both terrestrial and aquatic, within a short distance of Charleston. They include currently endangered species, and they recently included others that are now extinct. Others flourish, so the whole spectrum is here. All students at the 400 or higher level in the CofC Biology department should already be well acquainted with these species and ecosystems; for those who are not, it is now time to catch up. Accordingly, a list of approximately 200 species and ecosystems that every local Conservation Biologist should know will be provided to all students in this course, along with access to slide shows that introduce them and provide recognition cues. Students will be given a multiple choice recognition test on these taxa and systems in September. For anyone not satisfied with their score on this test, a retest will be given at the time of the final exam. An optional Saturday field trip to see these species and communities will be offered.
**World Geography:** The central problem of Conservation Biology is extinction. Extinction is not just a temporal phenomenon, the end for all time of a phylogenetic lineage. It is also a spatial phenomenon: the local extinction of a species changes ecosystem structure and thereby ecosystem function. Should Conservation Biology be more concerned with the functioning of local ecosystems and their utility to people, or with the pruning and wholesale destruction of branches of the phylogenetic tree, as has occurred five times previously in the history of life. To fully comprehend the natural and unnatural phenomena that Conservation Biology covers, we must know the geography of planet earth, both present and past, as reflected in maps. Accordingly, a list of approximately 100 physical features of Charleston County, South Carolina, the United States, and the world that every local Conservation Biologist should know will be provided to all students in this course, along with access to materials that introduce them and provide recognition cues. Students will be given a grade-free pre-test on these features in September, and will take the multiple-choice final test at the end of the semester.

**Book Report:** Each student will read and report (5 pp., double-spaced) on a popular book on any subject related to conservation of wild nature. The objective is a good read that amplifies the student's knowledge, understanding, and sympathy for the living world. The book must be at least 200 pages in length. Full instructions for the report will be provided on OAKS. That document contains a list of books that may be read without prior approval. If you want to read one of the many other books that are relevant, email the instructor for approval. The finished report is due October 26, 2015, at 5 PM. All written assignments will be submitted electronically to a dropbox on OAKS.

**Before and after Essay.** Each student will write two 5 page (digital, double-spaced) essays on your vision for the optimal distribution of biodiversity on Planet Earth. The Before Essay will be due at 5 PM, September 7, 2015, and will reveal your vision going into the course. The After Essay will be due no later than 12 Noon on December 15, 2015, and should be a re-assessment of your vision after having taken the course. There is no one correct answer, but resubmitting the before essay is not a wise gambit. The grade on both the Before and After versions of the essay will be based on the thoughtfulness, ingenuity, and articulateness of your exposition.

**Term Paper:** A 10 to 20-page (double-spaced) term paper on a subject of interest to the student will be due at the end of the semester. Each student must submit to the instructor a 1-page (more or less) proposal for the term paper subject by the end of September. The quality of this proposal will be incorporated in the midterm grade for the course. Every student should strive to make this paper publishable in the peer-reviewed scientific literature. Check the Commentaries in Conservation Biology for examples of how an idea and a literature review can advance the field. A couple of examples of topics: “Signature sounds in animals and their uses for monitoring.” “Do ‘culturally significant units’ exist, and do they deserve conservation attention?” While these sound like opinion pieces, they could not succeed without thorough literature review.
Exams: There will be two exams, one near the middle of the semester that will figure importantly into the midterm grade, which is unofficial and advisory. The other will be taken at the scheduled time for the final exam. Each exam will include some 30 multiple choice questions, which will be very specific and objectively graded. One multiple choice question will cover the material presented in each chapter of assigned reading in the three assigned books. Each exam will also include several short answer and essay questions that will cover major topics covered in lecture. Sample questions of both types will be provided to students. The first exam will include material from Kolbert and reading assignments from the text, while Marris and the rest of the text will be covered in the second exam.

Required Reading: *The Sixth Extinction*, by Elizabeth Kolbert, MacMillan; *The Rambunctious Garden*, by Emma Marris, Bloomsbury USA.


Prerequisites: Biology 111, 112, 211, 305, 341

Course Policies

Communication – Students are responsible for knowing and complying with all announcements made by the instructor during the regularly scheduled hours of Lecture. Additionally, documents needed for completing required (and optional) work will be available on OAKS. Check OAKS frequently for newly uploaded or recently revised documents. Finally, the instructor will send emails to the entire class as needed to inform students of changes of schedule, interesting seminars, materials needed for class, etc. It’s a good idea to check your cofc email shortly before each class.

Lecture – You are expected to attend every lecture. If you must be absent, please inform the instructor in advance and visit him during office hours if you have any questions about the lecture you missed.

Exams – If you know in advance of an unavoidable conflict with a scheduled exam, talk to the instructor about it during the first two weeks of the semester. Scheduled exams that are missed without prior permission cannot be made up except in the case of a true medical emergency suffered on the day of the exam. SNAP students are requested to make arrangements with the instructor well in advance of exams.

Academic Integrity

Academic integrity is important to the College of Charleston community. In addition, this course asks you to perform tasks like a professional biologist, and you will be required to uphold the standards of integrity expected in the profession. Plagiarism, lying, cheating or attempted cheating are violations of the College’s honor code and will
be dealt with accordingly. Please be absolutely sure that you understand what the honor code requires of you (refer to pages 10-12 of the student handbook, http://cofc.edu/generaldocuments/handbook.pdf). If you have any questions or concerns about honor code expectations or about how to avoid violations, please consult with the instructor.

Any honor code violations that occur will be handled as outlined in the student handbook.

(a) For lesser or unintentional offenses, the student will be asked to sign a form acknowledging an understanding of the mistake. This form will be kept on file by the Dean of Students, and a second such violation will automatically result in an honor court hearing.

(b) More serious cases of suspected academic dishonesty will be reported to the Dean of Students and forwarded to the honor board. Severe punishments are mandatory if found in violation of the honor code, including an XF for the course, a mark that indicates failure due to academic dishonesty.

**Plagiarism:** Plagiarism is any use of words or ideas produced by another person without proper attribution, and includes failing to paraphrase adequately or to cite sources properly. Whether intentional or unintentional, plagiarism is forbidden by the honor code. Please consult the instructor if you have any questions or concerns about how to use and cite sources.

**Re-using work:** Please be aware that re-submitting work that you or anyone else has done for this or any other class or project is a violation of the honor code, even if the work is revised. On the other hand, graduate students are urged to use the term paper and grant proposal required for this course to further their research programs, and this will undoubtedly lead to some redundancy. Consult the instructor for guidance.
ASSESSMENT

Your grade in this course will be based on the components shown below. These components will be worth the following percentages of your final grade:

Biology 406 (undergraduates)

<table>
<thead>
<tr>
<th>Course component</th>
<th>% of grade</th>
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<tbody>
<tr>
<td>Lowcountry Natural History</td>
<td>10%</td>
</tr>
<tr>
<td>Book Report</td>
<td>5%</td>
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<tr>
<td>Essay</td>
<td>10%</td>
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<td>Map Sense</td>
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<tr>
<td>Term Paper</td>
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<td>MidTerm Exam</td>
<td>25%</td>
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<tr>
<td>Final Exam</td>
<td>25%</td>
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</tbody>
</table>

*Total* 100%

Letter-grade percentages –

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93.0-100.0%</td>
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<tr>
<td>A-</td>
<td>90.0-92.9%</td>
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<td>B+</td>
<td>87.0-89.9%</td>
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<tr>
<td>B</td>
<td>83.0-86.9%</td>
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<tr>
<td>B-</td>
<td>80.0-82.9%</td>
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<tr>
<td>C+</td>
<td>77.0-79.9%</td>
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<td>C</td>
<td>73.0-76.9%</td>
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<tr>
<td>C-</td>
<td>70.0-72.9%</td>
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<tr>
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<td>F</td>
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</table>
Biology 629 and EVSS 629, Fall 2015
Graduate Conservation Biology

College of Charleston, Department of Biology, Fall 2015

Lecture: 8:30-9:20 M, W, and F. HWWE 307
Final: 8:00-11:00 AM, Friday, December 11, 2015

Instructor: Dr. Arch McCallum
Office: one of the faculty offices on 5th floor of HWWE
Email: mccallumd@cofc.edu

Office hours: by appointment, usually available after class

Course Description: Biologists study the natural world at many levels of a hierarchy. This course focuses on biology at the level of the whole organism and above, in the context of a planetary environment that is over-exploited by humans. What explains the abundance and distribution of different organisms? How does human activity influence their abundance and distribution? Are we in the midst of a mass extinction, and what should we do about it? How does science aid our ability to conserve biodiversity? This dual emphasis on action and understanding derives from conservation biology’s unique role as a value-laden science. Whether the values of conservation biology should include intrinsic valuation of nature is now being discussed vigorously within the field. We will join that debate.

Our study of conservation biology will have three focal questions: (1) What has gone wrong? (2) What can we do to correct it? (3) Why should we correct it? Is it a simple matter of enlightened self-interest, or do we have a deeper obligation to nature that derives from outside humanity? To establish context, we will review the current and past glories of biodiversity. Our study of the decline of biodiversity will be informed by our foundation in ecology and genetics. The solutions, though, are political and cultural as well as scientific. We will explore all avenues to conserving and restoring biodiversity. Finally, we will search our own minds, hearts, and souls to understand the need, if any, for conservation biology.

This course is taught concurrently for undergraduate and graduate credit. Graduate students have a more advanced text, an additional assignment, and a different apportionment of grading credit from their classmates taking Biology 406. Because they are expected to know the basics well, graduate students should reach out to undergraduates who are challenged by the more advanced material and offer assistance. This will help you crystallize your understanding of material you may not have truly mastered as undergraduates. Many undergraduates in this course are considering careers or vocations in...
conservation; offering these students the opportunity to assist with your research could be mutually beneficial.

Learning Objectives:
- understand and practice science as a way of knowing.
- understand how ecosystems function and sustain life on earth
- learn to apply ecological and evolutionary principles to the conservation of biodiversity
- be able to recognize and to classify signature species of local ecosystems and representative species from all branches of the tree of life
- know where to find major biomes and signature species locally and on planet earth
- acquire hands-on familiarity with the population genetics of small populations, population viability analysis (PVA), and the definition and recognition of evolutionarily significant units (ESUs)
- understand the pros and cons of contemporary species concepts, and how each affects the success of the U.S. Endangered Species Act (ESA).
- know what has caused extinction of biological lineages and depauuperization of local ecosystems in the past and how this informs an action plan for the present
- consider the ethical dimensions of human-caused extinction of other species, and practice making ethical arguments against extinction and the depauuperization of ecosystems
- understand the political dimensions of conservation and the inadequacy of purely technical solutions to conservation problems

Additional, more rigorous Student Learning Outcomes for graduate students in this cross-listed course:

Environmental Studies graduate students demonstrate a comprehension of environmental issues beyond general knowledge and understanding by:
- Obtaining, explaining, and applying scholarly information related to environmental issues
- Integrating facts, concepts, and methods from multiple disciplines
- Effectively communicating environmental facts, concepts, and methods
- Analyzing and synthesizing environmental facts, concepts, and methods to design and evaluate strategies, technologies, and methods to solve problems
- Demonstrating leadership in the classroom in both discussion and group projects

Course Structure: Different people learn in different ways. This course features a variety of learning activities to achieve redundancy, and hence success, in transmitting the core values and information of Conservation Biology from the academic establishment to the students.

Lecture: Lecture periods are thrice a week for 50 minutes each. Lectures will cover the basics of macro-evolution, ecology, and population genetics, as well as the applications of these fields to understanding the problems of populations and ecosystems at risk. In
addition, conservation ethics, economics, and policy will be summarized. Two high-weight exams will encourage students to make the most of lecture.

*Lowcountry Natural History:* There is no substitute for knowing and being able to name the species we are trying to save. We are blessed to have a wide variety of biomes, both terrestrial and aquatic, within a short distance of Charleston. They include currently endangered species, and they recently included others that are now extinct. Others flourish, so the whole spectrum is here. All students at the 400 or higher level in the CofC Biology department should already be well acquainted with these species and ecosystems; for those who are not, it is now time to catch up. Accordingly, a list of approximately 200 species and ecosystems that every local Conservation Biologist should know will be provided to all students in this course, along with access to slide shows that introduce them and provide recognition cues. Because graduate students are expected to already be accomplished naturalists, the credit value of this item will be less than for the undergraduates.

*World Geography:* The central problem of Conservation Biology is extinction. Extinction is not just a temporal phenomenon, the end for all time of a phylogenetic lineage. It is also a spatial phenomenon: the local extinction of a species changes ecosystem structure and thereby ecosystem function. Should Conservation Biology be more concerned with the functioning of local ecosystems and their utility to people, or with the pruning and wholesale destruction of branches of the phylogenetic tree, as has occurred five times previously in the history of life. To fully comprehend the natural and unnatural phenomena that Conservation Biology covers, we must know the geography of planet earth, both present and past, as reflected in maps. Accordingly, a list of approximately 100 physical features of Charleston County, South Carolina, the United States, and the world that every local Conservation Biologist should know will be provided to all students in this course, along with access to materials that introduce them and provide recognition cues. Because graduate students are presumably committed to a career in conservation or ecology, they are expected to have learned world geography during their undergraduate careers. Accordingly, the credit value of this item will be less than for the undergraduates.

*Book Report:* Each student will read and report (5 pp., double-spaced) on a popular book on any subject related to conservation of wild nature. The objective is a good read that amplifies the student’s knowledge, understanding, and sympathy for the living world. The book must be at least 200 pages in length. Full instructions for the report will be provided on OAKS. That document contains a list of books that may be read without prior approval. If you want to read one of the many other books that are relevant, email the instructor for approval. The finished report is due October 26, 2015, at 5 PM. All written assignments will be submitted electronically to a dropbox on OAKS.

*Before and after Essay.* Each student will write two 5 page (digital, double-spaced) essays on your vision for the optimal distribution of biodiversity on Planet Earth. The Before Essay will be due at 5 PM, September 7, 2015, and will reveal your vision going into the course. The After Essay will be due no later than 12 Noon on December 15, 2015, and should be a re-assessment of your vision after having taken the course. There is no correct
answer, but resubmitting the before essay is not a wise gambit. The grade on both the Before and After versions of the essay will be based on the thoughtfulness, ingenuity, and artfulness of your exposition.

**Term Paper:** A 10 to 20-page (double-spaced) term paper on a subject of interest to the student will be due at the end of the semester. Each student must submit to the instructor a 1-page (more or less) proposal for the term paper subject by the end of September. The quality of this proposal will be incorporated in the midterm grade for the course. Every student, and especially graduate students, should strive to make this paper publishable in the peer-reviewed scientific literature. Check the Commentaries in *Conservation Biology* for examples of how an idea and a literature review can advance the field. A couple of examples of topics: “Signature sounds in animals and their uses for monitoring.” “Do ‘culturally significant units’ exist, and do they deserve conservation attention?” While these sound like opinion pieces, they could not succeed without thorough literature review. Grad students are encouraged to select topics that advance their research programs.

**Grant Proposal:** Each student taking the course at the 600-level credit will produce a grant proposal by the end of the semester. Ideally, this will be a real proposal that is actually submitted to a funding source. For that reason, the requirements for this assignment will be flexible enough for the proposal to comply with guidelines of the funding entity. An annotated list of funding sources will be due by mid-semester. Each 600-level student should consult with the instructor early in the semester about the need and potential for funding, and shortly after submission of the annotated list about completing the assignment.

**Exams:** There will be two exams, one near the middle of the semester that will figure importantly into the midterm grade, which is unofficial and advisory. The other will be taken at the scheduled time for the final exam. Each exam will include some 30 multiple choice questions, which will be very specific and objectively graded. One multiple choice question will cover the material presented in each chapter of assigned reading in the three assigned books. Each exam will also include several short answer and essay questions that will cover major topics covered in lecture. Sample questions of both types will be provided to students. The first exam will include material from Kolbert and reading assignments from the text, while Marris and the rest of the text will be covered in the second exam.

**Required Reading:** *The Sixth Extinction*, by Elizabeth Kolbert, MacMillan; *The Rambunctious Garden*, by Emma Marris, Bloomsbury USA.

**Required Text:** *Principles of Conservation Biology, 3rd edition*. Croom, Meffe, and Carroll, Sinauer Associates. This text is unfortunately a little out of date, but it is comprehensive and a must for advanced study. Its many essays introduce the beginning professional to many of the major contributors to the field, and chapters drill deeply into the major themes of conservation biology.

**Prerequisites:** Biology 111, 112, 211, 305, 341
COURSE POLICIES

Communication – Students are responsible for knowing and complying with all announcements made by the instructor during the regularly scheduled hours of Lecture. Additionally, documents needed for completing required (and optional) work will be available on OAKS. Check OAKS frequently for newly uploaded or recently revised documents. Finally, the instructor will send emails to the entire class as needed to inform students of changes of schedule, interesting seminars, materials needed for class, etc. It’s a good idea to check your cofc email shortly before each class.

Lecture – You are expected to attend every lecture. If you must be absent, please inform the instructor in advance and visit him during office hours if you have any questions about the lecture you missed.

Exams – If you know in advance of an unavoidable conflict with a scheduled exam, talk to the instructor about it during the first two weeks of the semester. Scheduled exams that are missed without prior permission cannot be made up except in the case of a true medical emergency suffered on the day of the exam. SNAP students are requested to make arrangements with the instructor well in advance of exams.

ACADEMIC INTEGRITY

Academic integrity is important to the College of Charleston community. In addition, this course asks you to perform tasks like a professional biologist, and you will be required to uphold the standards of integrity expected in the profession. Plagiarism, lying, cheating or attempted cheating are violations of the College’s honor code and will be dealt with accordingly. Please be absolutely sure that you understand what the honor code requires of you (refer to pages 10-12 of the student handbook, http://cofc.edu/generaldocuments/handbook.pdf). If you have any questions or concerns about honor code expectations or about how to avoid violations, please consult with the instructor.

Any honor code violations that occur will be handled as outlined in the student handbook.

(a) For lesser or unintentional offenses, the student will be asked to sign a form acknowledging an understanding of the mistake. This form will be kept on file by the Dean of Students, and a second such violation will automatically result in an honor court hearing.

(b) More serious cases of suspected academic dishonesty will be reported to the Dean of Students and forwarded to the honor board. Severe punishments are mandatory if found in violation of the honor code, including an XF for the course, a mark that indicates failure due to academic dishonesty.

Plagiarism: Plagiarism is any use of words or ideas produced by another person without proper attribution, and includes failing to paraphrase adequately or to cite sources properly. Whether intentional or unintentional, plagiarism is forbidden by the honor code. Please
consult the instructor if you have any questions or concerns about how to use and cite sources.

Re-using work: Please be aware that re-submitting work that you or anyone else has done for this or any other class or project is a violation of the honor code, even if the work is revised. On the other hand, graduate students are urged to use the term paper and grant proposal required for this course to further their research programs, and this will undoubtedly lead to some redundancy. Consult the instructor for guidance.

**Assessment**

Your grade in this course will be based on the components shown below. These components will be worth the following percentages of your final grade:

### Biology 629 and Environmental Studies 629 (graduate students)

<table>
<thead>
<tr>
<th>Course component</th>
<th>% of grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowcountry Natural History</td>
<td>05%</td>
</tr>
<tr>
<td>Book Report</td>
<td>10%</td>
</tr>
<tr>
<td>Essay</td>
<td>10%</td>
</tr>
<tr>
<td>Map Sense</td>
<td>05%</td>
</tr>
<tr>
<td>Term Paper</td>
<td>20%</td>
</tr>
<tr>
<td>MidTerm Exam</td>
<td>20%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>20%</td>
</tr>
<tr>
<td>Proposal</td>
<td>10%</td>
</tr>
</tbody>
</table>

**Total**

100%

**Grading policy –**

A: 93 -100%

B+: 87 - 92%

B: 80 - 86%

C+: 77 - 79%

C: 70 - 77%

F: 0 - 69%
Contact Name: Timothy Callahan

Email: CallahanT@cofc.edu Phone: 953-8278

Department/Program: Environmental Studies School: Graduate School

Catalog Year in Which Change Will Take Effect: 2016-2017

Does this proposal include:
- ☑ Course title change*
- ☑ Course number change*
- ☐ Course description change*
- ☑ Undergraduate/Graduate cross-listing

*complete Existing Course/New Course Information

A. If you are proposing to cross-list two existing courses at the same level, list the courses (acronym, title, number, course description) and provide a reason for cross-listing.

B. If you are proposing to cross-list an existing undergraduate course with an existing graduate course, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach a syllabus (or separate syllabi) that clearly indicates student learning outcomes, assignments, and rigor appropriate for each level.

C. If you are proposing to cross-list an existing course with a new course at the same level, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach the appropriate new course proposal form.

D. If you are proposing to cross-list an existing course with a new course at a different level, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach the appropriate new course proposal form(s). Also attach a syllabus (or separate syllabi) that clearly indicates student learning outcomes, assignments, and rigor appropriate for each level.
**Proposed Cross-listed Courses**

*course acronyms, numbers, titles, and descriptions*

Pollution in the Environment: GEOL 441, EVSS 631
Pollution in the Environment Lab: GEOL 441L, EVSS 631L

Course focuses on theoretical and quantitative skills required to assess how natural and anthropogenic factors influence pollutant behavior in Earth's near-surface environments, including fresh water and soils. Laboratory focuses on assessing pollutants in various environmental media using appropriate analytical techniques.

**Reason for Cross-listing**

This course is offered for both undergraduate and graduate students. There is sufficient overlap in the topics covered that sharing resources makes sense. However, there is a distinct difference in assignments and expectations that allows different learning outcomes to be obtainable. Topics covered in Pollution in the Environment are beneficial for upper level undergraduate students pursuing a degree in Geology, and at the same time, are beneficial for graduate students pursuing a thesis or internship in a related field.

Please see attached syllabi for specific learning objectives.

**Changes to Existing Course Numbers/Titles/Descriptions**

Existing Course:

EVSS 631, EVSS 631L

Proposed Course Change:

EVSS 541, EVSS 541L

No changes to course title or description.
Pollution in the Environment

Fall 2015 Syllabus

Instructor: Dr. Vijay M. Vulava

1 Contact Information

Office: SSMB 250, MF 13:30-16:00 h (or by appoint.)
Lecture: SSMB 253, MWF 12:00-12:50 h
Laboratory: SSMB 241, W 14:00-17:00 h
Phone: 843.608.9628
Email: vulavav@cofc.edu
Lectures, readings, & links: “OAKS” on http://my.cofc.edu/

2 Course Goals and Structure

This course focuses on theoretical skills required to understand how natural and anthropogenic factors influence pollutant behavior on Earth’s near-surface environments. While we primarily focus on fresh water (i.e. streams, lakes, and groundwater) and shallow geological environments (soils and sediments), this year Dr. Ian Runsey of the Physics Department will introduce atmospheric pollution concepts as well.

Since this may be the only environmental chemistry-themed course you may take at the College, it is a broad survey course and will cover a lot of topics. Paradoxically, you will find that "environmental pollution" is so broad, that we barely touched a fraction of all aspects of this topic in this course. You will, however, have the opportunity to pursue and research topics related to pollution in detail on your own over the course of this class. Some examples of case studies/topics that are covered are shown in Figure 1. Depending on your interests more cases could be studied.

This course will take a quantitative approach to understanding environmental pollution issues. Over the course of the semester, you will also be introduced to tools such as (i) PHREEQC, a very powerful hydrogeochemical modeling tool (http://www.cr.usgs.gov/projects/GWC_coupled/phreeqc/), (ii) Visual MINTEQ, a visual chemical equilibrium model (http://www2.lwr.kth.se/English/OurSoftware/VMINTEQ/), (iii) Wolfram Alpha, a very powerful visual mathematics programming language (http://www.wolframalpha.com/), (iv) Excel, to solve and visualize equilibrium chemical problems, (v) \LaTeX 2e, an intelligent and very powerful scientific text-typesetting program (http://latex-project.org/).

Some of you may be uncomfortable with your math, chemistry, and/or geology background – I assure you that most of you are in the same boat. Just be open to learning lots of new concepts and don’t stress out – environmental chemistry and sciences are more fun than you can imagine!

Unlike most other science courses you have in Geology or other science classes, this course is a bit different in two regards:

1. A case study approach: The traditional approach of top-down incremental knowledge approach seems too contrived for this kind of a class. Instead, this class takes an unstructured case study approach to understanding environmental pollution issues. This approach will help you focus on the “big picture” and develop a context for using basic science concepts to understand how environments work. As you try to unravel specific environmental pollution issues, you will learn core science skills necessary to understand and predict outcomes in similar situations. Since this is a significantly different approach than what you probably see in other classes, I expect all of you to fully participate and give me periodic feedback on
what is working and what isn't. I will gratefully accept and welcome all comments (positive and negative) and will attempt to incorporate any changes necessary to make your learning experience successful. I expect you to be a full partner in this course.

2. **No Examinations**: One of the main goals of this course is to enhance your understanding of environmental pollution issues and be able to both qualitatively and quantitatively predict various outcomes. This requires critical thought and practice in both group settings and in individual settings. A traditional way to test your understanding is to have an exam and test your competence, but this is not the best approach for this course. Hence, there will be no exams (or a final exam) in this class, instead, there will be group and solo problem-solving activities and assignments. There will be several collaborative opportunities in this class on research and problem-solving activities.

For the laboratory component of this course, attendance is mandatory as these labs are hard to make up if missed (some of these are field trips.) The first half of the semester, you will learn basic environmental analytical techniques and familiarize yourselves with advanced instrumentation available in my lab. You will hand in brief reports (up to 1500 words including figures and data tables) that contain critical analysis of the experiments conducted. The second half of the semester will focus on your lab-based project. Upon completion of this project, you will turn in a 4000-word
research paper (including references, figures, and tables.)

There will be 2-3 field trips during the semester that may require more than the allocated class time. Hence, plan on spending 3-4 h during two weekends (if class-time field trip is not possible) to attend these field trips. Two of these trips will focus on conducting water quality surveys in Filbin Creek, North Charleston and another to Shem Creek in Mt. Pleasant. If you have other ideas for potential field trips, let me know in advance. On these trips you will have hands-on opportunities to learn about techniques that are used to assess basic environmental parameters in the field.

Since this class is about the environment and ultimately related to sustainable practices, we’ll limit use of paper as much as possible. Upload all your assignments and project reports in MS Word (PC format) or PDF format to OAKS. I encourage you to learn how to use the free $\LaTeX$ software to create your documents. This software allows you to easily typeset complex equations, tables, figures, tables of content, bibliography, etc. while you focus on content of your document. $\LaTeX$ is free and is available for PC, Mac, and Linux platforms (http://latex-project.org/). If you bring your laptop, I can help you setup the software. I can also show you how to create simple $\LaTeX$ documents.

3 Learning Outcomes:

On successful completion of this course, you will:

1. develop a solid understanding of environmental processes and pollutant behavior in the environment,
2. develop the requisite skills to apply you theoretical knowledge to solve environmental problems,
3. know how to make quantitative predictions about outcomes of chemical reactions that occur in context of geological processes, and
4. be able to work in small teams and effectively present research results in both written and oral formats.

4 Prerequisites

This course is designed for students that have had a two-course sequence of chemistry (CHEM 111 and 112) and college level introductory math courses. Students that are deficient can also do well in this course, provided they spend additional time getting up to speed with basic principles. Simple arithmetic is used throughout this class (logarithms, manipulating and solving simultaneous equations, etc.), so if you’re out of practice, either look up basic math (Math 101/102) textbooks or come and see me if you need additional help.

5 Textbooks

There is no required textbook for this class. All required readings will come from journal articles, textbook chapters, and other sources. These readings or links to sources will be made available as PDFs on OAKS.


Required Reading for Class: M. Davis and S. Masten. 2013. Principles of Environmental Engineering & Science. Chapters from this book will be posted on OAKS.


Reference Text: W. Stumm and J.J. Morgan. 1996. Aquatic Chemistry (Paperback), 3rd Ed., 1040 pp., Wiley. The BIBLE of aqueous chemistry - there is no better reference book than this. Includes several practice and worked problems and also in-depth coverage of several topics.


6 Tentative Class Schedule and Deadlines

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</tr>
<tr>
<td>8/31-9/4</td>
<td>Cr contamination</td>
<td>Individual student conference</td>
</tr>
<tr>
<td>9/7-9/11</td>
<td>Chemical concepts</td>
<td></td>
</tr>
<tr>
<td>9/14-9/18</td>
<td>Soils/ groundwater</td>
<td></td>
</tr>
<tr>
<td>9/21-9/25</td>
<td>A Civil Action/ TCE contamination</td>
<td>10/19 - Fall Break</td>
</tr>
<tr>
<td>9/28-10/2</td>
<td>Air Pollution/ Ian Rumsey</td>
<td>10/30, First draft of paper due</td>
</tr>
<tr>
<td>10/5-10/9</td>
<td>Climate change/Ocean acidification</td>
<td>Individual student conference</td>
</tr>
<tr>
<td>10/12-10/16</td>
<td>Research presentations</td>
<td>11/25-27 - Thanksgiving</td>
</tr>
<tr>
<td>10/19-10/23</td>
<td>Research presentations</td>
<td>Last Day of class, Final paper due</td>
</tr>
<tr>
<td>10/26-10/30</td>
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<td>11/2-11/6</td>
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<td>11/9-11/13</td>
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<td>11/16-11/20</td>
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<td>11/23-11/27</td>
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<td>11/30-12/4</td>
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<tr>
<td>12/7</td>
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</tr>
</tbody>
</table>
7 Student Expectations

I expect all of you to have working knowledge of basic sciences (biology, physics, and/or chemistry) and basic math, including algebra. If you feel deficient, you will take the opportunity to brush up on some basics as required. Since you are in a senior-level class, expect to get into a habit of writing papers and making oral presentations in front of peer audiences. Even if your experiences are limited, this course will help you to polish up your writing and presentation skills. You are also expected to participate or lead a group projects or be able to work independently as required. This class is preview of what graduate-level classes will be like.

I don’t expect anyone to fail in this class, but, you need to put in some effort! Class attendance is most important part of this class and you may not do well if you miss classes. All deadlines will be strictly enforced, unless you have a very good excuse (death in family, contagious illness, etc.)

8 Evaluation

You performance in this course will be assessed based on your understanding of basic environmental pollution concepts and the demonstration of your ability to apply this knowledge. This will involve a combination of (i) group problem-solving exercises – you will work in groups or by yourself, (ii) individual problem-solving exercises, (iii) paper and presentation associated with your research projects and case studies, and (iv) laboratory reports.

1. Group (2-3 students) problem-solving exercises will include solving problems and synthesis and interpretation of published data - there will be 6-7 of these - 15% of total grade. Notes: All students in the group get identical grade and hence it is important to work well together. Note that it is not necessary to work in a group, but, it is strongly encouraged. In some cases, I’ll pre-assign groups and all students within the group will work together. I’ll clearly specify if the exercise can be worked as a group assignment.

2. Individual problem-solving exercises include similar problems as above - there will be about 5-6 exercises total - 20% of total grade.

3. Brief, but in-depth, pollution case studies in areas that I do not plan to cover or of specific interest to you. This will be a small group (2-3 students) exercise. Each self-selected group identifies appropriate research papers ahead of time and shares these papers with entire class and then leads a discussion of 15-min each. Two of these exercises over the semester - 10% of total grade (entire group gets same grade.)

4. A 4000-word lab-research paper that is comprehensive and original in scope and takes a good look at specific aspect of a pollution related topic. You may work with another geology student on this project. Come and see me before you create an outline to discuss your topic. Use the journal “Environmental Pollution” as a model for your paper (see http://bit.ly/7y2Wbg for instructions on preparing the project report in a manuscript form) - 30% of total grade. Notes: Grade includes grades for all aspects of the paper, including the outline, the draft, and the final paper. Check course schedule for deadlines. I will provide detailed formatting and grading criteria over the next few weeks.

5. A 15 minute presentation of your project to the class during last week of class - 10% of total grade. Grading rubric will be provided over the last third of the semester.

6. Laboratory reports based on scheduled lab periods (includes partial grade for journal keeping and lab work) - 15% of total grade. Some weekly projects are collaborative efforts, but each of you will synthesize and submit your own reports. Formatting instructions and grading criteria will be provided during first lab period.

Vijay M. Vulava

Updated August 25, 2015
The grade you earn by the end of the semester will be based on this scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93-100</td>
</tr>
<tr>
<td>A−</td>
<td>90-92</td>
</tr>
<tr>
<td>B</td>
<td>83-86</td>
</tr>
<tr>
<td>B−</td>
<td>80-82</td>
</tr>
<tr>
<td>C</td>
<td>73-76</td>
</tr>
<tr>
<td>C−</td>
<td>70-72</td>
</tr>
<tr>
<td>D</td>
<td>63-66</td>
</tr>
<tr>
<td>D−</td>
<td>60-62</td>
</tr>
<tr>
<td>D</td>
<td>57-59</td>
</tr>
<tr>
<td>F</td>
<td>&lt; 50</td>
</tr>
</tbody>
</table>

9 Course Product (or What you will get from this course)

On successful completion of this course, you will be able to
- Critically understand processes related to environmental contamination
- Interpret the behavior of naturally complex environmental systems
- Critically analyze environmental data and explain your findings and conclusions to your peers
- Integrate various basic sciences (chemistry, biology, geology, etc.) and mathematical skills to solve multidisciplinary problems
- Collaboratively develop research projects
- Develop other ancillary skills:
  - Become familiar with journals and technical sources in subject area
  - Become proficient in conducting literature reviews
  - Improve your presentation and science writing skills
  - Learn how to use software (Excel, LaTeX2e, etc.) to analyze, visualize, and present chemical/physical data

10 CofC’s Honor Code and Academic Integrity

Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when identified, are investigated. Each incident will be examined to determine the degree of deception involved.

Incidents where the instructor determines the student’s actions are clearly related more to a misunderstanding will handled by the instructor. A written intervention designed to help prevent the student from repeating the error will be given to the student. The intervention, submitted by form and signed by both the instructor and the student will be forwarded to the Dean of Students and placed in the student’s file.

Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XF in the course, indicating failure of the course due to academic dishonesty. This grade will appear on the student’s transcript for two years after which the student may petition for the X to be expunged. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board.

Students should be aware that unauthorized collaboration—working together without permission—is a form of cheating. Unless the instructor specifies that students can work together on an assignment and/or test, no collaboration is permitted. Other forms of cheating include possessing or using an unauthorized study aid (such as an iPhone or other smartphones), copying from others’ exams, fabricating data, and giving unauthorized assistance.

Research conducted and/or papers written for other classes cannot be used in whole or in part for any assignment in this class without obtaining prior permission from the instructor.

Pollution in the Environment
Fall 2015 Syllabus
Instructor: Dr. Vijay M. Vulava

1 Contact Information
Office: SSMB 250, MF 13:30-16:00 h (or by appoint.)
Lecture: SSMB 253, MWF 12:00-12:50 h
Laboratory: SSMB 241, W 14:00-17:00 h
Phone: 843.608.9628
Email: vulavav@cofc.edu
Lectures, readings, & links: “OAKS” on http://my.cofc.edu/

2 Course Goals and Structure
This course focuses on theoretical skills required to understand how natural and anthropogenic factors influence pollutant behavior on Earth’s near-surface environments. While we primarily focus on fresh water (i.e. streams, lakes, and groundwater) and shallow geological environments (soils and sediments), this year Dr. Ian Rumsey of the Physics Department will introduce atmospheric pollution concepts as well.

Since this may be the only environmental chemistry-themed course you may take at the College, it is a broad survey course and will cover a lot of topics. Paradoxically, you will find that “environmental pollution” is so broad, that we barely touched a fraction of all aspects of this topic in this course. You will, however, have the opportunity to pursue and research topics related to pollution in detail on your own over the course of this class. Some examples of case studies/topics that could be covered are shown in Figure 1. Depending on your interests more cases could be studied.

This course will take a quantitative approach to understanding environmental pollution issues. Over the course of the semester, you will also be introduced to tools such as (i) PHREEQC, a very powerful geochemical modeling tool (http://www.brr.cr.usgs.gov/projects/GWC.coupled/phreeqc/), (ii) Visual MINTEQ, a visual chemical equilibrium model (http://www2.lwr.kth.se/English/OurSoftware/vminteq/), (iii) Wolfram Alpha, a very powerful visual mathematics programming language (http://www.wolframalpha.com/), (iv) Excel, to solve and visualize equilibrium chemical problems, (v) \LaTeX, an intelligent and very powerful scientific text-typesetting program (http://latex-project.org/).

Some of you may be uncomfortable with your math, chemistry, and/or geology background - I assure you that most of you are in the same boat. Just be open to learning lots of new concepts and don’t stress out - environmental chemistry and sciences are more fun than you can imagine!

Unlike most other science courses you have in Environmental Studies and Geology this course is a bit different in two regards:

1. A **case study approach**: The traditional approach of top-down incremental knowledge approach seems too contrived for this kind of a class. Instead, this class takes an unstructured case study approach to understanding environmental pollution issues. This approach will help you focus on the “big picture” and develop a context for using basic science concepts to understand how environments work. As you try to unravel specific environmental pollution issues, you will learn core science skills necessary to understand and predict outcomes in similar situations. Since this is a significantly different approach than what you probably
see in other classes, I expect all of you to fully participate and give me periodic feedback on what is working and what isn’t. I will gratefully accept and welcome all comments (positive and negative) and will attempt to incorporate any changes necessary to make your learning experience successful. I expect you to be a full partner in this course.

2. **No examinations:** One of the main goals of this course is to enhance your understanding of environmental pollution issues and be able to both qualitatively and quantitatively predict various outcomes. This requires critical thought and practice in both group settings and in individual settings. A traditional way to test your understanding is to have an exam and test your competence, but this is not the best approach for this course. Hence, there will be no exams (or a final exam) in this class, instead, there will be group and individual problem-solving activities and assignments. There will be several collaborative opportunities in this class on research and problem-solving activities.

For the laboratory component of this course, attendance is mandatory as these labs are hard to make up if missed (some of these are field trips.) The first half of the semester, you will learn basic environmental analytical techniques and familiarize yourselves with advanced instrumentation available in my lab. You will hand in brief reports (up to 1500 words including figures and data tables) that contain critical analysis of the experiments conducted. The second half of the semester will focus on your lab-based project. Upon completion of this project, you will turn in a 5000-word research paper (including references, figures, and tables.)
There will be 2-3 field trips during the semester that may require more than the allocated class time. Hence, plan on spending 3-4 h during two weekends (if class-time field trip is not possible) to attend these field trips. Two of these trips will focus on conducting water quality surveys in Filbin Creek, North Charleston and another to Shem Creek in Mt. Pleasant. If you have other ideas for potential field trips, let me know in advance. On these trips you will have hands-on opportunities to learn about techniques that are used to assess basic environmental parameters in the field.

Since this class is about the environment and ultimately related to sustainable practices, we’ll limit use of paper as much as possible. Upload all your assignments and project reports in MS Word (PC format) or PDF format to OAKS. I encourage you to learn how to use the free \LaTeX software to create your documents. This software allows you to easily typeset complex equations, tables, figures, tables of content, bibliography, etc. while you focus on content of your document. \LaTeX is free and is available for PC, Mac, and Linux platforms (http://latex-project.org/). If you bring your laptop, I can help you setup the software. I can also show you how to create simple \LaTeX documents.

3 Learning Outcomes:

On successful completion of this course, you will:

1. develop thorough understanding of pollutant behavior in diverse environmental settings,
2. learn how to make quantitative predictions using thermodynamic principles in the context of environmental processes,
3. work independently in theoretical and practical settings and effectively present collected research data in both written and oral formats, and
4. apply knowledge gained in this class to independently design, execute, and present a lab-based research project that explores a practical environmental problem.

Additional, more rigorous Student Learning Outcomes for graduate students in this cross-listed course:

Environmental Studies graduate students demonstrate a comprehension of environmental issues beyond general knowledge and understanding by:

- Obtaining, explaining, and applying scholarly information related to environmental issues
- Integrating facts, concepts, and methods from multiple disciplines
- Effectively communicating environmental facts, concepts, and methods
- Analyzing and synthesizing environmental facts, concepts, and methods to design and evaluate strategies, technologies, and methods to solve problems
- Demonstrating leadership in the classroom in both discussion and group projects

4 Prerequisites

This course is appropriate for students that have had a two-course sequence of chemistry (CHEM 111 and 112) and college level introductory math courses. Students that are deficient can also do well in this course, provided they spend additional time getting up to speed with basic principles. Simple arithmetic and algebra is used throughout this class (logarithms, manipulating and solving simultaneous equations, etc.), so if you’re out of practice, either look up basic math (Math 101/102) textbooks or come and see me if you need additional help.
5 Textbooks & Reference Materials

Below are required/recommended readings for this class. You may borrow any of the books below from me or the CoFC library. Other required readings (reports, journal articles, etc.) will be made available as PDFs on OAKS.

**Required Textbook:** E.R. Weiner. 2013. Applications of Environmental Aquatic Chemistry. 3rd Ed. 588 pp. CRC Press.


**Required Reading for Class:** M. Davis and S. Masten. 2013. Principles of Environmental Engineering & Science. Chapters from this book will be posted on OAKS.

**Reference Text:** R.A. Hites. 2007. Elements of Environmental Chemistry (Paperback), 224 pp., Wiley. Compact introduction to various concepts in environmental chemistry.

**Reference Text:** W. Stumm and J.J. Morgan. 1996. Aquatic Chemistry (Paperback), 3rd Ed., 1040 pp., Wiley. The BIBLE of aqueous chemistry - there is no better reference book than this. Includes several practice and worked problems and also in-depth coverage of several topics.


6 Tentative Class Schedule and Deadlines

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<tr>
<td>9/28-10/2</td>
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<td></td>
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<tr>
<td>10/5-10/9</td>
<td>A Civil Action/ TCE contamination</td>
<td>10/19 - Fall Break</td>
</tr>
<tr>
<td>10/12-10/16</td>
<td></td>
<td>10/30, First draft of paper due</td>
</tr>
<tr>
<td>10/19-10/23</td>
<td></td>
<td>Individual student conference</td>
</tr>
<tr>
<td>10/26-10/30</td>
<td></td>
<td></td>
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<tr>
<td>11/2-11/6</td>
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</tr>
</tbody>
</table>

Vijay M. Vulava  Updated January 19, 2016
7 Student Expectations

I expect all of you to have working knowledge of basic sciences (biology, physics, and/or chemistry) and basic math, including algebra. If you feel deficient, you will take the opportunity to brush up on some basics as required. Since you are in graduate school, I also expect that you have some experience in writing papers and making oral presentations in front of peer audiences. If your experiences are limited, then this is a course that requires you to polish up some skills. You are also expected to participate in lead group projects or be able to work independently as required.

I don’t expect anyone to fail in this class, but, you need to put in some effort! Class attendance is most important part of this class and you may not do well if you miss classes. All deadlines will be strictly enforced, unless you have a very good excuse (death in family, contagious illness, etc.)

8 Evaluation

You performance in this course will be assessed based on your understanding of basic environmental pollution concepts and the demonstration of your ability to apply this knowledge. This will involve a combination of (i) group problem-solving exercises - you will work in groups or by yourself, (ii) individual problem-solving exercises, (iii) paper and presentation associated with your research projects and case studies, and (iv) laboratory reports.

1. Group (2-3 students) problem-solving exercises will include solving problems and synthesis and interpretation of published data - there will be 6-7 of these - 15% of total grade. Notes: All students in the group get identical grade and hence it is important to work well together. Note that it is not necessary to work in a group, but, it is strongly encouraged. In some cases, I’ll pre-assign groups and all students within the group will have to work together. I’ll clearly specify if the exercise can be worked as a group assignment.

2. Individual problem-solving exercises include similar problems as above - there will be about 5-6 exercises total - 20% of total grade.

3. Brief, but in-depth, pollution case studies in areas that I do not plan to cover or of specific interest to you. This will be a small group (2-3 students) exercise. Each self-selected group identifies appropriate research papers ahead of time and shares these papers with entire class and then leads a discussion of 15-min each. Two of these exercises over the semester - 10% of total grade (entire group gets same grade.)

4. A 5000-word lab-research paper that is comprehensive and original in scope and takes a good look at specific aspect of a pollution related topic. Come and see me before you create an outline to discuss your topic. Use the journal “Environmental Pollution” as a model for your paper (see http://bit.ly/qyZNhg for instructions on preparing the project report in a manuscript form) - 30% of total grade. Notes: Grade includes grades for all aspects of the paper, including the outline, the draft, and the final paper. Check course schedule for deadlines. I will provide detailed formatting and grading criteria over the next few weeks.

5. A 15 minute presentation of your project to the class during last week of class - 10% of total grade. Grading rubric will be provided over the last third of the semester.

6. Laboratory reports based on scheduled lab periods (includes partial grade for journal keeping and lab work) - 15% of total grade. Some weekly projects are collaborative efforts, but each of you will synthesize and submit your own reports. Formatting instructions and grading
criteria will be provided during first lab period.
The grade you earn by the end of the semester will be based on this scale: Excellent (A), Good (B+), Fair (B), Poor (< B)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93-100</td>
</tr>
<tr>
<td>B+</td>
<td>92-87</td>
</tr>
<tr>
<td>C+</td>
<td>80-75</td>
</tr>
<tr>
<td>F</td>
<td>&lt; 70</td>
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<tr>
<td>B</td>
<td>86-81</td>
</tr>
<tr>
<td>C</td>
<td>74-70</td>
</tr>
</tbody>
</table>

9 Course Product (or What you will get from this course)

On successful completion of this course, you will be able to
- Critically understand processes related to environmental contamination
- Interpret the behavior of naturally complex environmental systems
- Critically analyze environmental data and explain your findings and conclusions to your peers
- Integrate various basic sciences (chemistry, biology, geology, etc.) and mathematical skills to solve multidisciplinary problems
- Collaboratively develop research projects
- Develop other ancillary skills:
  - Become familiar with journals and technical sources in subject area
  - Become proficient in conducting literature reviews
  - Improve your presentation and science writing skills
  - Learn how to use software (Excel, PowerPoint, \LaTeX, etc.) to analyze, visualize, and present chemical/physical data

10 CofC’s Honor Code and Academic Integrity

Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when identified, are investigated. Each incident will be examined to determine the degree of deception involved.

Incidents where the instructor determines the student’s actions are clearly related more to a misunderstanding will be handled by the instructor. A written intervention designed to help prevent the student from repeating the error will be given to the student. The intervention, submitted by form and signed by both the instructor and the student will be forwarded to the Dean of Students and placed in the student’s file.

Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XF in the course, indicating failure of the course due to academic dishonesty. This grade will appear on the student’s transcript for two years after which the student may petition for the X to be expunged. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board.

Students should be aware that unauthorized collaboration – working together without permission – is a form of cheating. Unless the instructor specifies that students can work together on an assignment and/or test, no collaboration is permitted. Other forms of cheating include possessing or using an unauthorized study aid (such as an iPhone or other smartphones), copying from others’ exams, fabricating data, and giving unauthorized assistance.

Research conducted and/or papers written for other classes cannot be used in whole or in part for any assignment in this class without obtaining prior permission from the instructor.

Contact Name: Timothy Callahan

Email: CallahanT@cofc.edu  Phone: 953-8278

Department/Program: Environmental Studies  School: Graduate School

Catalog Year in Which Change Will Take Effect: 2016-2017

Does this proposal include:

☐ Course title change*
☐ Course number change*
☐ Course description change*
☒ Undergraduate/Graduate cross-listing
*Complete Existing Course/New Course Information

A. If you are proposing to cross-list two existing courses at the same level, list the courses (acronym, title, number, course description) and provide a reason for cross-listing.

B. If you are proposing to cross-list an existing undergraduate course with an existing graduate course, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach a syllabus (or separate syllabi) that clearly indicates student learning outcomes, assignments, and rigor appropriate for each level.

C. If you are proposing to cross-list an existing course with a new course at the same level, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach the appropriate new course proposal form.

D. If you are proposing to cross-list an existing course with a new course at a different level, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach the appropriate new course proposal form(s). Also attach a syllabus (or separate syllabi) that clearly indicates student learning outcomes, assignments, and rigor appropriate for each level.
**Proposed Cross-listed Courses**
(course acronyms, numbers, titles, and descriptions)

Introduction to Hydrogeology: GEOL 438, EVSS638
Introduction to Hydrogeology Lab: GEOL 438L, EVSS638L

Introduction to quantitative nature of water flow within geologic media. Discuss the significance of water flow theory and the dynamics of many natural flow systems in geologic settings. Quantitative analysis of water resources in a decision-making format. Lectures three hours per week; laboratory three hours per week.

Prerequisites: MATH 120 or 220 or equivalent; or permission of the instructor.

**Reason for Cross-listing**

This course is offered for both undergraduate and graduate students. There is sufficient overlap in the topics covered that sharing resources makes sense. However, there is a distinct difference in assignments and expectations that allows different learning outcomes to be obtainable. Topics covered in Introduction to Hydrogeology are beneficial for upper level undergraduate students pursuing a degree in Geology, and at the same time, are beneficial for graduate students pursuing a thesis or internship in a related field.

Please see attached syllabi for specific learning objectives.

**Changes to Existing Course Numbers/Titles/Descriptions**

Existing Course:

EVSS638, EVSS638L

Proposed Course Change:

EVSS 538, EVSS 538L

No changes to course title or description.
GEOL 438 Hydrology and Lab 4 credits SYLLABUS

Instructor: Timothy Callahan Office: SSMB 252
Phone 953-8278 e-mail: callahant@cofc.edu
Office Hours: Tuesdays and Wednesdays 10:00 – 11:00 AM and by appointment.

Required Textbook


Class Location and Meeting Times
LECTURE: SSMB 253 Tues/Thurs 12:15 – 1:30 PM
LAB: SSMB 253/261 Tues 1:45 – 4:45 PM

Prerequisites
GEOL101 / GEOL101L or GEOL103 / GEOL103L and GEOL105 / GEOL105L and MATH111 or MATH120, or equivalents, or permission of instructor.

Course Plan
• Class periods will include lectures and demonstrations. We will also perform experiments in the laboratory and the field.
• Lectures will cover and expand upon material in the text.
• Homework assignments will be assigned every two weeks or so. You will have at least a week to complete each assignment.

Learning Outcome Goals
• To solve problems dealing with surface water and groundwater flow and pollution.
• To use geology principles and apply groundwater and surface water knowledge to real-world cases.
  ○ Example: evaluate the conditions of different aquifers to interpret their viability and resiliency as a water supply.
• Be able to ask an interesting research question, write a paper on a hydrology or water resources topic, and give an in-class presentation on the topic.

Student Responsibilities [No late work will be accepted without prior arrangement with me.]
• Complete and turn in all assigned homework.
  ○ There will be about 6 homework assignments. Homework is due at beginning of class.
• Complete laboratory projects.
• Complete a research report and present the results to the class.

Ground Rules
• Attend and participate in all classroom meetings. Excessive absence is defined as missing four or more class sessions, whether excused or unexcused. A written warning will be issued after the fourth absence; one additional absence will result in dismissal from the class with a grade of WA (same as an “F”).
• During times of class discussion, you may find that your ideas and opinions may conflict with others in the class, or perhaps your past experiences do not coincide with what is presented during lecture. Please respect each other's viewpoints and treat everyone with courtesy.

• As a College of Charleston student, you have agreed to follow an honor code. You will receive a failing grade for this course if you lie, cheat, steal, or plagiarize. The Honor Board will be notified for further disciplinary action. See last page of syllabus for more information.

• We all know that time spent outside of class is necessary to be successful in any course. My conservative estimate is that you will need to spend six to ten hours per week outside of class completing lab reports, homework, assigned reading, etc.

• **Course auditor:** in order to receive a satisfactory audit credit, you are expected to attend all lectures, read assigned materials, and participate in class discussions.

**Assessment and Evaluation**

Homework: 25%. Laboratory projects: 30%. Research paper and presentation: 20%. Exams: 25%

Grading scale:  
- A: 94 - 100%  
- A−: 90 - 93  
- B+: 87 - 89  
- B−: 80 - 82  
- C+: 77 - 79  
- C−: 70 - 72  
- D+: 67 - 69  
- D−: 60 - 62  
- F: below 60

**Tentative Class Schedule**

Class meets M/W 12:00 – 1:15 PM

<table>
<thead>
<tr>
<th>Topic</th>
<th>Reading in Fitts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>Chapter 1</td>
</tr>
<tr>
<td>Measuring Aquifer Properties</td>
<td>Chapter 2, 5</td>
</tr>
<tr>
<td>Principles of Groundwater</td>
<td>Chapter 3, 6</td>
</tr>
<tr>
<td>Surface Water Hydrology</td>
<td>from Dingman and others (provided)</td>
</tr>
<tr>
<td>Unsaturated Zone Hydrology</td>
<td>Chapter 3; add'l handouts (provided)</td>
</tr>
<tr>
<td>Hydrogeochemistry</td>
<td>Chapter 10</td>
</tr>
<tr>
<td>Geology of Groundwater</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>Water Quality and Water Contamination</td>
<td>Chapter 11</td>
</tr>
<tr>
<td>Hydrology Models</td>
<td>Chapter 7, 8, 9</td>
</tr>
</tbody>
</table>
Research Report and Presentation (20% of class grade)

Identify a research project from the selection of topics below:

- Groundwater aquifer management
- Groundwater and wetlands
- Groundwater resource: future concerns and needs
- Watershed pollution (can include or focus on aquifer resources)
- Water management for agriculture
- Groundwater pollution: assessment or remediation.
- Aquifer storage and recovery

For the project reports, aim for 2,400 – 3,600 (with about 400 words equaling one page, so about 6 – 9 pages). A half-page sized figure or table is equal to 200 words. Be careful about what tables and figures to include. Format the Word document to be 1.5 or double-spaced.

Citation format: Note: primary sources are essentially important!

CBE format, as described in Scientific Style and Format: The CBE Manual for Authors, Editors, and Publishers (6th ed.). 1994. The “References” or “Literature Cited” section at the end of your paper should be in alphabetical order based on the first author’s surname. Citations in the text should include the authors’ surnames and date of publication. See www.lib.washington.edu/help/guides/42cbe.pdf.

Grading Rubric for Project Outline: (1.5% of class grade)  Outline is due FEB. 12 on OAKS

| Clarity of topic and objectives of the research | / 35 |
| Review of existing literature (at least 6 peer-reviewed references) | / 20 |
| Viable projected results supported by proposed methodology | / 30 |
| Writing and grammar; style | / 15 |
| Final Score: | / 100 |

Grading Rubric for Project Rough Draft (5% of class grade)  Rough Draft is due MAR. 18 on OAKS

<p>| Ability to convey main goal/objective/implications | / 20 |
| Background and overview: setting the stage for the study; literature review thoroughness | / 20 |
| Relevance and clear consideration of data collection and analysis methods | / 20 |
| Initial results and interpretation of the findings | / 20 |
| References: Proper and consistent use of citations within the text. | 5 |
| Writing style, grammar; clarity of presentation of information (including figures and tables as appropriate) | / 15 |
| Final Score: | / 100 |</p>
<table>
<thead>
<tr>
<th>Grading Rubric for Project</th>
<th>In-Class Presentation (5% of class grade)</th>
<th>Presentations are APR. 14</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organizational</strong></td>
<td>1: Audience cannot understand presentation; no sequence of information.</td>
<td>2: Audience has difficulty following presentation; presenter jumps around.</td>
</tr>
<tr>
<td><strong>Subject Knowledge</strong></td>
<td>1: Presenter does not have grasp of information; presenter cannot answer questions about subject.</td>
<td>2: Presenter is uncomfortable with information and is able to answer only rudimentary questions.</td>
</tr>
<tr>
<td><strong>Graphics</strong></td>
<td>1: Presenter uses superfluous graphics or no graphics</td>
<td>2: Presenter occasionally uses graphics that rarely support text and presentation.</td>
</tr>
<tr>
<td><strong>Mechanics</strong></td>
<td>1: Presenter's presentation has four or more spelling errors / grammatical errors.</td>
<td>2: Presentation has three misspellings and/or grammatical errors.</td>
</tr>
<tr>
<td><strong>Eye Contact</strong></td>
<td>1: Presenter reads all of report with no eye contact.</td>
<td>2: Presenter occasionally uses eye contact, but still reads most of report.</td>
</tr>
<tr>
<td><strong>Elocution</strong></td>
<td>1: Presenter mumbles, poorly pronounces terms, and speaks too quietly for presenters in the back of class to hear.</td>
<td>2: Presenter's voice is low. Presenter incorrectly pronounces terms. Audience members have difficulty hearing presentation.</td>
</tr>
</tbody>
</table>
### Grading Rubric for Project

**Final Draft (8.5% of class grade)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to convey main goal/objective/implications</td>
<td>20</td>
</tr>
<tr>
<td>Background and overview: setting the stage for the study; literature review thoroughness</td>
<td>20</td>
</tr>
<tr>
<td>Relevance and clear consideration of data collection and analysis methods</td>
<td>15</td>
</tr>
<tr>
<td>Initial results and interpretation of the findings</td>
<td>15</td>
</tr>
<tr>
<td>Writing style, grammar; clarity of presentation of information (including figures and tables as appropriate)</td>
<td>15</td>
</tr>
<tr>
<td>References: Proper and consistent use of citations within the text.</td>
<td>10</td>
</tr>
<tr>
<td>Figures and Tables: Good use of relevant figures and table.</td>
<td>15</td>
</tr>
<tr>
<td><strong>Final Score:</strong></td>
<td>100</td>
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</tbody>
</table>

**Final Draft is due APR. 22**

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**Due Dates for Report Aspects (upload to OAKS dropbox):**

After the first two due dates, I will schedule a 30-minute meeting with each student to discuss the strengths and weaknesses. You should come prepared to take careful notes during these meetings because each subsequent step will include an evaluation of how you responded to the previous comments and corrections.

1. **12 February**  
   **Detailed Outline** (1-2 pages)  
   (1.5% of class grade)
   This requires an initial literature survey (at least 10 journal/book references – NO WEB PAGE REFERENCES). Focus on the what, why, where, how, and what you expect to find.

2. **18 March**  
   **Rough Draft**  
   (5% of class grade)
   Your report should have a clear goal and set of objectives, as well as a hypothesis based on the literature research. The results and discussion can be preliminary at this point but there should be a clear direction of where the project is headed.

3. **14 April**  
   **Presentation**  
   (5% of class grade)
   Presentations will be given to the entire class and should be prepared in the format designed for scientific conferences (8-10-minute presentation).

4. **22 April**  
   **Final Report**  
   (8.5% of class grade)
   The final paper should be 2,400 - 3,600 words, including figures and tables (see note above).
GEOL 438: Hydrology

GEOL 438L HYDROLOGY LABORATORY

Location and Meeting Times
SSMB 253 or 261 Tuesdays 1:45 – 4:45 PM

Objective
Apply theory to practice using physical analogs and computer software programs to demonstrate hydrogeologic processes as discussed in lecture.

Student Responsibilities (in addition to those for the lecture, listed above)

- Attend and participate in all laboratory meetings
- Follow all lab safety requirements; wear lab coats, closed-toed shoes, and long pants.
- Maintain a bound laboratory notebook
- Complete and turn in a report for laboratory assignments. Include copies of your lab notes.
  - Reports are REQUIRED for the topics highlighted below, and are due by the beginning of the lab meeting the following week — upload the report to the OAKS dropbox using the file name pattern: Lastname-LabX.doc.
    - Late reports will not be accepted without prior consent from the instructor.
  - For the other lab projects, tabulation of data and responses to specific questions will be due by the following week.
- Each laboratory exercise will require 2.5 - 3 hours to conduct the experiment and collect the data, and additional time outside of lab to analyze the data and prepare the report.
- For the field projects, we will be back to campus by 4:45 PM at the latest.

Assessment and Evaluation
Same as for the class, listed above.
Laboratory Schedule

Lab meets TUESDAYS from 1:45-4:45 pm, SSMB 253 or 261

The weekly write-up or report is due the week after it is assigned by 11:00 pm on OAKS. For example, the write-up for Lab 1 will be due by 11:00 pm on January 19.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 12</td>
<td>Water Cycle and Water Balance</td>
</tr>
<tr>
<td>2</td>
<td>Jan 19</td>
<td>Groundwater models and porosity</td>
</tr>
<tr>
<td>3</td>
<td>Jan 26</td>
<td>Permeability: sieve analysis, permeameters</td>
</tr>
<tr>
<td>4</td>
<td>Feb 2</td>
<td>Groundwater models: flow and transport *****Report</td>
</tr>
<tr>
<td>5</td>
<td>Feb 9</td>
<td>Groundwater and wells FIELD METHODS</td>
</tr>
<tr>
<td>6</td>
<td>Feb 16</td>
<td>Hydraulic conductivity ***** Report</td>
</tr>
<tr>
<td>7</td>
<td>Feb 23</td>
<td>Storativity of porous media: column tests</td>
</tr>
<tr>
<td>8</td>
<td>Mar 1</td>
<td>Groundwater mapping: FIELD METHODS ***** Report</td>
</tr>
<tr>
<td>9</td>
<td>MARCH 8-</td>
<td>NO LAB: SPRING BREAK</td>
</tr>
<tr>
<td>10</td>
<td>Mar 15</td>
<td>Aquifer characterization: pumping test data analysis</td>
</tr>
<tr>
<td>11</td>
<td>Mar 22</td>
<td>Groundwater geochemistry / contaminant hydrology: chem. evolution</td>
</tr>
<tr>
<td>13</td>
<td>Mar 29</td>
<td>Stream hydrology</td>
</tr>
<tr>
<td>14-15</td>
<td>Apr 5/12</td>
<td>Numerical Modeling ***** Report (due Apr 19)</td>
</tr>
</tbody>
</table>

Write-up details: Provide a brief outline of the procedure (100 - 200 words), a 200 - 400-word listing of the results (table format, and figure(s) as necessary) and a 400-word discussion of the results. One page is about 400 words; a half-page table or figure is 200 words.

Rubric for write-up:

<table>
<thead>
<tr>
<th>NAME</th>
<th>Score</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methods</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Accuracy of Results</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Writing Style and Clarity</td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

Report details: Write an abstract (which covers 'what', 'how', 'why', 'what you found'); briefly of the objective and methods/procedure (300 - 400 words); present the results (table format, and figure(s) as necessary) and a discussion of the results (600 - 800 words). One page is about 400 words; a half-page table or figure is 200 words.

Rubric for reports:

<table>
<thead>
<tr>
<th>NAME</th>
<th>Score</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
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<tr>
<td>Introduction</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Methods</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Results and Discussion</td>
<td></td>
<td>35</td>
</tr>
<tr>
<td>Conclusion</td>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>
The Honor Code, College of Charleston

The Honor Code specifically forbids the following:

1. Lying: knowingly furnishing false information, orally or in writing, including but not limited to deceit or efforts to deceive relating to academic work, to information legitimately sought by an official or employee of the College, and to testimony before individuals authorized to inquire or investigate conduct; lying also includes the fraudulent use of identification cards and fabrication of data, endnotes, footnotes and other information related to academic work.

2. Cheating: the actual giving or receiving of unauthorized, dishonest assistance that might give one student an unfair advantage over another in the performance of any assigned, graded academic work, inside or outside of the classroom, and by any means whatsoever, including but not limited to fraud, duress, deception, theft, talking, making signs, gestures, copying, electronic messaging, photography, unauthorized reuse of previously graded work, unauthorized dual submission, unauthorized collaboration and unauthorized use or possession of study aids, memoranda, books, data, or other information. The term cheating includes engaging in any behavior related to graded academic work specifically prohibited by a faculty member in the course syllabus or class discussion.

3. Attempted cheating: a willful act designed to accomplish cheating, but falling short of that goal.

4. Stealing: the unauthorized taking or appropriating of property from the College or from another member of the college community. Note also that stealing includes unauthorized copying of, and unauthorized access to, computer software.

5. Attempted stealing: a willful act designed to accomplish stealing, but falling short of that goal.

6. Plagiarism:

   6.1. The verbatim repetition, without acknowledgement, of the writings of another author. All significant phrases, clauses, or passages, taken directly from source material must be enclosed in quotation marks and acknowledged either in the text itself and/or in footnotes/endnotes.

   6.2. Borrowing without acknowledging the source.

   6.3. Paraphrasing the thoughts of another writer without acknowledgement.

6.4. Allowing any other person or organization to prepare work which one then submits as his/her own.

7. Penalties (Sanctions) for Violations of the Honor Code

   7.1. XF – Transcript Notation (See Appendix A for full description.)

      a) The grade of “XF” has been added to our grading options at the College. The grade of XF means failure due to academic dishonesty. If a student is found responsible for an act of serious academic dishonesty, the instructor for that course must assign an XF. The XF remains on the student’s official transcript for a minimum of 2 years. After 2 years, the student can petition the Honor Board for removal of the X. The F will remain.

      b) Instructors, with assistance from the Dean of Students if requested, will assess whether the behavior of the student falls into one of three classes:

         Class 1 – act involves significant premeditation; conspiracy and/or intent to deceive, e.g., purchasing a research paper. Penalties: XF and either suspension or expulsion assigned if student found responsible by Honor Board.

         Class 2 – act involves deliberate failure to comply with assignment directions, some conspiracy and/or intent to deceive, e.g., use of the Internet when prohibited, some fabricated endnotes or data, copying several answers from another student’s test. Penalties: XF and other sanctions assigned if student found responsible by Honor Board.

         Class 3 – act mostly due to ignorance, confusion and/or poor communication between instructor and class, e.g., unintentional violation of the class rules on collaboration. Penalties: Student and instructor agree upon the response and forward agreement to the Dean of Students. See “Class 3 Report and Resolution Form” on the Student Affairs, Honor System website.

   7.2. Other penalties for violations of the Honor Code range up to and include expulsion from the College. Other penalties may be combined with the XF. Attempted cheating, attempted stealing, and the knowing possession of stolen property shall be subject to the same punishment as the other offenses. Because the potential penalties for an Honor Code violation are extremely serious, all students should be thoroughly familiar with the above definitions and be guided by them.
CONTRACT

I have read and understand this syllabus.

[Return this page to me by the second week of class.]

NAME: ____________________________

SIGNED: ____________________________
EVSS 638 Hydrogeology SYLLABUS

Instructor: Timothy Callahan

Office: Science Center 337
Phone 953-8278 e-mail: callahant@cofc.edu
Office Hours: Tues 9:30 - 11:00 AM, Thur 2:00 - 3:30 PM and by appointment

Class Web Site

http://www.cofc.edu/~geology/hydro/GEOL438.html

Text


Supplementary additional text


Class Location and Meeting Times

LECTURE: Science Center Room 334 T/Th 12:15 - 1:30 PM
LAB: Sci Ctr Room 341 T 2:00 - 5:00 PM

Prerequisites

GEOL 101 / GEOL 101L or GEOL 103 / GEOL 103L, GEOL 105 / GEOL 105L, and MATH 111 or MATH 120, or equivalents, or permission of instructor

Objectives

- Discuss the basic physical concepts concerning groundwater and surface water.
- Recognize the relationships between geologic materials and water.
- Apply knowledge to decision-making situations regarding water supply and water quality issues.

Additional, more rigorous Student Learning Outcomes for graduate students in this cross-listed course:

Environmental Studies graduate students demonstrate a comprehension of environmental issues beyond general knowledge and understanding by:

- Obtaining, explaining, and applying scholarly information related to environmental issues
- Integrating facts, concepts, and methods from multiple disciplines
- Effectively communicating environmental facts, concepts, and methods
- Analyzing and synthesizing environmental facts, concepts, and methods to design and evaluate strategies, technologies, and methods to solve problems
- Demonstrating leadership in the classroom in both discussion and group projects
Course Plan

- Class periods will include lectures and demonstrations. We will also perform experiments in the laboratory and in the field to further study hydrology concepts.
- Lectures will cover and expand upon material in the text.
- Homework assignments will be assigned every two weeks or so. You will have at least a week to complete each assignment.

Expected Outcomes

- Knowledge of the hydrologic cycle, water budget analysis, and surface water hydrology.
- Knowledge of groundwater processes, hydrogeologic assessment methods, and groundwater as a resource.
- Improvement of quantitative analysis skills.
- Improvement of problem-solving skills.
- Preparation for entry into either the environmental consulting industry or further study in graduate school.

Student Responsibilities

- Complete two exams.
- Complete and turn in all assigned homework.
  - There will be about 5 homework assignments.
  - Homework is due at beginning of the class period. Late homework will not be accepted without prior arrangement with the instructor. (You must contact me ahead of time to receive credit for late work.)
- Complete laboratory projects and a final class/lab project.

Ground Rules

- Attend and participate in all classroom meetings. Excessive absence is defined as missing four or more class sessions, whether excused or unexcused. A written warning will be issued after the fourth absence and one additional absence will result in dismissal from the class with a grade of WA (same as an “F”).
- During times of class discussion, you may find that your ideas and opinions may conflict with others in the class, or perhaps your past experiences do not coincide with what is presented during lecture. Please respect each other’s viewpoints and treat everyone with courtesy.
- As a College of Charleston student, you have agreed to follow an honor code. You will receive a failing grade for this course if you lie, cheat, steal, or plagiarize. The Honor Board will be notified for further disciplinary action. See http://www.cofc.edu/studentaffairs/general_info/honor_system/faq.html for more information.
- We all know that time spent outside of class is necessary to be successful in any course. My conservative estimate is that you will need to spend six to ten hours per week outside of class completing lab reports, homework, assigned reading, etc.
- Course auditors: in order to receive a satisfactory audit credit, you are expected to attend all lectures, read assigned materials, and participate in class discussions.
Assessment and Evaluation

Homework assignments: 15%. Midterm Exam: 20%. Final Exam: 25% Laboratory projects: 20% Research

term paper: 20%. Active class participation is strongly encouraged!

Grading scale:  
A: 90 - 100%  
B: 80 - 85%  
C: 70 - 75%  
B+: 86 - 89%  
C+: 76 - 79%  
F: below 70%

Tentative Class Schedule  
Class meets T/Th 12:15 – 1:30 PM

Topic  
Introduction  
Measuring Aquifer Properties  
Surface Water Hydrology

Principles of Groundwater Flow  
Measuring and Predicting Groundwater Resources

READING IN FETTER

Chapter 1
Chapter 3
Chapter 2; Add'l readings, S.L. Dingman

Chapter 4
Chapter 5

MIDTERM EXAM  
TUESDAY, FEBRUARY 21

Regional Groundwater Flow  
The Geology in Hydrogeology  
Unsaturated Zone Hydrology  
Hydrogeochemistry  
Water Quality and Contaminant Hydrology

Chapter 7
Chapter 8
Chapter 6; Add'l readings, S.L. Dingman
Chapter 9
Chapter 10

FINAL EXAM  
THURSDAY APRIL 27, 12 – 3 pm
Research Reports and Presentations (20% of class grade)
You will select a research topic in hydrology of your choosing (and with my approval) that goes beyond a literature review. That is, I expect to see a component of innovative thought and/or a new approach to an existing research topic. This does not have to be anything grandiose or complex; an example might be using a certain observational or predictive method normally used in certain applications to investigate a new problem in geochemistry. I welcome you to write on a topic relevant to your thesis or internship project, if desired.

Format: the paper should be double-spaced with 1-inch margins. The final report should be no longer than 15 pages (not including figures and tables).

Schedule:
1  9 February  Project Abstract and Proposal (2% of class grade)
   This requires some amount of literature survey (at least 10 journal/book references – NO WEB PAGE REFERENCES). Focus on the what, why, where, how, and what you expect to find.
2  21 March  Rough Draft (5% of class grade)
   Your report should be close to the final product; perhaps you will be collecting results at this point.
3  18, 20 April  Presentations (5% of class grade)
   Presentations will be given to the entire class and should be prepared in the format designed for scientific conferences (15-minute presentation of results, 5-minute question-and-answer period).
4  24 April  Final Report (8% of class grade)
   The final paper shall be no more than 15 pages (not including Figures, Tables, and Appendices).
EVSS638L HYDROGEOLOGY LABORATORY

Class Location and Meeting Times
Science Center Room 341 Tues 2-5 PM

Objective
Apply theory to practice using physical analogs and computer software programs to demonstrate hydrogeologic processes as discussed in lecture. Our ultimate goal this semester is to collect and interpret hydrogeologic data from Dixie Plantation and, as a group, you will prepare an overview report of the hydrogeologic assessment of this site.

Student Responsibilities (in addition to those for the lecture, listed above)

- Attend and participate in all laboratory meetings
- Maintain a bound laboratory notebook
- Complete and turn in a report for each laboratory assignment. Photocopies of pertinent laboratory notes MUST be included with each report. See me for example lab reports from previous years.
  - There will be 10 laboratory exercises and a final lab project.
  - Reports are due at the beginning of the lab meeting on the date it is due. Late lab reports will not be accepted without prior arrangement with instructor. See report-writing details with the Lab 1 handout.
- Each laboratory exercise will require 2.5 - 3 hours to conduct the experiment and collect the data and up to several hours to analyze the data and prepare the report. For the field exercises, we will meet at 12:15 PM and will be back to campus by 6:00 PM at the latest.

Assessment and Evaluation
Same as for the class, listed above.

Tentative Laboratory Schedule

<table>
<thead>
<tr>
<th>Lab</th>
<th>Date</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab 1</td>
<td>Jan. 17</td>
<td>due Jan. 25</td>
</tr>
<tr>
<td>Lab 2</td>
<td>Jan. 24</td>
<td>due Jan. 31</td>
</tr>
<tr>
<td>Lab 3</td>
<td>Feb. 7</td>
<td>due Feb. 14</td>
</tr>
<tr>
<td>Lab 4</td>
<td>Feb. 14</td>
<td>due Feb. 21</td>
</tr>
<tr>
<td>Lab 5</td>
<td>Feb. 21</td>
<td>due Feb. 28</td>
</tr>
</tbody>
</table>

**MARCH 6-10**

- **SPRING BREAK**

| Lab 6  | Mar. 14| due Mar. 21|
| Lab 7  | Mar. 21| due Mar. 28|
| Lab 8  | Mar. 28| due Apr. 4|
| Lab 9  | Apr. 4 | due Apr. 11|
| Lab 10 | Apr 11 | due Fri. Apr. 21|

Lab meets Tuesdays 2-5 PM

Surface Water/Groundwater Field Methods
Physical Model of Groundwater
Grain Size Analysis and Permeability of Sediments
Hydraulic Conductivity and Storativity of Porous Media
Interpreting Well Hydraulic Data
Well Testing Field Methods
Analysis of Well Testing Data
Groundwater Geochemistry / Contaminant Hydrology
Groundwater Modeling of Dixie Plantation
Summary Hydrogeology Project
Contact Name  Timothy Callahan
Email  CallahanT@cofc.edu  Phone  953-8278

Department/Program  Environmental Studies  School  Graduate School

Catalog Year in Which Change Will Take Effect  2016-2017

Does this proposal include:  
☐ Course title change*  
☑ Course number change*  
☐ Course description change*  
☑ Undergraduate/Graduate cross-listing
*complete Existing Course/New Course Information

A. If you are proposing to cross-list two existing courses at the same level, list the courses (acronym, title, number, course description) and provide a reason for cross-listing.

B. If you are proposing to cross-list an existing undergraduate course with an existing graduate course, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach a syllabus (or separate syllabi) that clearly indicates student learning outcomes, assignments, and rigor appropriate for each level.

C. If you are proposing to cross-list an existing course with a new course at the same level, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach the appropriate new course proposal form.

D. If you are proposing to cross-list an existing course with a new course at a different level, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach the appropriate new course proposal form(s). Also attach a syllabus (or separate syllabi) that clearly indicates student learning outcomes, assignments, and rigor appropriate for each level.
**Proposed Cross-listed Courses**
(courses acronyms, numbers, titles, and descriptions)

<table>
<thead>
<tr>
<th>Course</th>
<th>Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fundamentals of Remote Sensing: GEOL 442</td>
<td>EVSS 642</td>
</tr>
<tr>
<td>Fundamentals of Remote Sensing Lab: GEOL 442L</td>
<td>EVSS 642L</td>
</tr>
</tbody>
</table>

Course includes fundamentals of remote sensing and digital image processing for applications in earth and environmental sciences, including concepts of electromagnetic radiation, satellite image data collection, reduction and application, software tools, data acquisition, and ground truthing.

Lectures: three hours per week; laboratory: three hours per week.
Prerequisite: Graduate standing or permission of the instructor

**Reason for Cross-listing**

This course is offered for both undergraduate and graduate students. There is sufficient overlap in the topics covered that sharing resources makes sense. However, there is a distinct difference in assignments and expectations that allows different learning outcomes to be obtainable. Topics covered in Fundamentals of Remote Sensing are beneficial for upper level undergraduate students pursuing a degree in Geology, and at the same time, are beneficial for graduate students pursuing a thesis or internship in a related field.

Please see attached syllabi for specific learning objectives.

**Changes to Existing Course Numbers/Titles/Descriptions**

Existing Course:
EVSS 642, EVSS 642L

Proposed Course Change:
EVSS 542, EVSS 542L

No changes to course title or description.
Syllabus – Spring 2015
GEOL 442: Fundamentals of Remote Sensing

- 4 credits
- SSMB room 255
- Class/Lab hours: Monday and Wednesday 12:00 p.m. – 3:00 p.m.
- Dr. John Chadwick
- Office: room 244 (office hrs M 9 – 11, T 11–12, W 10-11 or appointment)
- Email: chadwickj@cofc.edu

Course Goals and Learning Outcomes:

➢ Review fundamental concepts and jargon of remote sensing.
➢ Review the basics of the electromagnetic spectrum and how it is used in remote sensing.
➢ Demonstrate how remote sensors work to map and monitor the surface of the Earth.
➢ Apply knowledge of digital imagery and to manipulate and interpret digital images through image processing techniques using ENVI software.
➢ Discuss the current state of knowledge in remote sensing, the advantages and limitations of the technology, and recent developments.
➢ Demonstrate how remote sensing is integrated with other geo-technologies (GIS and GPS).
➢ Discuss a variety of applications of these technologies, especially for geological and environmental studies.

Course letter grades: A: 93-100%, A-: 90-93%, B+: 87-89%, B: 83-87%, B -: 80-83%, etc.

Labs/homework assignments/quizzes/small projects/attendance: 20%
Three exams (20% each): 60%
Final project presentations and written report: 20%

Prerequisites: Geology 101/103 & 105 or permission of instructor.

REQUIRED TEXTBOOK: None! You should invest in an external drive/thumb drive of at least 4 Gb for class data storage.

ATTENDANCE is very important if you want to learn the material for this class and keep up. You are expected to attend every class. Make-up exams will be allowed only in the event of excused absence (documented sickness or injury, official College travel, family emergency) and only if you contact me within 24 hours of the missed exam (email address above). An absence memo from the College is required for an absence to be excused. You must make up a missed exam as soon as possible and you will need an absence memo for each day that you do not take the exam after its scheduled date.
TAKE NOTES: This is an essential skill for success in this class as well as in your career. Daily quizzes will be "open notes," so it's a good idea to write down the important material that we discuss in class. Remember: the most important (and testable) ideas will not only be on the slides and in readings. Often, the things we discuss about the slides are the most vital things to put in your notes. It's a great idea to take notes when you are reading book chapters and articles as well.

CLASSROOM BEHAVIOR: Please come to class on time, and be considerate of your classmates and your professor and turn off your phone before class. You must respect the rights of other students to learn, and the professor to teach, without undue distraction. Turn off your phone and come to class on time. Please be respectful of everyone in the classroom and understand that everyone has the right to learn in a non-threatening and non-distracting environment. Texting, talking, websurfing, taking calls, playing games etc. are distracting to those around you and to me. Calling you out on it is time-consuming and makes me very grumpy. There will be retribution in the form of not allowing you to have your computer or cell phone in class at all.

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STUDENTS WITH DISABILITIES: Our program is committed to all students achieving their potential. If you have a disability that requires a reasonable accommodation please contact SNAP services (http://disabilityservices.cofc.edu/). Please present your Professor Notification Letter to me within the first two weeks of class. If you wish, you can speak to me in private about your needed accommodation before or after class or during my office hours.

CENTER FOR STUDENT LEARNING: We encourage you to use the Center for Student Learning's (CSL) academic support services for assistance in study strategies and course content. They offer tutoring, supplemental instruction, study skills appointments, and workshops. Students of all abilities have become more successful using these programs throughout their academic career and the services are available to you at no additional cost. For more information regarding these services please visit the CSL website at http://csl.cofc.edu or call (843)953-5635.

MES Students: As this is a combined graduate and undergraduate class, graduate students will be required to read some additional course materials, answer additional test questions, and work on a more challenging final project than undergraduates. Details given in class.

If you need help or have issues, talk to me! Or talk to Alex (the Awesome TA) who will talk to me. We will sort it out. But don't wait until the end of the semester to ask how to deal with stuff.
### Schedule: Spring 2015 (modifications to the schedule are possible & will be announced in class)

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Homework /Project /Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>January 12</td>
<td>Welcome and Introduction to Remote Sensing</td>
<td>Get a job</td>
</tr>
<tr>
<td>1</td>
<td>January 14</td>
<td>Electromagnetic Spectrum</td>
<td>Wavelength conversions</td>
</tr>
<tr>
<td>2</td>
<td>January 19</td>
<td>Martin Luther King Day; no class today</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>January 21</td>
<td>Aerial photographs and digital data, platforms and data types, raster vs. vector</td>
<td>Pixel “field trip”</td>
</tr>
<tr>
<td>3</td>
<td>January 26</td>
<td>Multispectral data: Pixels and bands and images</td>
<td>Multispectral poster lab</td>
</tr>
<tr>
<td>3</td>
<td>January 28</td>
<td>Four types of resolution, J-Track</td>
<td>Binary data and resolution class/homework</td>
</tr>
<tr>
<td>4</td>
<td>February 2</td>
<td>Multispectral Remote Sensing, Digital image processing; radiometric issues</td>
<td>Intro ENVI Lab</td>
</tr>
<tr>
<td>4</td>
<td>February 4</td>
<td>Multispectral Remote Sensing, Digital image processing; radiometric issues</td>
<td>Multispectral ENVI lab</td>
</tr>
<tr>
<td>5</td>
<td>February 9</td>
<td>Review for exam #1</td>
<td>Multispectral ENVI lab</td>
</tr>
<tr>
<td>5</td>
<td>February 11</td>
<td>Exam #1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>February 16</td>
<td>Hyperspectral Remote Sensing</td>
<td>ENVI Lab</td>
</tr>
<tr>
<td>6</td>
<td>February 18</td>
<td>Thermal IR Remote Sensing</td>
<td>Sensor “adoptions”</td>
</tr>
<tr>
<td>7</td>
<td>February 23</td>
<td>Microwave RS, Synthetic Aperture Radar</td>
<td>ENVI Lab</td>
</tr>
<tr>
<td>7</td>
<td>February 25</td>
<td>DEMs: lidar, photogrammetry, InSAR</td>
<td>ENVI Lab</td>
</tr>
<tr>
<td>8</td>
<td>March 2</td>
<td>SPRING BREAK</td>
<td>Chill Out</td>
</tr>
<tr>
<td>8</td>
<td>March 4</td>
<td>SPRING BREAK</td>
<td>Chill Out</td>
</tr>
<tr>
<td>9</td>
<td>March 9</td>
<td>Digital image processing: geometric issues</td>
<td>ENVI Lab</td>
</tr>
<tr>
<td>9</td>
<td>March 11</td>
<td>Geometric corrections, projections, datums, coordinate systems</td>
<td>Work on sensors presentation and report, projections vid</td>
</tr>
<tr>
<td>10</td>
<td>March 16</td>
<td>sensors presentations</td>
<td>Sensor’s reports due today</td>
</tr>
<tr>
<td>10</td>
<td>March 18</td>
<td>Exam #2</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>March 23</td>
<td>Introduction to final project, Field Work: Ground Truth, GPS</td>
<td>GPS “field trip”</td>
</tr>
<tr>
<td>11</td>
<td>March 25</td>
<td>FIELD TRIP</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>March 30</td>
<td>More introduction to final project, Image Classification, error matrices</td>
<td>ENVI Lab</td>
</tr>
<tr>
<td>12</td>
<td>April 1</td>
<td>Remote sensing of rocks and soils</td>
<td>ENVI Lab</td>
</tr>
<tr>
<td>13</td>
<td>April 6</td>
<td>Remote sensing of vegetation</td>
<td>Work on final projects</td>
</tr>
<tr>
<td>13</td>
<td>April 8</td>
<td>Remote sensing of water bodies</td>
<td>Work on final projects</td>
</tr>
<tr>
<td>14</td>
<td>April 13</td>
<td>Remote sensing of the atmosphere, radiative transfer, AIRS</td>
<td>Work on final projects</td>
</tr>
<tr>
<td>14</td>
<td>April 15</td>
<td>Remote sensing of urban areas, spy satellites, drones, and espionage</td>
<td>Work on final projects, “Rise of the Drones”</td>
</tr>
<tr>
<td>15</td>
<td>April 20</td>
<td>Planetary science</td>
<td>Work on final projects</td>
</tr>
<tr>
<td>15</td>
<td>April 22</td>
<td>Exam #3</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>April 27</td>
<td>Work on final projects</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Finals Week</td>
<td>FINAL PROJECT PRESENTATIONS</td>
<td>Final Reports due</td>
</tr>
</tbody>
</table>
Syllabus – Spring 2015
EVSS 642: Fundamentals of Remote Sensing

- 4 credits
- SSMB room 255
- Class/Lab hours: Monday and Wednesday 12:00 p.m. – 3:00 p.m.
- Dr. John Chadwick - Office: room 244 (office hrs M 9 – 11, T 11-12, W 10-11 or appointment) - Email: chadwickj@cofc.edu

Learning Outcomes:

- Review the basics of the electromagnetic spectrum and how it is used in remote sensing.
- Demonstrate how remote sensors work to map and monitor the surface of the Earth.
- Apply knowledge of digital imagery and to manipulate and interpret digital images through image processing techniques using ENVI software.
- Discuss the current state of knowledge in remote sensing, the advantages and limitations of the technology, and recent developments.
- Demonstrate how remote sensing is integrated with other geotechnologies (GIS and GPS).
- Discuss a variety of applications of these technologies, especially for geological and environmental studies.
- Apply remote sensing knowledge to an advanced image processing project
- Demonstrate advanced understanding of remote sensing methods via testing, an oral presentation about the project, and research paper.

Course letter grades: A: 93-100%, B+: 86-89%, B: 82-85%, C+: 78-81%, C: 70-77%, F: below 70%

Labs/homework assignments/quizzes/small projects/attendance:
20%
Three exams (20% each): 60%
Final project, oral presentations, and research paper: 20%

Prerequisites: Geology 101/103 & 105 or permission of instructor.

REQUIRED TEXTBOOK: None! You should invest in an external drive/thumb drive of at least 4 Gb for class data storage.

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- Demonstrating leadership in the classroom in both discussion and group projects.
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<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Homework /Project /Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>January 12</td>
<td>Welcome and Introduction to Remote Sensing</td>
<td>Get a job</td>
</tr>
<tr>
<td>1</td>
<td>January 14</td>
<td>Electromagnetic Spectrum</td>
<td>Wavelength conversions</td>
</tr>
<tr>
<td>2</td>
<td>January 19</td>
<td>Martin Luther King Day; no class today</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>January 21</td>
<td>Aerial photographs and digital data, platforms and data types, raster vs. vector</td>
<td>Pixel “field trip”</td>
</tr>
<tr>
<td>3</td>
<td>January 26</td>
<td>Multispectral data: Pixels and bands and images</td>
<td>Multispectral poster lab</td>
</tr>
<tr>
<td>3</td>
<td>January 28</td>
<td>Four types of resolution, J-Track</td>
<td>Binary data and resolution class/homework</td>
</tr>
<tr>
<td>4</td>
<td>February 2</td>
<td>Multispectral Remote Sensing, Digital image processing; radiometric issues</td>
<td>Intro ENVI Lab</td>
</tr>
<tr>
<td>4</td>
<td>February 4</td>
<td>Multispectral Remote Sensing, Digital image processing; radiometric issues</td>
<td>Multispectral ENVI lab</td>
</tr>
<tr>
<td>5</td>
<td>February 9</td>
<td>Review for exam #1</td>
<td>Multispectral ENVI lab</td>
</tr>
<tr>
<td>5</td>
<td>February 11</td>
<td>Exam #1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>February 16</td>
<td>Hyperspectral Remote Sensing</td>
<td>ENVI Lab</td>
</tr>
<tr>
<td>6</td>
<td>February 18</td>
<td>Thermal IR Remote Sensing</td>
<td>Sensor “adoptions”</td>
</tr>
<tr>
<td>7</td>
<td>February 23</td>
<td>Microwave RS, Synthetic Aperture Radar</td>
<td>ENVI Lab</td>
</tr>
<tr>
<td>7</td>
<td>February 25</td>
<td>DEMs: lidar, photogrammetry, InSAR</td>
<td>ENVI Lab</td>
</tr>
<tr>
<td>8</td>
<td>March 2</td>
<td>SPRING BREAK</td>
<td>Chill Out</td>
</tr>
<tr>
<td>8</td>
<td>March 4</td>
<td>SPRING BREAK</td>
<td>Chill Out</td>
</tr>
<tr>
<td>9</td>
<td>March 9</td>
<td>Digital image processing: geometric issues</td>
<td>ENVI Lab</td>
</tr>
<tr>
<td>9</td>
<td>March 11</td>
<td>Geometric corrections, projections, datums, coordinate systems</td>
<td>Work on sensors presentation and report, projections vid</td>
</tr>
<tr>
<td>10</td>
<td>March 16</td>
<td>sensors presentations</td>
<td>Sensors reports due today</td>
</tr>
<tr>
<td>10</td>
<td>March 18</td>
<td>Exam #2</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>March 23</td>
<td>Introduction to final project, Field Work: Ground Truth, GPS</td>
<td>GPS “field trip”</td>
</tr>
<tr>
<td>11</td>
<td>March 25</td>
<td>FIELD TRIP</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>March 30</td>
<td>More introduction to final project, Image Classification, error matrices</td>
<td>ENVI Lab</td>
</tr>
<tr>
<td>12</td>
<td>April 1</td>
<td>Remote sensing of rocks and soils</td>
<td>ENVI Lab</td>
</tr>
<tr>
<td>13</td>
<td>April 6</td>
<td>Remote sensing of vegetation</td>
<td>Work on final projects</td>
</tr>
<tr>
<td>13</td>
<td>April 8</td>
<td>Remote sensing of water bodies</td>
<td>Work on final projects</td>
</tr>
<tr>
<td>14</td>
<td>April 13</td>
<td>Remote sensing of the atmosphere, radiative transfer, AIRS</td>
<td>Work on final projects</td>
</tr>
<tr>
<td>14</td>
<td>April 15</td>
<td>Remote sensing of urban areas, spy satellites, drones, and esplonage</td>
<td>Work on final projects, “Rise of the Drones”</td>
</tr>
<tr>
<td>15</td>
<td>April 20</td>
<td>Planetary science</td>
<td>Work on final projects</td>
</tr>
<tr>
<td>15</td>
<td>April 22</td>
<td>Exam #3</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>April 27</td>
<td>Work on final projects</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Finals Week</td>
<td>FINAL PROJECT PRESENTATIONS</td>
<td>Final Reports due</td>
</tr>
</tbody>
</table>
Contact Name  Timothy Callahan

Email CallahanT@cofc.edu Phone 953-8278

Department/Program Environmental Studies  School Graduate School

Catalog Year in Which Change Will Take Effect 2016-2017

Does this proposal include: □ Course title change*  
☑ Course number change*  
□ Course description change*  
☑ Undergraduate/Graduate cross-listing  
*complete Existing Course/New Course Information

A. If you are proposing to cross-list two existing courses at the same level, list the courses (acronym, title, number, course description) and provide a reason for cross-listing.

B. If you are proposing to cross-list an existing undergraduate course with an existing graduate course, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach a syllabus (or separate syllabi) that clearly indicates student learning outcomes, assignments, and rigor appropriate for each level.

C. If you are proposing to cross-list an existing course with a new course at the same level, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach the appropriate new course proposal form.

D. If you are proposing to cross-list an existing course with a new course at a different level, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach the appropriate new course proposal form(s). Also attach a syllabus (or separate syllabi) that clearly indicates student learning outcomes, assignments, and rigor appropriate for each level.
Proposed Cross-listed Courses
(course acronyms, numbers, titles, and descriptions)

Geographic Information Systems: GEOL 449, EVSS 649
Geographic Information Systems Lab: GEOL 449L, EVSS 649L

This course will cover spatial types and quality, data input operations, database management, data analysis, and software design concerns. We will also examine institutional and political concerns for using GIS. Computer-based GIS software (Unix, PC, and Mac) will be used throughout the course.
Prerequisites: Some computer experience necessary.

Reason for Cross-listing

This course is offered for both undergraduate and graduate students. There is sufficient overlap in the topics covered that sharing resources makes sense. However, there is a distinct difference in assignments and expectations that allows different learning outcomes to be obtainable. Topics covered in Geographic Information Systems are beneficial for upper level undergraduate students pursuing a degree in Geology, and at the same time, are beneficial for graduate students pursuing a thesis or internship in a related field.

Please see attached syllabi for specific learning objectives.

Changes to Existing Course Numbers/Titles/Descriptions

Existing Course:
EVSS 649, EVSS 649L

Proposed Course Change:
EVSS 549, EVSS 549L

No changes to course title or description.
GEOL 449
Geographic Information Systems

Instructor: Norman Levine NSCB 224F - - 953 - 5308 - - levinen@cofc.edu
Lab TA: Alex Braud - - - Braudag@q.cofc.edu By Appointment

Office Hours: 1-2 pm, Monday, and Wednesday
Also Available for walk-in hours and by appointment. OPEN DOOR come on in

Prerequisites:
GEOL 101, 101L, 102, 102L, 314 314L, or permission of the Instructor.

Computer Experience Necessary

Course Description:
This course is an introduction to Geographic Information Systems (GIS). We will cover the history and theory behind GIS, spatial data types, data quality, data input operations, database management, data analysis, software design concerns and look at various applications of GIS. We will investigate the institutional and political concerns for using GIS. This is a computer intensive laboratory based course. GIS software on various platforms will be used throughout the semester.

Course Objectives

- To develop an understanding of the structure of GIS and its associated data
- To provide hands on exposure to the discipline of GIS / Remote Sensing and current computer software and data
- To provide students with a working knowledge of how GIS and Remote Sensing technologies are used in an environmental/geologic context

Learning Objectives

- Students will be able to evaluate, prepare, or create primary data.
- Students will frame questions for GIS analysis.
- Students will be able to use a GIS to analyze, interpret and integrate disparate data sets from multiple disciplines to develop analyses and formulate metrics that can be used to communicate results to multiple audiences.
- Students will be able to create basic models for processes and task automation.
- Students will be able to construct and maintain a web GIS platform and communicate projects through story mapping
- Students will develop skills in group/team cooperation and project development

Textbook and Reference Materials
There is no official textbook. Chapters from multiple sources will be posted on the class website and you are expected to read them. Additional reading can be found at the following sites:
http://www.csri.com/
http://training.csri.com/
http://training.csri.com/campus/library/index.cfm
http://www.colorado.edu/geography/geraft/notes/notes.html
http://en.wikipedia.org/wiki/Geographic_information_system
Additional materials list will be posted on the class website

**Course Content**
Lecture and hands-on exercise topics

- Introduction to Geographic Information Systems
- Maps and cartography
- Spatial data basics
- Raster, vector and object oriented data models
- Capabilities and uses of GIS
- Raster data: data structures, coding issues, indexing
- Vector data: data structures, topology, attaching attributes
- Object oriented data: structures and usage
- Data acquisition and quality: digitizers, scanners, GPS,
- Acquisition of Government data sets: DEM, DLG, TIGER, SURGO, STATSGO
- Global Positioning System: theory, data collection, and data reduction
- Digital terrain models: data acquisition and modeling, contouring, DEMs, TINs
- Overview of database management systems
- Address matching
- Dynamic Pages
- ArcGIS Online
- GIS operations and functionality
- GIS and society: political, organizational and legal considerations in the information age

**Semester Project**
Based on knowledge gained during the semester, the students will work in small teams to write proposals, prepare and present a research project.

**Instructional Materials**

- Departmental/private demonstration materials
- Departmental/private data collections
- The Santee Cooper GIS Laboratory and Departmental remote sensing computer facilities
- College library facilities
- Private resource reading materials
- Web-based tutorials and reading materials
- Guest lectures
Exams and Grading

Semester grades will be based on: point values associated with each item then weighted by the following table:

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Class Participation</td>
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<tr>
<td>15%</td>
<td>Exercises</td>
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<tr>
<td>20%</td>
<td>Midterm Exam</td>
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<tr>
<td>15%</td>
<td>Small Group Project</td>
</tr>
<tr>
<td>30%</td>
<td>The Semester Project (group work and write up)</td>
</tr>
<tr>
<td>10%</td>
<td>Project Presentation</td>
</tr>
</tbody>
</table>

Letter grades will be based on a percentage of your total points accumulated:

\[
\begin{align*}
\geq 93\% &= A \\
90-92 &= A- \\
87-89 &= B+ \\
83-86 &= B \\
82-80 &= B- \\
77-79 &= C+ \\
73-76 &= C \\
72-70 &= C- \\
67-69 &= D+ \\
63-66 &= D \\
62-60 &= D- \\
\leq 59 &= F
\end{align*}
\]

STUDENT EXPECTATIONS: students will be expected to stay on top of their assignments, prepare professional quality reports and lab materials. Students will be expected to create an electronic portfolio of what they consider their 3 best class assignments.

ATTENDANCE: Attendance is mandatory. You are expected to attend all classes. Attendance will be taken. Please note: if you miss more than three unexcused classes, you will be withdrawn from the course with a WA. You are responsible for all missed coursework even if the absence is excused.

Examples of legitimate reasons for an absence:

- Documented illness (i.e. with Dr's note), family wedding, family funeral, or similar reason beyond your control for which you can provide documentation.

The following are not legitimate reasons:

- Pressures from other classes or jobs; vague illnesses (colds, hangovers, etc.); advisor meetings, appointments/duties for other classes, work arrangements, vacations of any type.

ATTENDANCE: You are expected to attend all class meetings. If extreme circumstances necessitate an absence, get the notes and assignment from a classmate. YOU ARE RESPONSIBLE FOR MAKING UP ANY MISSED WORK. IF YOU MISS CLASS THE DAY HOMEWORK IS Assigned OR TEST ANNOUNCED, IT IS YOUR RESPONSIBILITY TO FIND OUT ABOUT IT. Attendance for the scheduled tests is mandatory.

If for some reason you are forced by circumstances beyond your control to miss a test (a dean's excuse in advance of the test is required), please contact me as soon as possible to arrange a make-up test. Make-up tests are generally in essay format. You will not be allowed to make up any exam for an unexcused absence.

If you have a problem taking the final exam on the day it is scheduled, see me WAY BEFORE the exam. Should you fail to take the final exam, you will receive an X, which will automatically convert to an F for the course.
HINTS FOR SUCCESSFULLY COMPLETING THE CLASS:

- Start a study/work group with people who will actually study before you get together. Meet once a week and before exams.
- Outline or summarize the week’s notes and readings each weekend.
- Use sketches and diagrams to help explain concepts.
- Ask questions! Ask in or before/after class, email me, come to my office, ask your lab instructor, ask your classmates, etc.
- Try to understand concepts and processes, not just memorize definitions.
- DON’T CRAM! It will not work! Keep current in the class.

COURTESY AND TOLERANCE: You are also required to respect the rights of other students to learn, and the professor to teach, without undue distraction. The following activities are not permitted and may result in your being required to leave the class temporarily or permanently:

- Chatter during lecture
- Cell phones should be switched off or to vibrate during class. TEXTING WILL NOT BE TOLERATED.
- Use of iPods, etc.
- Reading newspapers, magazines, etc. during the lecture.
- Frequently arriving late.

ACADEMIC HONESTY POLICY: You are bound by the College of Charleston Honor Code. This means you will produce your own work and will not lie, cheat, plagiarize, steal, or attempt to do so. Collaboration with other students without permission will result in a “0” grade for that particular exam, quiz, or assignment for the first offense. For the second offense, you will receive an ‘F’ for the entire course. This also applies to cheating or plagiarizing on extra credit papers or assignments. If two papers or assignments are turned in that show such similarity that I interpret it as evidence of cheating or plagiarizing, I will penalize both parties. Should you violate the Honor Code, the College Honor Board will be notified and disciplinary action, up to expulsion, will ensue. For more information see http://www.cofc.edu/studentaffairs/HonorBoard.htm.

Cheating includes the use of unauthorized materials, copying from another student’s paper, or allowing another student to copy from your paper during exams, quizzes or assignments. Unauthorized materials include quizzes, exams, and assignments from previous semesters. Midterm and final exams are collected and held by the Instructor. Students will have the opportunity to review their exams, but will not keep copies of exams. Possession of an exam is considered cheating. Other examples of cheating include unauthorized access to an exam given to the class, if you are taking it at a different time for some valid reason; discussion of any exam with students in another lab section during the semester; copying homework assignments; paying someone to do your assignments or papers; buying or downloading a paper; or leaving the room before completing an exam or quiz without permission.

Plagiarizing includes copying a sentence or sentences verbatim or paraphrasing from the source without using quotations around the verbatim materials and providing a complete reference (author, date, source of material, etc.). This also includes printing or downloading material from the Internet or a database and turning it in as your own work. You MUST read, synthesize, and write your own original sentences.

ACCOMMODATIONS: If there is a student in this class who has a documented disability and has been approved to receive accommodations through SNAP Services, please feel free to come and discuss this with me during my office hours. In not, please know that the College will make reasonable accommodations for persons with documented disabilities. Students should apply for services at the Center for Disability Services located on the first floor of the Lightsey Center, Suite 104. Students approved for accommodations should notify me as quickly as possible.

Lab Materials and Readings can be found on OAKS
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Introduction - - GIS 123 abc mapping you and me...</td>
</tr>
<tr>
<td></td>
<td>History of GIS</td>
</tr>
<tr>
<td></td>
<td>Lab 1 Getting around in ArcGIS - General Data Management</td>
</tr>
<tr>
<td>Week 2</td>
<td>Maps and Mapping</td>
</tr>
<tr>
<td></td>
<td>What’s in a Map</td>
</tr>
<tr>
<td></td>
<td>Lab 2 Creating first maps in GIS - Place in space - - where you people from</td>
</tr>
<tr>
<td>Week 3</td>
<td>Topology capabilities and uses of GIS</td>
</tr>
<tr>
<td></td>
<td>Data structures and topology Geodatabases</td>
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<tr>
<td></td>
<td>Lab 3 Shapefile Geodatabase Creation</td>
</tr>
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<td></td>
<td>Digitizing on the Fly Phytophraphy</td>
</tr>
<tr>
<td>Week 4</td>
<td>Managing Tables (Join and Relates)</td>
</tr>
<tr>
<td></td>
<td>Solving Spatial Problems with Query and Analysis</td>
</tr>
<tr>
<td></td>
<td>Lab Manipulating tables in ArcGIS - - - Geocoding</td>
</tr>
<tr>
<td>Week 5</td>
<td>Using Model Builder for Map Overlays</td>
</tr>
<tr>
<td></td>
<td>Lab Model Builder vs. Manual Method for Map Overlays</td>
</tr>
<tr>
<td></td>
<td>Raster data, data structures and visualization</td>
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<tr>
<td></td>
<td>Digital Line Graphs (DLGs), and images</td>
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<td></td>
<td>Lab data clearinghouse download and map making - Basic model sh</td>
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<td>Week 6</td>
<td>Introduction to GPS</td>
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<td></td>
<td>Primary data acquisition</td>
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<td></td>
<td>Lab Outdoor data collection GPS - Marion Square</td>
</tr>
<tr>
<td>Week 7</td>
<td>Object oriented data: Structures and usage</td>
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<td></td>
<td>Acquisition of Government data sets</td>
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<td></td>
<td>Lab BOLIDE</td>
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<tr>
<td>Week 8</td>
<td>See where we are week</td>
</tr>
<tr>
<td>Week 9</td>
<td>Small Team Map Assignment</td>
</tr>
<tr>
<td>Week 10 - 14</td>
<td>Major Group Project</td>
</tr>
<tr>
<td>Week 15</td>
<td>Final Project Presentations</td>
</tr>
</tbody>
</table>
EVSS 649
Geographic Information Systems

Instructor: Norman Levine NSCB 224F - - 953 - 5308 - - levinen@cofc.edu
Lab TA: Alex Braud - - Braudas@cofc.edu By Appointment

Office Hours: 1-2 pm, Monday, and Wednesday
Also Available for walk-in hours and by appointment. OPEN DOOR come on in

Prerequisites:
GEOL 101, 101L, 102, 102L, 314 314L, or permission of the Instructor.

Computer Experience Necessary

Course Description:
This course is an introduction to Geographic Information Systems (GIS). We will cover the history and theory behind GIS, spatial data types, data quality, data input operations, database management, data analysis, software design concerns and look at various applications of GIS. We will investigate the institutional and political concerns for using GIS. This is a computer intensive laboratory based course. GIS software on various platforms will be used throughout the semester.

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- Students will be able to create basic models for processes and task automation.
- Students will be able to construct and maintain a web GIS platform and communicate projects through story mapping
- Students will lead project teams using project management and team development skills
- Students will integrate previous goals in final capstone project.

Additional, more rigorous Student Learning Outcomes for graduate students in this cross-listed course:
Environmental Studies graduate students demonstrate a comprehension of environmental issues beyond general knowledge and understanding by:
- Obtaining, explaining, and applying scholarly information related to environmental issues
- Integrating facts, concepts, and methods from multiple disciplines
- Effectively communicating environmental facts, concepts, and methods
- Analyzing and synthesizing environmental facts, concepts, and methods to design and evaluate strategies, technologies, and methods to solve problems
- Demonstrating leadership in the classroom in both discussion and group projects
Textbook and Reference Materials
There is no official textbook. Chapters from multiple sources will be posted on the class website and you are expected to read them. Additional reading can be found at the following sites:
http://www.esri.com/
http://training.esri.com/
http://training.esri.com/campus/library/index.cfm
http://www.colorado.edu/geography/gcraft/notes/notes.html
http://en.wikipedia.org/wiki/Geographic_information_system
Additional materials list will be posted on the class website

Course Content
Lecture and hands-on exercise topics

- Introduction to Geographic Information Systems
- Maps and cartography
- Spatial data basics
- Raster, vector and object oriented data models
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- Digital terrain models: data acquisition and modeling, contouring, DEMs, TINs
- Overview of database management systems
- Address matching
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- GIS and society: political, organizational and legal considerations in the information age

Semester Project
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83-86 &= B \\
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\leq 72 &= F
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GRADUATE STUDENT EXPECTATIONS: Graduate students will be expected to do 3 additional homework assignments during the course of the semester. The first assignment 1 page write-up on how GIS could be used within their research or internship projects. The second will be a 3 minute presentation on to the class on how to use a prepackaged tool assigned to them in class. The final homework assignment will be to make a basic how to make a map lab for mapping in one of the following GIS packages: ArcMap, ArcScene, ArcGlobe, ArcPro or ArcGIS online as assigned by the instructor. Finally all Graduate students will serve as team leaders and project managers on all Group Projects and team assignments in the class.

ATTENDANCE: Attendance is mandatory. You are expected to attend all classes. Attendance will be taken. Please note: If you miss more than three unexcused classes, you will be withdrawn from the course with a WA. You are responsible for all missed coursework even if the absence is excused.

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- Outline or summarize the week’s notes and readings each weekend.
- Use sketches and diagrams to help explain concepts.
- Ask questions! Ask in or before/after class, email me, come to my office, ask your lab instructor, ask your classmates, etc.
- Try to understand concepts and processes, not just memorize definitions.
- DON’T CRAM! It will not work! Keep current in the class.

COURTESY AND TOLERANCE: You are also required to respect the rights of other students to learn, and the professor to teach, without undue distraction. The following activities are not permitted and may result in your being required to leave the class temporarily or permanently:

- Chatter during lecture
- Cell phones should be switched off or to vibrate during class. TEXTING WILL NOT BE TOLERATED.
- Use of iPods, etc.
- Reading newspapers, magazines, etc. during the lecture.
- Frequently arriving late.

ACADEMIC HONESTY POLICY: You are bound by the College of Charleston Honor Code. This means you will produce your own work and will not lie, cheat, plagiarize, steal, or attempt to do so. Collaboration with other students without permission will result in a "0" grade for that particular exam, quiz, or assignment for the first offense. For the second offense, you will receive an 'F' for the entire course. This also applies to cheating or plagiarizing on extra credit papers or assignments. If two papers or assignments are turned in that show such similarity that I interpret it as evidence of cheating or plagiarizing, I will penalize both parties. Should you violate the Honor Code, the College Honor Board will be notified and disciplinary action, up to expulsion, will ensue. For more information see http://www.cofc.edu/studentaffairs/HonorBoard.htm.

Cheating includes the use of unauthorized materials, copying from another student's paper, or allowing another student to copy from your paper during exams, quizzes or assignments. Unauthorized materials include quizzes, exams, and assignments from previous semesters. Midterm and final exams are collected and held by the instructor. Students will have the opportunity to review their exams, but will not keep copies of exams. Possession of an exam is considered cheating. Other examples of cheating include unauthorized access to an exam given to the class, if you are taking it at a different time for some valid reason; discussion of any exam with students in another lab section during the semester; copying homework assignments; paying someone to do your assignments or papers; buying or downloading a paper; or leaving the room before completing an exam or quiz without permission.

Plagiarizing includes copying a sentence or sentences verbatim or paraphrasing from the source without using quotations around the verbatim materials and providing a complete reference (author, date, source of material, etc.). This also includes printing or downloading material from the Internet or a database and turning it in as your own work. You MUST read, synthesize, and write your own original sentences.

ACCOMMODATIONS: If there is a student in this class who has a documented disability and has been approved to receive accommodations through SNAP Services, please feel free to come and discuss this with me during my office hours. In not, please know that the College will make reasonable accommodations for persons with documented disabilities. Students should apply for services at the Center for Disability Services located on the first floor of the Lightsey Center, Suite 104. Students approved for accommodations should notify me as quickly as possible.

Lab Materials and Readings can be found on OAKS
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Introduction - GIS 123 abc mapping you and me...</td>
</tr>
<tr>
<td></td>
<td>History of GIS</td>
</tr>
<tr>
<td></td>
<td>Lab 1: Getting around in ArcGIS – General Data Management</td>
</tr>
<tr>
<td>Week 2</td>
<td>Maps and Mapping</td>
</tr>
<tr>
<td></td>
<td>What’s in a Map</td>
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<td></td>
<td>Lab 2: Creating first maps in GIS - Place in space -- where you people from</td>
</tr>
<tr>
<td>Week 3</td>
<td>Topology capabilities and uses of GIS</td>
</tr>
<tr>
<td></td>
<td>Data structures and topology Geodatabases</td>
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<td></td>
<td>Lab 3: Shapefile Geodatabase Creation</td>
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<tr>
<td></td>
<td>Digitizing on the Fly: Physiography</td>
</tr>
<tr>
<td>Week 4</td>
<td>Managing Tables (Joins and Relates)</td>
</tr>
<tr>
<td></td>
<td>Solving Spatial Problems with Query and Analysis</td>
</tr>
<tr>
<td></td>
<td>Lab: Manipulating tables in ArcGIS ------ Geocoding</td>
</tr>
<tr>
<td>Week 5</td>
<td>Using Model Builder for Map Overlays</td>
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<tr>
<td></td>
<td>Lab: Model Builder vs. Manual Methods for Map Overlays</td>
</tr>
<tr>
<td></td>
<td>Raster data, data structures and visualization</td>
</tr>
<tr>
<td></td>
<td>Digital Line Graphs (DLGs), and images</td>
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<tr>
<td></td>
<td>Lab data cleaninghouse download and map making - Basic models</td>
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<tr>
<td>Week 6</td>
<td>Introduction to GPS</td>
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<td></td>
<td>Primary data acquisition</td>
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<td></td>
<td>Lab: Outdoor data collection - GPS - Marion Square</td>
</tr>
<tr>
<td>Week 7</td>
<td>Object oriented data, Structures and usage</td>
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<td></td>
<td>Acquisition of Government data sets</td>
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<td></td>
<td>Lab: BOLIDE</td>
</tr>
<tr>
<td>Week 8</td>
<td>See where we are week</td>
</tr>
<tr>
<td>Week 9</td>
<td>Small Team Map Assignment</td>
</tr>
<tr>
<td>Week 10-14</td>
<td>Major Group Project</td>
</tr>
<tr>
<td>Week 15</td>
<td>Final Project Presentations</td>
</tr>
</tbody>
</table>
Contact Name: Timothy Callahan

Email: CallahanT@cofc.edu Phone: 953-8278

Department/Program: Environmental Studies School: Graduate School

Catalog Year in Which Change Will Take Effect: 2016-2017

Does this proposal include:

- [x] Course title change*
- [x] Course number change*
- [ ] Course description change*
- [x] Undergraduate/Graduate cross-listing
*complete Existing Course/New Course Information

A. If you are proposing to cross-list two existing courses at the same level, list the courses (acronym, title, number, course description) and provide a reason for cross-listing.

B. If you are proposing to cross-list an existing undergraduate course with an existing graduate course, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach a syllabus (or separate syllabi) that clearly indicates student learning outcomes, assignments, and rigor appropriate for each level.

C. If you are proposing to cross-list an existing course with a new course at the same level, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach the appropriate new course proposal form.

D. If you are proposing to cross-list an existing course with a new course at a different level, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach the appropriate new course proposal form(s). Also attach a syllabus (or separate syllabi) that clearly indicates student learning outcomes, assignments, and rigor appropriate for each level.
**Proposed Cross-listed Courses**
(course acronyms, numbers, titles, and descriptions)

<table>
<thead>
<tr>
<th>Satellite Meteorology: PHYS 457, EVSS 657</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satellite meteorology is the measurement of weather by sensors aboard Earth-orbiting satellites. Topics include satellite orbits and navigation; electromagnetic radiation; instrumentation; image interpretation; atmospheric temperature; winds, clouds, precipitation and radiation.</td>
</tr>
</tbody>
</table>

**Reason for Cross-listing**

This course is offered for both undergraduate and graduate students. There is sufficient overlap in the topics covered that sharing resources makes sense. However, there is a distinct difference in assignments and expectations that allows different learning outcomes to be obtainable. Topics covered in Satellite Meteorology are beneficial for upper level undergraduate students pursuing a degree in Physics, and at the same time, are beneficial for graduate students pursuing a thesis or internship in a related field.

Please see attached syllabi for specific learning objectives.

**Changes to Existing Course Numbers/Titles/Descriptions**

Existing Course:

EVSS 657

Proposed Course Change:

EVSS 557

No changes to course title or description.
GRADUATE PERMISSION TO CROSS-LIST FORM

This form must ALWAYS be accompanied by a graduate COURSE FORM.

Contact Name: B. Lee Lindner Email: lindnerb@cofc.edu Phone: 953-8288
Department Name: Physics and Astronomy Graduate Program name: Environmental Studies (EVSS)

Date (Semester/Year) cross-listing will take effect: Fall 2017

I. CATEGORY OF REVIEW (Check all that apply)

☐ New Course -- Course Number/Title
☒ Existing Course -- Course Number/Title EVSS657(557)/Satellite Meteorology
☐ Special Topic Course -- Course Number/Title

This course will be cross-listed with an

☒ undergraduate course (complete sections II, III, and IV below)
☐ existing graduate course (complete section IV below)

II. CURRICULUM DIFFERENCES – UNDERGRADUATE AND GRADUATE LEVELS

Please submit separate syllabi for both graduate and undergraduate courses

Syllabi for both undergraduate and graduate courses are attached ☒ YES ☐ NO

Explain the differences between the syllabi in terms of requirements, learning objectives and course content

EVSS657 and PHYS457 are currently cross-listed and have been for two decades. In accord with new college policy, EVSS657 is being renumbered as EVSS557; no other changes are requested. The American Meteorological Society and Federal Civil Service require a course in “atmospheric measurements, instrumentation, or remote sensing” for jobs and accreditation. Satellite Meteorology fits that requirement and thus suits the needs of the undergraduate meteorology audience. Additionally, Satellite Meteorology blends perfectly with geology remote sensing classes, which are a staple of the MES program. The MES audience in 657 has historically consisted of students with either interests in general meteorology or in remote sensing. The course content is based on a standard satellite meteorology textbook book infused with issues of concern to environmental scientists. This provides the undergraduate students with additional useful knowledge of policy and applications while still providing the training graduate students can use for careers in satellite meteorology. Thus both audiences are well served by the course despite their different backgrounds and career goals.
Graduate students are required to do an extra paper and presentation using technical journals as source material on a topic related to their environmental interest. This ties in with the additional learning objectives for graduate students of applying scholarly information, taking a multi-disciplinary approach, enhancing communication skills, synthesizing facts and leadership in discussion.
III. APPROVAL SECTION – GRADUATE COURSE WITH UNDERGRADUATE COURSE

Undergraduate Course Number / Title PHYS457/Satellite Meteorology

Names and Signatures:
Name of Department Chair of the Graduate Course

Signature ___________________________ Date: __________________

Department Chair of the Undergraduate Course

Signature ___________________________ Date: __________________

Graduate Program Director

Signature ___________________________ Date: __________________

Provost

Signature ___________________________ Date: __________________

IV. APPROVAL SECTION – GRADUATE COURSE WITH EXISTING GRADUATE COURSE

Graduate Course Number / Title of Existing Graduate Course

Program(s) of Existing Graduate Course

Names and Signatures:
“Host” Program Director

Signature ___________________________ Date: __________________

“Requesting” Program Director

Signature ___________________________ Date: __________________

Provost

Signature ___________________________ Date: __________________

Return form to the Graduate School Office for Further Processing
Signature of Chair of the Faculty Committee on Graduate Education, Continuing Education & Special Programs:

_________________________________________ Date: ______________

Signature of Chair of the Graduate Council:

_________________________________________ Date: ______________

Signature of Faculty Senate Secretary:

_________________________________________ Date: ______________

Date Approved by Faculty Senate: _________________________________
FACULTY COMMITTEE ON GRADUATE EDUCATION, CONTINUING EDUCATION AND SPECIAL PROGRAMS

GRADUATE COURSE PROPOSAL FORM

Contact Name: B. Lee Lindner  Email: lindnerb@cofc.edu  Phone: 953-8288

Department Name: Physics and Astronomy  Graduate Program name: Environmental Studies (EVSS)

Course Prefix, Number, and Title: EVSS657; Satellite Meteorology

I. CATEGORY OF REVIEW (Check all that apply)

NEW COURSE

CHANGE COURSE

DELETE COURSE

☐ New Course (attach syllabus*)

☒ Change Number (IV, VII, VIII, IX)

☐ Delete Course (IV, VII, IX)

☐ Change Title (IV, VII, VIII, IX)

☐ Change Credits/Contact hours (II, IV, VII, IX)

☐ Prerequisite Change (IV, VII, VIII, IX)

☐ Edit Description (III, IV, VII, VIII, IX)

☒ Approve for Cross-listing (attach Graduate Permission to Cross-list Form)

Date (Semester/Year) the course will first be offered, course changes or deletion will go into effect: Fall 2017

NEW COURSE:

*ATTACH THE SYLLABUS FOR A NEW GRADUATE COURSE to include:

- Course description and objectives
- Method of teaching (e.g., lecture, seminar, on-line, hybrid)
- Required and optional texts and materials
- Graduate School Grading Scale
- Assignments, student learning outcomes and assessment components
- Policies to include attendance, Honor Code, American Disabilities Act statement
- Tentative course schedule with specific topics
List prerequisites and / or other restrictions below

Will this course be added to the Degree Requirements?

a) ☐ Yes ☐ No

b) If yes, explain

II. NUMBER OF CREDITS and CONTACT HOURS per week

Lecture Lab Seminar Ind. Study

A. Contact Hours

B. Credit Hours

Is this course repeatable? ☐ yes ☐ no If so, how many credit hours may the student earn in this course?

III. CATALOG DESCRIPTION Limit to 50 words EXACTLY as you want it to appear in the catalog; include prerequisites, co-requisites, and other restrictions. If changing course description, please include both old and new course descriptions.
IV. RATIONALE / JUSTIFICATION: If course change – please indicate the course change details. If course change or deletion—please provide reasons for change(s) to or deletion of a course. If a new course—briefly address the goals/objectives for the course and the relationship to the strategic plan.

The driving reason for the change is the college wide renumbering of all cross-listed undergraduate and graduate courses from 600 level to 500 level. EVSS657 will become EVSS557. This course is cross-listed with PHYS457, Satellite Meteorology. Aside from the course number, nothing else will change.

V. STUDENT LEARNING OUTCOMES and ASSESSMENT

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Method and Performance Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>What will students know and be able to do when they complete the course?</td>
<td>How will each outcome be measured? Who will be assessed, when, and how often? How well should students be able to do on the assessment?</td>
</tr>
<tr>
<td>1.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
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<tr>
<td>3.</td>
<td></td>
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<tr>
<td>4.</td>
<td></td>
</tr>
</tbody>
</table>

How does this course align with the student learning outcomes articulated for the major, program, or general education? What program-level outcome or outcomes does it support? Is the content or skill introduced, reinforced, or demonstrated in this course?
VII. IMPACT ON EXISTING PROGRAMS and COURSES: Please briefly document the impact and expected changes of this new/changed/deleted course on other departments, programs and courses; if deleting a course—list all departments and programs that include the course; if adding/changing a course—explain any overlap with existing courses in the same or different departments; if adding or deleting a course that will be part of a joint program identify the partner institution.

No change is expected. The course has been offered in both the EVSS and PHYS programs seven times in the past, with student enrollment from both programs. The undergraduate meteorology curriculum has been restructured and it is anticipated the course will see slightly increased demand.

VIII. COSTS ASSOCIATED WITH THE ACTION REQUESTED: List all of the new costs or cost savings, (including new faculty/staff requests, library or equipment, etc.) associated with the action requested. New courses requiring additional resources will need special justification.

None; simple renumbering of an existing course
IX. APPROVAL AND SIGNATURES

Signature of Program Director: ___________________________ Date: ___________________

Signature of Department Chair: __________________________ Date: ___________________

Signature of Additional Chair*: __________________________ Date: ___________________

Signature of Schools’ Dean: _____________________________ Date: ___________________

Signature of Additional Schools’ Dean*: ___________________ Date: ___________________

Signature of the Provost: ________________________________ Date: ___________________

Signature of Budget Director/Business Affairs Office: _______ Date: __________________

*For interdisciplinary courses

Return form to the Graduate School Office for Further Processing

Signature of Chair of the Faculty Committee on Graduate Education, Continuing Education & Special Programs: ___________________________ Date: ___________________

Signature of Chair of the Graduate Council: ___________________________ Date: ___________________

Signature of Faculty Senate Secretary: _____________________________ Date: ___________________

Date Approved by Faculty Senate: ________________________________

September 2011
SATELLITE METEOROLOGY
PHYS457
Spring 2017

WHEN/WHERE: Noon - 12:50 pm MWF in Room 126 of the Rita Hollings Science Center

PREREQUISITES: One of the following: [PHYS459; PHYS425; PHYS230; PHYS225; PHYS215; PHYS210; PHYS106 (with a grade of C- or better); PHYS105] and one of the following: [PHYS102 (with a grade of C- or better); PHYS112; HONS158] and one of the following: [MATH220; MATH229]; or permission of the instructor


INSTRUCTOR: Dr. B. Lee Lindner; Associate Professor of Atmospheric Physics

OFFICE: Room 143, Rita Hollings Science Center

PHONE: 953-8288 (Office)

EMAIL: Lindnerb@cofc.edu

INTERNET: http://lindnerb.people.cofc.edu/

OFFICE HOURS: 10:00am – 11:45am MWF, 1:00pm – 1:45pm MWF, 3:00pm – 3:45pm W; other times by appointment. I am often around at other times, so feel free to stop by without an appointment. Please look around the building for me if I'm not in my office (I occasionally leave my cage to stretch my legs for a few minutes).

EDUCATION: B.S. in Astronomy and B.S. in Physics, University of Washington, 1979
Ph.D. in Astrophysical, Planetary and Atmospheric Sciences, University of Colorado, 1985

EXPERIENCE: NASA/Ames Research Center, 1985-1987
Atmospheric and Environmental Research, Inc., 1987-1994
University of Kyoto, Japan, 1994
University of Charleston, 1994-Present

PERSONAL: Married; 4 children.
GRADING POLICY: Midterm Exam 50% of Total
Homework 5% of Total (included in exams)
Final Exam 50% of Total

I strongly encourage you to do the homework. You may work in groups, and you may seek my assistance or that of any faculty member or student. You do not need to turn the homework in to me; I will select homework problems at random and place them on the tests, word for word. Those who have done the homework, and understand it, will consequently get most of those problems correct on the test. Exam scores will be curved. Final exam will be at noon on April 28 in the normal classroom. Note that the final exam is cumulative, but will emphasize the last half of the course. All students are encouraged to read non-technical journals, such as Weatherwise, EOS, Bulletin of the American Meteorological Society and Aviation Week and Space Technology. These journals are easy to read and can be thought of as newspapers for the field.

ATTENDANCE POLICY: Students are expected to attend class. Attendance is not required (i.e., attendance will not factor directly into your grade) except for the dates of your presentation and final exam, but is highly recommended for every class. Some of the material presented in class will not be available in textbooks, and thus will be difficult to acquire outside of class. Students are responsible for all information disseminated in the course, whether present or not. I will present some viewgraphs and short movie clips to demonstrate concepts, and it is strongly suggested you take notes during these presentations. Students are required to be present for all tests and presentations. Should you miss a test or presentation for a valid reason (e.g., illness, car trouble, death in family, etc.), promptly visit our friendly Office of the Associate Dean of Students with appropriate documentation to complete an absence memo. If your absence memo is approved by that office, they will email me and you will then be allowed a make-up exam or presentation. No admittance to exams after 15 minutes past the starting time.

CATALOG DESCRIPTION: Satellite Meteorology is the measurement of the weather by sensors aboard Earth-orbiting satellites.

TOPICS COVERED:
1. Satellite Orbits and Navigation
2. Electromagnetic Radiation
3. Instrumentation
4. Image Interpretation
5. Atmospheric Temperature
6. Winds
7. Clouds
8. The Future

APPROXIMATE TIMELINE:
Week 1: Introduction to the course (Ch. 1) and Orbits and Navigation (Ch. 2)
Week 2: Orbits and Navigation ctd. (Ch. 2) and Electromagnetic Radiation (Ch. 3)
Week 3: Electromagnetic Radiation ctd. (Ch. 3)
Week 4: Electromagnetic Radiation ctd. (Ch. 3)
Week 5: Instrumentation (Ch. 4)
Week 6: Instrumentation ctd. (Ch. 4) and Image Interpretation (Ch. 5)
Week 7: Image Interpretation ctd. (Ch. 5) and Midterm Exam (date selected by students)
Week 8: Image Interpretation ctd. (Ch. 5) and Temperature and Trace Gases (Ch. 6)
Week 9: Spring Break
Week 10: Temperature and Trace Gases ctd. (Ch. 6)
Week 11: Temperature and Trace Gases ctd. (Ch. 6) and Winds (Ch. 7)
Week 12: Student presentations (date selected by students) and Winds ctd. (Ch. 7)
Week 13: Clouds (Ch. 8)
Week 14: Clouds ctd. (Ch. 8)
Week 15: The Future (Ch. 11)
Week 16: Parts of Precipitation (Ch. 9) and Final Exam (Wednesday April 28, Noon to 3pm)

COURSE FORMAT: Lectures (by the instructor and by students), short films, discussion and demonstrations. Questions and comments from students are highly encouraged.

LEARNING OUTCOMES:
1. Acquaint students with all disciplines and topics in Satellite Meteorology.
2. Enable students in the scientific method.
3. Develop interest in science.
4. Enhance student’s problem solving ability.
5. Improve writing skills.
6. Improve presentation skills.
7. Encourage critical thinking and participation.

COLLEGE GRADING SYSTEM:

<table>
<thead>
<tr>
<th>Letter</th>
<th>Grade</th>
<th>Quality Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Superior</td>
<td>4.0</td>
</tr>
<tr>
<td>A-</td>
<td></td>
<td>3.7</td>
</tr>
<tr>
<td>B+</td>
<td>Very Good</td>
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</tr>
<tr>
<td>B</td>
<td>Good</td>
<td>3.0</td>
</tr>
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<tr>
<td>C+</td>
<td>Fair</td>
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<tr>
<td>C</td>
<td>Acceptable</td>
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<tr>
<td>C-</td>
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</tr>
<tr>
<td>D+</td>
<td>Barely Acceptable; Passing</td>
<td>1.3</td>
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<td>F</td>
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<td>Withdrawn due to Excessive Absences</td>
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</tr>
<tr>
<td>XF</td>
<td>Failure due to Academic Dishonesty</td>
<td>0.0</td>
</tr>
</tbody>
</table>
COLLEGE OF CHARLESTON HONOR CODE AND ACADEMIC INTEGRITY (Recommended Language for Course Syllabi):

Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when identified, are investigated. Each incident will be examined to determine the degree of deception involved.

Incidents where the instructor determines the student’s actions are related more to a misunderstanding will be handled by the instructor. A written intervention designed to help prevent the student from repeating the error will be given to the student. The intervention, submitted by form and signed by both the instructor and the student, will be forwarded to the Dean of Students and placed in the student’s file.

Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XF in the course, indicating failure of the course due to academic dishonesty. This grade will appear on the student’s transcript for two years after which the student may petition for the X to be expunged. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board.

Students should be aware that unauthorized collaboration--working together without permission-- is a form of cheating. Unless the instructor specifies that students can work together on an assignment, quiz and/or test, no collaboration during the completion of the assignment is permitted. Other forms of cheating include possessing or using an unauthorized study aid (which could include accessing information stored on a cell phone), copying from others’ exams, fabricating data, and giving unauthorized assistance.

Research conducted and/or papers written for other classes cannot be used in whole or in part for any assignment in this class without obtaining prior permission from the instructor.

Students can find the complete Honor Code and all related processes in the Student Handbook at [http://www.cofc.edu/generaldocuments/handbook.pdf](http://www.cofc.edu/generaldocuments/handbook.pdf)

SERVICES FOR STUDENTS WITH DISABILITIES

The College will make reasonable accommodations for persons with documented disabilities. Students should apply for services at the Center for Disability Services/SNAP located on the first floor of the Lightsey Center, Suite 104. Students approved for accommodations are responsible for notifying me as soon as possible and for contacting me one week before accommodation is needed.

I have read and agree to the terms of this syllabus
SATELLITE METEOROLOGY
EVSS557
Spring 2017

WHEN/WHERE: Noon - 12:50 pm MWF in Room 126 of the Rita Hollings Science Center

PREREQUISITES: Admission to MES Program (i.e., no particular course prerequisites)


INSTRUCTOR: Dr. B. Lee Lindner; Associate Professor of Atmospheric Physics

OFFICE: Room 143, Rita Hollings Science Center

PHONE: 953-8288 (Office)

EMAIL: Lindnerb@cofc.edu

INTERNET: http://lindnerb.people.cofc.edu/

OFFICE HOURS: 10:00am – 11:45am MWF, 1:00pm – 1:45pm MWF, 3:00pm – 3:45pm W; other times by appointment. I am often around at other times, so feel free to stop by without an appointment. Please look around the building for me if I'm not in my office (I occasionally leave my cage to stretch my legs for a few minutes).

EDUCATION: B.S. in Astronomy and B.S. in Physics, University of Washington, 1979
Ph.D. in Astrophysical, Planetary and Atmospheric Sciences, University of Colorado, 1985

EXPERIENCE: NASA/Ames Research Center, 1985-1987
Atmospheric and Environmental Research, Inc., 1987-1994
University of Kyoto, Japan, 1994
University of Charleston, 1994-Present

PERSONAL: Married; 4 children.

GRADING POLICY: Midterm Exam 45% of Total
Homework 5% of Total (included in exams)
Paper/Presentation 10% of Total
Final Exam 45% of Total

I strongly encourage you to do the homework. You may work in groups, and you may seek my assistance or that of any faculty member or student. You do not need to turn the homework in to me; I will select homework problems at random and place
them on the tests, word for word. Those who have done the homework, and
understand it, will consequently get most of those problems correct on the test.
Exam scores will be curved. Final exam will be at noon on April 28 in the normal
classroom. Note that the final exam is cumulative, but will emphasize the last half of
the course. Graduate students will select one topic in the field of satellite
meteorology and write a 5 page double-spaced paper and give a 5 to 10 minute
presentation (complete with some figures and/or graphs, abstract, reference list, etc.).
No two students may select the same area. Students will be expected to look at
current and back issues of technical journals in the library to research the paper and
presentation. A minimum of five articles from any of these journals can be used
(listed in order from those most relevant to those least relevant, but you may use any
journal): Journal of Applied Meteorology, Journal of Atmospheric and Oceanic
Geophysical Research-Atmospheres Section, Journal of the Atmospheric Sciences,
Monthly Weather Review, Weather and Forecasting, Climate Dynamics,
Atmosphere-Ocean, Science, and Nature. Students should use the internet to
supplement the journals. All students are encouraged to read non-technical journals,
such as Weatherwise, EOS, Bulletin of the American Meteorological Society and
Aviation Week and Space Technology. These journals are easy to read and can be
thought of as newspapers for the field.

ATTENDANCE POLICY: Students are expected to attend class. Attendance is not required (i.e.,
attendance will not factor directly into your grade) except for the dates of your
presentation and final exam, but is highly recommended for every class. Some of the
material presented in class will not be available in textbooks, and thus will be
difficult to acquire outside of class. Students are responsible for all information
disseminated in the course, whether present or not. I will present some viewgraphs
and short movie clips to demonstrate concepts, and it is strongly suggested you take
notes during these presentations. Students are required to be present for all tests and
presentations. Should you miss a test or presentation for a valid reason (e.g., illness,
car trouble, death in family, etc.), promptly visit our friendly Office of the Associate
Dean of Students with appropriate documentation to complete an absence memo. If
your absence memo is approved by that office, they will email me and you will then
be allowed a make-up exam or presentation. No admittance to exams after 15
minutes past the starting time.

CATALOG DESCRIPTION: Satellite Meteorology is the measurement of the weather by sensors
aboard Earth-orbiting satellites.

TOPICS COVERED:

1. Satellite Orbits and Navigation
2. Electromagnetic Radiation
3. Instrumentation
4. Image Interpretation
5. Atmospheric Temperature
6. Winds
7. Clouds
8. The Future

APPROXIMATE TIMELINE:
Week 1: Introduction to the course (Ch. 1) and Orbits and Navigation (Ch. 2)
Week 2: Orbits and Navigation ctd. (Ch. 2) and Electromagnetic Radiation (Ch. 3)
Week 3: Electromagnetic Radiation ctd. (Ch. 3)
Week 4: Electromagnetic Radiation ctd. (Ch. 3)
Week 5: Instrumentation (Ch. 4)
Week 6: Instrumentation ctd. (Ch. 4) and Image Interpretation (Ch. 5)
Week 7: Image Interpretation ctd. (Ch. 5) and Midterm Exam (date selected by students)
Week 8: Image Interpretation ctd. (Ch. 5) and Temperature and Trace Gases (Ch. 6)
Week 9: Spring Break
Week 10: Temperature and Trace Gases ctd. (Ch. 6)
Week 11: Temperature and Trace Gases ctd. (Ch. 6) and Winds (Ch. 7)
Week 12: Student presentations (date selected by students) and Winds ctd. (Ch. 7)
Week 13: Clouds (Ch. 8)
Week 14: Clouds ctd. (Ch. 8)
Week 15: The Future (Ch. 11)
Week 16: Parts of Precipitation (Ch. 9) and Final Exam (Wednesday April 28, Noon to 3pm)

COURSE FORMAT: Lectures (by the instructor and by students), short films, discussion and demonstrations. Questions and comments from students are highly encouraged.

LEARNING OUTCOMES:
1. Acquaint students with all disciplines and topics in Satellite Meteorology.
2. Enable students in the scientific method.
3. Develop interest in science.
4. Enhance student’s problem solving ability.
5. Improve writing skills.
6. Improve presentation skills.
7. Encourage critical thinking and participation.

ADDITIONAL STUDENT LEARNING OUTCOMES: Environmental Studies graduate (EVSS) students shall demonstrate a comprehension of environmental issues beyond general knowledge and understanding by:
   • Obtaining, explaining, and applying scholarly information related to environmental issues
   • Integrating facts, concepts, and methods from multiple disciplines
   • Effectively communicating environmental facts, concepts, and methods
   • Analyzing and synthesizing environmental facts, concepts, and methods to design and evaluate strategies, technologies, and methods to solve problems
   • Demonstrating leadership in the classroom in both discussion and group projects

COLLEGE GRADING SYSTEM:
Letter Grade Quality Points
A Superior.................................................. 4.00
B+ Very Good........................................... 3.50
B Good....................................................... 3.00
C+ Fair..................................................... 2.50
C Acceptable.......................................... 2.00
F Failure................................................... 0
I Incomplete............................................ 0
W Withdrawal.......................................... 0
P Pass....................................................... 0
S Satisfactory.......................................... 0
U Unsatisfactory......................................... 0
XF Failure due to academic dishonesty....... 0

COLLEGE OF CHARLESTON HONOR CODE AND ACADEMIC INTEGRITY (Recommended Language for Course Syllabi):

Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when identified, are investigated. Each incident will be examined to determine the degree of deception involved.

Incidents where the instructor determines the student’s actions are related more to a misunderstanding will be handled by the instructor. A written intervention designed to help prevent the student from repeating the error will be given to the student. The intervention, submitted by form and signed by both the instructor and the student, will be forwarded to the Dean of Students and placed in the student’s file.

Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XF in the course, indicating failure of the course due to academic dishonesty. This grade will appear on the student’s transcript for two years after which the student may petition for the X to be expunged. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board.

Students should be aware that unauthorized collaboration—working together without permission—is a form of cheating. Unless the instructor specifies that students can work together on an assignment, quiz and/or test, no collaboration during the completion of the assignment is permitted. Other forms of cheating include possessing or using an unauthorized study aid (which could include accessing information stored on a cell phone), copying from others’ exams, fabricating data, and giving unauthorized assistance.

Research conducted and/or papers written for other classes cannot be used in whole or in part for any assignment in this class without obtaining prior permission from the instructor.
Students can find the complete Honor Code and all related processes in the Student Handbook at [http://www.cofc.edu/generaldocuments/handbook.pdf](http://www.cofc.edu/generaldocuments/handbook.pdf)

SERVICES FOR STUDENTS WITH DISABILITIES

The College will make reasonable accommodations for persons with documented disabilities. Students should apply for services at the Center for Disability Services/SNAP located on the first floor of the Lightsey Center, Suite 104. Students approved for accommodations are responsible for notifying me as soon as possible and for contacting me one week before accommodation is needed.

I have read and agree to the terms of this syllabus

_____________________________  __________________________
Name                                      Date
Contact Name  Timothy Callahan

Email  CallahanT@cofc.edu  Phone  953-8278

Department/Program  Environmental Studies  School  Graduate School

Catalog Year in Which Change Will Take Effect  2016-2017

Does this proposal include:  □ Course title change*
  □ Course number change*
  □ Course description change*
  □ Undergraduate/Graduate cross-listing
  *complete Existing Course/New Course Information

A. If you are proposing to cross-list **two existing courses at the same level**, list the courses (acronym, title, number, course description) and provide a reason for cross-listing.

B. If you are proposing to cross-list **an existing undergraduate course with an existing graduate course**, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and **attach a syllabus** (or separate syllabi) that clearly indicates student learning outcomes, assignments, and rigor appropriate for each level.

C. If you are proposing to cross-list **an existing course with a new course at the same level**, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach the appropriate new course proposal form.

D. If you are proposing to cross-list **an existing course with a new course at a different level**, list the courses (acronym, title, number, course description), provide a reason for cross-listing, and attach the appropriate new course proposal form(s). Also **attach a syllabus** (or separate syllabi) that clearly indicates student learning outcomes, assignments, and rigor appropriate for each level.
**Proposed Cross-listed Courses**
(course acronyms, numbers, titles, and descriptions)

Advanced GIS: Environmental and Hazards Models: GEOL 469, EVSS 669
Advanced GIS: Environmental and Hazards Models Lab: GEOL 469L, EVSS 669L

Advanced GIS: Environmental and Hazards Modeling is designed to enhance student's knowledge of and skills in the science and applications of Geographic Information Systems. Topics include: Cloud GIS, model building, processing automation, LiDAR and image processing and FEMA's HAZUS.

**Reason for Cross-listing**

This course is offered for both undergraduate and graduate students. There is sufficient overlap in the topics covered that sharing resources makes sense. However, there is a distinct difference in assignments and expectations that allows different learning outcomes to be obtainable. Topics covered in Advanced GIS are beneficial for upper level undergraduate students pursuing a degree in Geology, and at the same time, are beneficial for graduate students pursuing a thesis or internship in a related field.

Please see attached syllabi for specific learning objectives.

**Changes to Existing Course Numbers/Titles/Descriptions**

Existing Course:

EVSS 669, EVSS 669L

Proposed Course Change:

EVSS 569, EVSS 569L

No changes to course title or description.
Undergraduate Syllabus

Instructor Information

Name: Dr. Norman S. Levine
Email: levinen@cofc.edu
Office location: NSCB 224F
Office hours: T TH 11:00-12:00
Phone: (843) 953 – 5308
Teaching Assistants: Alex Braud
Faculty Facilitator: Joe Francis

Learning objectives and goals:

- Students will advance their understanding of arc GIS and develop skills that will define them as GIS "Power" Users
- Students will learn professional standards prepare professional quality reports and presentations
- Students will become proficient in using GIS-Based (Arc-based) add-ons and stand alone programs.
- Students will design and develop GIS-Based models and integrated automation tools.
- Students will create basic Python scripts for use in calculations
- Students will gain a deeper understanding of natural hazards modeling and mitigation.

Course Requirements

Introduction:

This course is designed for students with understanding of and a passion for GIS. This course is designed to provide the students with the ability to develop and control GIS projects on their own. Students will work with concepts of Cloud GIS, Model building, process automation and FEMA’s HAZUS (Natural Hazards Analysis software). Students will work on independent and Group projects in order to enhance the student’s knowledge of and skills in the science and application of Geographic information systems.

Requirements:

Knowledge of the ESRI ArcGIS System. Basic knowledge of Excel and Access

Policies
SPECIAL CONSIDERATIONS

SNAP students, to enable us to meet your accommodation needs, please present your Professor Notification Letter within the first two weeks of class. If you wish, you can speak to me about your needed accommodation either after class or during my office hours.

CHEATING AND PLAGIARISM

College of Charleston Honor Code spells out your responsibilities to yourself and your fellow students. You will produce your own work, and you will not cheat on tests or plagiarize written assignments. If you violate the Honor Code, the College Honor Board will be notified.

All Students will be expected to follow the College of Charleston Code of Conduct, Honor Policy and Santee Cooper Laboratory policies when in this class.

ATTENDANCE POLICY

Attendance is not only strongly encouraged…it is required. You will not be able to get a top grade in the class without it. Miss three classes and your grade will be lowered one full step. Miss five classes and you Fail!

This class will be graded as follows if depending of the number activities and assignments based on a total point system of between 800 and 1200 points:

For example:

> Homework Assignments 200
> Online Certificates 100
> Class Module Projects 300
> Final Class Project 300
> Tests and Quizzes 100
> Class Participation and Attendance 50

Letter grades will be based on a percentage of your total points accumulated:

> >94% = A 90-93 = A- 87-89 = B+
> 84-86 = B 80-83 = B- 77-79 = C+
> 74-76 = C 70-73 = C- 67-69 = D+
> 64-66 = D 60-63 = D- <60 = F

Additional information: This class requires in class assignments and out of class work. I have an Open Door policy. Do not hesitate to ask for help or ever voice your concerns or opinions about the class. The last day of classes will be Thursday, April 21 (full semester and Express II classes), but that Thursday will count as a Monday. In other words, the last week of the spring will be Monday, Tuesday, Wednesday, Monday as far as classes are concerned. Only classes that meet on Monday will meet on April 21. Also note that we have a shortened exam schedule this semester. Final exams for the spring semester will begin on Saturday, April 23 and will end on Friday, April 29.
Textbooks
Recommended reading: *Online readings from the ESRI Campus*
Recommended reading: *GIS and Hydrology*
Recommended reading: *HAZUS-MH Basic Users Manual*

**Topic Modules**

Not all topics will be covered in any given semester. Selected modules will be based on the composition of the students in the class and the focus of projects and research currently underway in the department. Topics are being adjusted to account for new and upgraded facilities in the geology department and the Santee Cooper GIS laboratories at the College of Charleston. Several topics will always be included in each semester, topics 1, 2, 8 and 9 will always be part of each course.

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<tr>
<td><strong>Objectives:</strong></td>
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<tr>
<td><strong>Topics:</strong></td>
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<td><strong>Assignments:</strong></td>
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<th>Topic 2</th>
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<td><strong>Topics:</strong></td>
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<td><strong>Readings:</strong></td>
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<td><strong>Assignments:</strong></td>
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<tr>
<th>Topic 3</th>
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<tbody>
<tr>
<td><strong>Lesson:</strong></td>
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<td>Objectives:</td>
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<tr>
<td>Topics:</td>
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<tr>
<td>Readings:</td>
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<tr>
<td>Assignments:</td>
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</tbody>
</table>

**Topic 4**

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<tr>
<th>Lesson:</th>
<th>Run-off and Erosion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectives:</td>
<td>Understanding the Run-off portion of the hydrologic Cycle. How run-off effects erosion Established models for runoff and erosion</td>
</tr>
<tr>
<td>Topics:</td>
<td>Precipitation and runoff in the hydrologic cycle The rational Method The SCS Curve Method of How Erosion and water flow fit in USLE and RUSLE - Erosion models</td>
</tr>
<tr>
<td>Readings:</td>
<td>Journal articles on Rational Method, SCS curve method applications Article on RUSLE. Online material on Hydrology and run-off</td>
</tr>
<tr>
<td>Assignments:</td>
<td>Create a Rational Equation Model for runoff in a watershed (Q = CIA) Create a SCS curve number model for the same watershed Create a RUSLE model for the watershed</td>
</tr>
</tbody>
</table>

**Topic 5**

<table>
<thead>
<tr>
<th>Lesson:</th>
<th>HAZUS -MH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectives:</td>
<td>Complete the Basic FEMA Certification for the HAZUS-MH Hazard mitigation and assessment program</td>
</tr>
<tr>
<td>Topics:</td>
<td>Complete the following Modules: Hurricane, Flood, Earthquake</td>
</tr>
<tr>
<td>Readings:</td>
<td>HAZUS Training manuals and Materials for the FEMA Course</td>
</tr>
<tr>
<td>Assignments:</td>
<td>Running the FEMA HAZUS GIS software</td>
</tr>
</tbody>
</table>

**Topic 6**

<table>
<thead>
<tr>
<th>Lesson:</th>
<th>Scripting and Add-ons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectives:</td>
<td>Portability Key to Utility: Converting model to scripts</td>
</tr>
<tr>
<td>Topics:</td>
<td>Native languages of the GIS Converting models to scripts Professional Look</td>
</tr>
<tr>
<td>Assignments:</td>
<td>Convert One model to a Toolbox Convert one model to a menu Script</td>
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</table>

**Topic 7**

<table>
<thead>
<tr>
<th>Lesson:</th>
<th>3D Visualization</th>
</tr>
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<tbody>
<tr>
<td>Objectives:</td>
<td>Understanding the powered of Advanced Visualization technologies for environmental and scientific Communication.</td>
</tr>
<tr>
<td>Topics:</td>
<td>Principles of 3D visualization, 3-D tools within ArcGIS, proper uses of 3-D communication.</td>
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<tr>
<td>---------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Assignments:</td>
<td>Convert an existing project from this class into a 3-D format displayed both at desktop stations and on the Geowall.</td>
</tr>
</tbody>
</table>

**Topic 8**

<table>
<thead>
<tr>
<th>Lesson:</th>
<th>Advanced mapping techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectives:</td>
<td>Bringing it all together</td>
</tr>
<tr>
<td>Topics:</td>
<td>Cloud GIS – porting and Pushing information to the world</td>
</tr>
<tr>
<td>Readings:</td>
<td>Cartographic design and web-GIS practices (ESRI online)</td>
</tr>
<tr>
<td>Assignments:</td>
<td>Create a informational poster / brochure and upload data to the Arc-Cloud Server for one of the assignments</td>
</tr>
</tbody>
</table>

**Topic 9**

<table>
<thead>
<tr>
<th>Lesson:</th>
<th>ArcGIS PRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectives:</td>
<td>Learning Interface developing multiple project windowing</td>
</tr>
<tr>
<td>Topics:</td>
<td>Visualization</td>
</tr>
<tr>
<td>Assignments:</td>
<td>Student based quest related to personal research</td>
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</tbody>
</table>

**Topic 10**

<table>
<thead>
<tr>
<th>Lesson:</th>
<th>Survey 123</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectives:</td>
<td>Developing a point data collection App</td>
</tr>
<tr>
<td>Topics:</td>
<td>Survey creation, app development.</td>
</tr>
<tr>
<td>Assignments:</td>
<td>As required by research or C of C department/agency. Need</td>
</tr>
</tbody>
</table>

**Topic 11**

<table>
<thead>
<tr>
<th>Lesson:</th>
<th>Final Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectives:</td>
<td>Group Project</td>
</tr>
<tr>
<td>Assignments:</td>
<td>Group Project have fun doing lots of stuff</td>
</tr>
</tbody>
</table>
Graduate Syllabus

Instructor Information
Name: Dr. Norman S. Levine
Email: levinen@cofc.edu
Office location: NSCB 224F
Office hours: T TH 11:00-12:00
Phone: (843) 953 – 5308
Teaching Assistants: Alex Braud
Faculty Facilitator: Joe Francis

Learning objectives and goals:
• Students will advance their understanding of arc GIS and develop skills that will define them as GIS "Power" Users
• Students will learn professional standards prepare professional quality reports and presentations
• Students will become proficient in using GIS-Based (Arc-based) add-ons and stand alone programs
• Students will design and develop GIS-Based models and integrated automation tools.
• Students will create basic Python scripts for use in calculations
• Students will gain a deeper understanding of natural hazards modeling and mitigation.
• Students will develop skills in project management and team development

Additional, more rigorous Student Learning Outcomes for graduate students in this cross-listed course:

Environmental Studies graduate students demonstrate a comprehension of environmental issues beyond general knowledge and understanding by:

• Obtaining, explaining, and applying scholarly information related to environmental issues
• Integrating facts, concepts, and methods from multiple disciplines
• Effectively communicating environmental facts, concepts, and methods
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Requirements: Knowledge of the ESRI ArcGIS System. Basic knowledge of Excel and Access

Policies

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This class will be graded as follows if depending of the number activities and assignments based on a total point system of between 800 and 1300 points: Graduates students have 3 additional assignments compared to Undergraduate section

For example:

<table>
<thead>
<tr>
<th>Homework Assignments</th>
<th>300</th>
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<tbody>
<tr>
<td>Online Certificates</td>
<td>100</td>
</tr>
<tr>
<td>Class Module Projects</td>
<td>300</td>
</tr>
<tr>
<td>Final Class Project</td>
<td>300</td>
</tr>
</tbody>
</table>

Letter grades will be based on a percentage of your total points accumulated:

- >90% = A
- 87-89 = B+
- 80-86 = B
- 77-79 = C+
- 70-76 = C
- <70 = F
Tool – Script presentation ............100 **
Tests and Quizzes .................. 100
Class Participation and Attendance 50
(** a graduate student only assignment)

Additional information: This class requires in class assignments and out of class work. I have an Open Door policy Do not hesitate to ask for help or ever voice your concerns or opinions about the class. The last day of classes will be Thursday, April 21 (full semester and Express II classes), but that Thursday will count as a Monday. In other words, the last week of the spring will be Monday, Tuesday, Wednesday, Monday as far as classes are concerned. Only classes that meet on Monday will meet on April 21. Also note that we have a shortened exam schedule this semester. Final exams for the spring semester will begin on Saturday, April 23 and will end on Friday, April 29.

Textbooks
Recommended reading: *Online readings from the ESRI Campus*
Recommended reading: *GIS and Hydrology*
Recommended reading: *HAZUS-MH Basic Users Manual*

Topic Modules

Not all topics will be covered in any given semester. Selected modules will be based on the composition of the students in the class and the focus of projects and research currently underway in the department. Topics are being adjusted to account for new and upgraded facilities in the geology department and the Santee Cooper GIS laboratories at the College of Charleston. Several topics will always be included in each semester, topics 1, 2, 8 and 9 will always be part of each course.

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<thead>
<tr>
<th>Lesson</th>
<th>Introduction and Overview To Advanced GIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectives:</td>
<td>To ease the class into the world of high powered GIS.</td>
</tr>
<tr>
<td>Topics:</td>
<td>Expectations - - What will this class cover.</td>
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<td>Skills Test</td>
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<td></td>
<td>Tools of the trade</td>
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<tr>
<td></td>
<td>Overview of topics to be covered</td>
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<td>Getting on ESRI.com</td>
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<td></td>
<td>Campus Logons</td>
</tr>
<tr>
<td>Assignments:</td>
<td>Map Assignment - Student Addresses See where your skills are!!! ESRI Geodatabase Workshop.</td>
</tr>
</tbody>
</table>
# Topic 2

<table>
<thead>
<tr>
<th>Lesson:</th>
<th>Models and Modeling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectives:</td>
<td>Basics of Models and Modeling Learning terminology of modeling Learning to use the Model Builder Extension in GIS Creating simple models and toolboxes</td>
</tr>
<tr>
<td>Topics:</td>
<td>Model types Model limitations Parts of a model Modeling Environments</td>
</tr>
<tr>
<td>Readings:</td>
<td>Online readings from ESRI on Modeling</td>
</tr>
<tr>
<td>Assignments:</td>
<td>Learning GIS Model builder tutorial Simple modeling assignment Graduate students only prepare a 3 minute presentation of and ESRI arcScript add on that would be useful in your research area</td>
</tr>
</tbody>
</table>

# Topic 3

<table>
<thead>
<tr>
<th>Lesson:</th>
<th>Basic Inundation Model</th>
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<tbody>
<tr>
<td>Objectives:</td>
<td>Create a simple Bathtub Inundation Model for a coastal region</td>
</tr>
<tr>
<td>Topics:</td>
<td>Coastal modeling Flood modeling Questions of data accuracy precision and scale in modeling sea level; rise Saffir-Simpson Hurricane scale</td>
</tr>
<tr>
<td>Readings:</td>
<td>2 Journal articles on sea level rise modeling</td>
</tr>
<tr>
<td>Assignments:</td>
<td>Create a hurricane inundation model for a section of the Low country in SC. prepare a write up and small poster for the work Graduates include a powerpoint of how to use your tool</td>
</tr>
</tbody>
</table>

# Topic 4

<table>
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# Topic 5

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<tr>
<th>Lesson:</th>
<th>HAZUS-MH</th>
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</thead>
<tbody>
<tr>
<td>Objectives:</td>
<td>Complete the Basic FEMA Certification for the HAZUS-MH Hazard mitigation and assessment program</td>
</tr>
<tr>
<td>Topics:</td>
<td>Complete the following Modules: Hurricane, Flood, Earthquake</td>
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<tr>
<td>Topic 6</td>
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<tr>
<td>Lesson:</td>
<td>Scripting and Add-ons</td>
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<tr>
<td>Objectives:</td>
<td>Portability Key to Utility: Converting model to scripts</td>
</tr>
<tr>
<td>Topics:</td>
<td>Native languages of the GIS Converting models to scripts Professional Look</td>
</tr>
<tr>
<td>Assignments:</td>
<td>Convert One model to a Toolbox Convert one model to a menu Script Graduates present a how to use the tool lesson to the class</td>
</tr>
</tbody>
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<thead>
<tr>
<th>Topic 7</th>
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<tbody>
<tr>
<td>Lesson:</td>
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<tr>
<td>Objectives:</td>
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<td>Topics:</td>
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<th>Topic 8</th>
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<tr>
<td>Lesson:</td>
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<tr>
<td>Objectives:</td>
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<tr>
<td>Topics:</td>
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<td>Readings:</td>
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<td>Topics:</td>
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<td>Lesson:</td>
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<td>Topics:</td>
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<td>-------------</td>
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<td><strong>Topic 11</strong></td>
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<tr>
<td><strong>Lesson:</strong></td>
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<tr>
<td><strong>Objectives:</strong></td>
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<tr>
<td><strong>Assignments:</strong></td>
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FACULTY COMMITTEE ON GRADUATE EDUCATION, CONTINUING EDUCATION
AND SPECIAL PROGRAMS

CHANGE/DELETE GRADUATE PROGRAM PROPOSAL FORM

Contact Name: Tim Callahan  Email: callahant@cofc.edu  Phone: 3-2002

Department and School Name: Master of Science in Environmental Studies, Sciences and Mathematics/Humanities
and Social Science  Name and Acronym of Graduate Program: EVSS (MES Program)

Date (Semester/Year) changed/deleted program will take effect: Immediately upon Senate approval

I. CATEGORY OF REVIEW (Check all that apply)

☐ Change Request (attach details):
  ☒ Add existing course or courses to requirements or electives
  ☐ Add new course(s) to requirements or electives (complete and attach COURSE FORM for each)
  ☐ Delete courses from requirements or electives
  ☐ Add new emphasis (check one):  ☐ concentration  ☐ track  Total # of hours:
    (note: any emphasis involving more than 18 credit hours will also require CHE approval)

☐ Terminate Program (check one):  ☐ Degree  ☐ Certificate  ☐ Emphasis (concentration/track)
(if checked, skip section II, IV, V, and VII below)

Are students currently enrolled in the program?  ☐ Yes  ☐ No
If yes, what semester will students complete the program?

If the program termination includes deleting courses from the inventory, a COURSE FORM must be included with this form for each course deletion.

☐ Interdisciplinary (attach evidence of acknowledgement from relevant departments)

II. DESCRIPTION OF CHANGES: If a changed program—please explain changes below; if a new emphasis—please provide the details below.

Add the following courses to the list of approved courses for the EVSS program.

BIOL 618 Marine Molecular Ecology (4)
BIOL 650 Seminar in Marine Biology (1)
III. RATIONALE or JUSTIFICATION

For changes or termination, please provide a detailed justification. For a new emphasis, briefly address the goals/objectives for the new emphasis, provide evidence of student interest (i.e., has the program offered special topics courses in this area? has the program interviewed student focus groups as part of an internal assessment? etc.), and explain how the emphasis supports the liberal arts tradition and the mission of the institution.

These courses have been approved in the past but apparently have not been officially designated as approved courses.

IV. CURRICULUM

Provide the COMPLETE curriculum for the changed program and/or new emphasis distinguishing between required and elective courses. Note pre-requisite courses where appropriate. Note any sequencing of courses or requirements in the program, listed exactly as it should appear in the catalog.

Master of Science in Environmental Studies  (37 credit hours)
The Master of Science in Environmental Studies degree requires a minimum of 37 credit hours of coursework.
Each student is required to complete a sequence of core courses. Students will then choose electives from a range of approved courses, according to their area of interest. Central to the student's activity is a research project (as either a thesis or applied research project) of which six credit hours are awarded upon successful completion of the project.
Students are required to take at least 23 credit hours of core courses as outlined below. The core courses fall into four categories: statistics, science, policy, and case-based (thesis/internship).
Degree Requirements:
  37 total credit hours
  23 credit hours of Core Requirements
   6 credit hours of Thesis (EVSS 691) or Internship (EVSS 690)
   At least 14 credit hours of elective courses
   Program of Study designed with Academic Advisor based on student's area of interest
Core Requirements:
Environmental Studies:
EVSS 646 Core Seminar (2)
Statistics:
EVSS 659 Environmental Statistics (3)
  OR
EVSS 624 Biometry (4)
Policy and Social Science:
EVSS 601 Economic Theory for Policy Analysis (3)
EVSS 602 Public Policy (3)
EVSS 632 Social Science Methods for Environmental Studies (3)
Natural Science:
EVSS 610 Environmental Biology (3)
OR
EVSS 631 Pollution in the Environment (4)
OR
EVSS 640 Earth Systems Science (3)
OR
EVSS 650 Energy Production for Resource Management (3)
Thesis/Internship:
EVSS 690 Internship (6)
OR
EVSS 691 Thesis (6)
Students must take at least 14 credit hours of the following Electives (14 hours):
EVSS 605 Environmental Law and Regulatory Policy (3)
EVSS 606 Wildlife Law (3)
EVSS 607 Administrative Law (3)
EVSS 608 Perspectives on Public Administration (3)
EVSS 609 Administrative Ethics and Accountability (3)
EVSS 619 Biology of Coral Reefs (3)
EVSS 620 Physiology and Cell Biology of Marine Organisms (4)
EVSS 622 Ecology of Marine Organisms (4)
EVSS 623 Physical Oceanography (4)
EVSS 627 Marine Tetrapod Biology (4)
EVSS 628 Plant Ecology (4)
EVSS 629 Conservation Biology (3)
EVSS 630 Natural Resources Law and Policy (3)
EVSS 633 Urban Policy (3)
EVSS 635 Land Use Law (3)
EVSS 637 Wetlands Policy (3)
EVSS 638 Introduction to Hydrogeology (4)
EVSS 639 Wetlands and Watersheds (3)
EVSS 641 Aqueous Geochemistry (4)
EVSS 642 Fundamentals of Remote Sensing (4)
EVSS 645 Coastal Issues and Processes (3)
EVSS 649 Geographic Information Systems (4)
EVSS 656 Atmospheric Science (4)
EVSS 657 Satellite Meteorology (3)
EVSS 658 Climate Change (4)
EVSS 669 Advanced GIS: Environmental and Hazards Models (4)
EVSS 680 Case Studies in Environmental Issues (4)
EVSS 693 Independent Study (1-4)
EVSS 695 Special Topics in Environmental Studies (3-4)
EVSS 721 Aquaculture (3)
EVSS 722 Marine Invertebrate Zoology (4)
EVSS 724 Ichthyology (4)
EVSS 725 Marine Botany (4)
EVSS 726 Fisheries Science (3)
EVSS 746 Aquatic Toxicology (3)
BIOL 618 Marine Molecular Ecology (4)
BIOL 650 Seminar in Marine Biology (1)
Attach the completed COURSE FORM and a sample syllabus for each new course.

Is a syllabus for each new course attached?  ☒ Yes  ☐ No

V. STUDENT LEARNING OUTCOMES and ASSESSMENT

<table>
<thead>
<tr>
<th>Program-Level Student Learning Outcomes</th>
<th>Assessment Method and Performance Expected</th>
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<tbody>
<tr>
<td>What will students know and be able to do when they complete the program/emphasis? Attach Curriculum Map.</td>
<td>How will each outcome be measured? Who will be assessed, when, and how often? How well should students be able to do on the assessment?</td>
</tr>
<tr>
<td>1.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
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<tr>
<td>4.</td>
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Additional Outcomes or Comments:

VI. IMPACT ON EXISTING PROGRAMS and COURSES Please briefly document the impact of this changed/deleted program or new emphasis on other programs and courses; if changing/deleting a program—list all programs that will be impacted (and how); if adding a new emphasis—explain any overlap with existing programs or courses in the same or different departments.

No change

Is this changed/deleted program used by others?  ☐ Yes  ☒ No
If yes, please provide a letter of support in each case.
VII. COSTS ASSOCIATED WITH THE ACTION REQUESTED List all of the new costs or cost savings, (including new faculty/staff requests, library or equipment, etc.) associated with the action requested.

No cost
VIII. APPROVAL and SIGNATURES

Signature of Program Director:

Date: 2/29/16

Signature of Department Chair:

Date:

Signature of School Dean:

Date: 2/29/16

Signature of the Provost:

Date: 3/9/16

Return form to the Graduate School Office for Further Processing

Signature of Chair of the Faculty Committee on Graduate Education, Continuing Education & Special Programs:

Date: 3/25/16

Signature of Chair of the Graduate Council:

Date: 3/28/16

Signature of Faculty Senate Secretary:

Date:

Date Approved by Faculty Senate:
Callahan, Timothy J

From: Plante, Craig J
Sent: Monday, February 29, 2016 1:34 PM
To: Callahan, Timothy J
Cc: Brew, Shelly; Hillenius, Willem Jacob
Subject: Re: EVSS list of electives: note of support

Dear Tim,

Thank you for the email pertaining to the addition of two graduate-level Biology courses, BIOL 618 and BIOL 650, to the EVSS list of approved electives. These additions should cause no problems for GPMB students and, in fact, will at times be helpful should these courses approach the lower limit for enrollment numbers. More importantly, the option to take these electives will benefit those MES students wanting these courses. I am in full support of including these BIOL courses on the list of EVSS electives.

Thank you,
Craig Plante
Director, Graduate Program in Marine Biology

From: "Callahan, Timothy J" <CallahanT@cofc.edu>
Date: Monday, February 29, 2016 10:51 AM
To: Craig Plante <planteC@cofc.edu>
Cc: Shelly Brew <BrewS@cofc.edu>
Subject: EVSS list of electives: note of support

Craig,

I’d like to add BIOL 618 and 650 to our list of approved electives; these are courses that MES students tend to want on occasion for their program of study.
See attached proposal.

If you are OK with this, please send me a quick email note of support. Sorry for the rush but if you could provide the note by tomorrow (Tuesday 3/01) I’d appreciate it.

Thanks,
Tim

 Timothy J. Callahan, Ph.D.
 Professor of Geology and Environmental Geosciences
 College of Charleston
 Director, Graduate Program in Environmental Studies
 University of Charleston, South Carolina
 843-953-8278
 Mailing address:
 Dept of Geology
 College of Charleston
 66 George Street
 Charleston, SC 29424 USA