Narrative – ENVI361: Oceanography Foundation Studies Course Proposal
Integrative Upper Division Elective Category

This course introduces students to concepts and principles in oceanography. It is an interdisciplinary science course that uses real examples as case studies to link course content to current global issues related to ocean sciences and hands on activities and demonstrations to reinforce course concepts. ENVI361 has been modified to give students hands-on experience to better facilitate the learning of concepts. ENVI361 is currently taught every fall semester and will be developed as an online course for distance education students if it is approved as a foundational studies course to be taught in conjunction with the face to face course and/or over the summer if there is interest or a need. Annotations are listed in italics throughout the course syllabus.

Integrate multiple ways of knowing in a thematic approach to a particular topic or issue. There are two themes prevalent throughout the course. The first is the role of the oceans in global change, for example how the oceans respond to climate change or how ocean processes drive changes in climate, including tectonics, ocean chemistry, marine biological processes, heat transport by ocean currents, etc. In addition to studying past intervals of geologic time, we will also consider modern oceans and their role in present day climate change. The second theme revolves around human impacts, for example how population pressures on coasts impair water quality, how pollution impacts marine ecology, how the burning of fossil fuels alters ocean chemistry, etc. In the last third of the class, students apply the principles and concepts learned earlier to real-world examples of human impacts and global change happening now and in the recent past. Several topics in the course illustrate the historical development of theories and technology, for example, the development of the theory of plate tectonics, ultimately, the scientific evidence for plate tectonics resulting from scientific ocean drilling, and the applications to marine environments. Another example is the use of remotely sensed data to expand our knowledge of processes in the surface ocean ranging from temperatures and currents to biological productivity of marine algae. Students are also expected to consider cultural influences on the use of marine resources (i.e. fishing practices, off-shore drilling, etc.), the links between marine resources and economies (i.e. what happens when fisheries collapse, the impact of hurricanes on coasts, the impact of agricultural chemicals in the Gulf of Mexico, the impacts of eco-tourism and cruise ships, etc.), and policy implications for marine environments (i.e. extensions on permits allowing the dumping of sewage in the oceans, the formation of marine sanctuaries, regulations over dragging anchors in/near ports, potential legislation (and treaties) to curb carbon emissions and control ocean carbon sequestration).

Engage in a project or conduct research that makes use of multiple ways of knowing to address a particular topic or issue. In this course, students are asked to read their textbook and journal articles, participate in hands-on class activities, and do additional research outside of class for several projects. For in-class activities, students will be expected to develop hypotheses, test those hypotheses, and then report their results. In homework assignments, students are asked to interpret authentic data, which will require additional research on their own outside of class. Students also write three research papers on different aspects of oceanography and participate in a group research project.

Analyze and write at an advanced level. Three papers are due during the semester. Students are encouraged to submit their papers early for comments prior to the due date. Each students gets substantial feedback on each paper to help them develop their written communication skills. In addition, students have several homework assignments that make use of real-world data. They are expected to create plots of the data and make interpretations. Exams and homework assignments also require students interpret data and develop their writing skills.

Demonstrate the ability to effectively orally communicate the results of a project to an appropriate audience. Students will complete a group project that will be presented as a PowerPoint presentation to the entire course. In addition, students will work in small groups to complete in-class activities and engage in small group discussions. In both cases, groups are expected to report to the entire class their findings and points of discussion.

ENVI361: Oceanography - Fall 2009

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Class Meets: Tuesdays and Thursdays, 11:00 – 12:15 pm, Science 138
Office hours: Wednesday 2:00-4:00 pm, or by appointment
Textbook: Introduction to Ocean Sciences (10th edition) by Garrison
Note: This textbook should be widely available as a new and used textbook. To save money, this textbook is also available for purchase as an e-book or rented from the publisher. Information about purchasing an e-book or renting a textbook is available on the course BlackBoard site. In addition, there is little difference between this particular edition and the previous edition. Either edition may be used for this course.

Course Objectives
Over 70% of earth's surface is covered by oceans and more than half of the world's population lives within 100 miles of the ocean. As a result of increasing population pressures on our coasts and present-day climate change, many environmental problems are severely threatening the world's oceans and coastal areas. Oceanography is a truly interdisciplinary field, and in this course, we will investigate chemical, physical, biological, and geologic aspects of oceanography as well as political, economic, and social issues/concepts as appropriate, with the ultimate goal of understanding human impacts on the oceans, the influence the oceans have over climate, and potential consequences for marine ecology, resources, and environments as a result of global change. We will use real world examples to study topics such as damage due to hurricanes, human modification of estuaries, the impacts of the loss of wetlands, the dangers of invasive species, the problems with coastal structures, the impacts of sea level rise on island nations, etc. We will use authentic data to better understand ocean chemistry and the impacts of climate change. We will also discuss how principles in oceanography are related to terrestrial environments encountered in the mid-continent.

ENVI361 is an interdisciplinary science course for students wishing to satisfy their general education requirement for a science elective (GE2000) and/or an upper division integrative elective (FS2010).

Course Goals
- Increase knowledge about the scientific process and the importance of science in making informed and reasonable choices.
- Formulate hypotheses and interpret authentic data to evaluate those hypotheses.
- Develop critical thinking skills and critical analysis through problem solving of practical problems.
- Apply basic principles of physics, chemistry, geology, and ecology as they relate to the oceanography.
- Improve knowledge and understanding of human impacts on the marine environment.
- Increase communication skills through class discussions, writing short essays, reading assignments, and note-taking assessments.
- Understand the links between the marine sciences and other disciplines, for example, policy, economics, environmental science, etc.

Foundational Studies Learning Objectives for a Integrative Upper-Division Electives

- Use a thematic approach to a particular topic or issue that integrates multiple ways of knowing.
- Engage in a project or conduct research that makes use of multiple ways of knowing to address a particular topic or issue.
- Analyze and write at an advanced level.
- Critically read an analyze sophisticated, complex text, and to write intensively
- Includes assignments that apply information from within and across various "ways of knowing"
- Develop critical thinking skills and information literacy

Foundation Studies Learning Objectives Met By This Course:
FS-1 - Locate, critically read, and evaluate information to solve problems;
FS-2 - Critically evaluate the ideas of others;
FS-3 - Apply knowledge and skills within and across the fundamental ways of knowing (natural sciences, social and behavioral sciences, arts and humanities, mathematics, and history);
FS-5 - Demonstrate the skills for effective citizenship and stewardship;
FS-7 - Demonstrate the skills to place their current and local experience in a global, cultural, and historical context;
FS-8 - Demonstrate an understanding of the ethical implications of decisions and actions;
FS-10 - Express themselves effectively, professionally, and persuasively both orally and in writing.

Tentative **Course Schedule**

date	T	R	topic	chapter
Aug		27	Introduction/Gallery Walk[1]	1
Sept	1		Introduction/History *(technological advances that drove marine science)*	1,2
		3	Studying the Oceans; *oceanography from space exercise*	3
	8		Plate Tectonics	4
		10	Plate Tectonics, quiz 1, paper 1 due (the historical development of the theory of plate tectonics and the marine records that led to the acceptance of the hypothesis as a theory)	4
	15		Plate Tectonics; *seafloor spreading exercise*	5
		17	Water and Seawater[2], quiz 2	6
	22		Physical Properties of Seawater; *ocean chemistry exercise*	7
		24	**Exam 1**	
	29		Ocean Sediments *(natural resource exploitation)*	8
Oct		1	Ocean Sediments; *interpreting*	8

			sedimentology exercise	
	6		Air-Sea Interactions, quiz 3 *(build a subtropical oligotrophic gyre, part I)*	9
		8	Air-Sea Interaction; *carbon dioxide exercise*	9
	13		Ocean Circulation *(build a subtropical oligotrophic gyre, part II)*	10
		15	Ocean Circulation[3]; paper 2 due	10
	20		Ocean Circulation, *El Nino exercise*	10
		22	Waves, quiz 4	11
	27		Tides *(waves and tides as sources of electricity)*	12
		29	**Exam 2**	
Nov	3		Coasts (near-shore marine resources and their local/regional value – i.e. fisheries, petroleum, coral reefs; dangers to coasts from pollution, sea level rise, tourism, etc.)	13,15
		5	Coasts[4]	13,15
	10		Marine Biology	14
		12	Marine Ecology quiz 5 *(coral reef bleaching and the impacts on ecotourism and ocean ecology)*	16
	17		Ocean Ecosystems; *exotic species exercise*	17
		19	Thanksgiving, no class	17
	24		Ocean Ecosystems	19
		26	Pollution; *toxic chemicals in seawater exercise*	
Dec	1		Global Change (IPCC recommendations and concerns about oceans; impacts on oceans of different approaches to managing climate change)	TBA
		3	Global Change, quiz 6, paper 3 due	TBA
	8		Student Presentations	
		10	Student Presentations	
Dec		17	**Final Exam (10 am)**	

[1]*First day Gallery Walk: Students are divided into small groups. The groups travel around the room and answer various questions about the course that are written on large post-its (easel size). Each group must provide an answer for each question, and each group has a different colored sharpie that they keep to track their comments. They spend 3-5 minutes at each question and then move on. I time them and cue them when to move. Once all questions have been answered by all groups, we discuss their answers. The purpose is to highlight the variety of topics we will be discussing in class and quickly identify common misconceptions about oceanography. Also, the exercise attempts to set the tone for the class – that it will be interactive and have lots of discussion. Sample questions include, "How are the oceans related to weather and climate?"; "How does your local community impact the oceans or coastal processes?"; "How important are marine ecosystems to the world economies?"; "If all of the ice sheets and glaciers on the planet melted, how much do you think sea level would rise and how*

would that impact coastal communities?"; "Which organism or types of organisms are most important in the oceans?". In addition, several images are provided to students, and they describe what they think they are looking at.
[2] In-class demonstration illustrating how the addition of salt to water impacts the physical properties of water.
[3] In-class activity to study density and thermohaline circulation. Students will work in small groups, develop hypotheses and carry out an experiment.
[4]In-class activity with wave tanks to see the impacts of coastal structures on long shore drift. Students will work in small groups.

[2-4] above provide experiential learning opportunities

Exercises (homework)

- *Oceanography from space: Students will be given several different satellite images of land-use along coasts, sea surface temperatures, and ocean color. They will interpret the images (i.e. what is the impact on the ocean, what is the cause of the phenomenon, what are the consequences).*
- *Seafloor spreading: Questions are asked about different plate boundaries represented in a figure from the textbook – what types of motion are occurring today, what will be the impacts in the future, etc.*
- *Ocean chemistry: Students are given real chemical data from the north Atlantic Ocean and asked to plot the data and make interpretations.*
- *Sedimentology: Students are shown examples of different types of sediments in class. They are then given a set of data and a core photo and asked to plot the data and make interpretations about the depositional history based on changes in sediment type.*
- *Carbon Dioxide: Student are given CO_2 data from Mauna Loa and asked to plot the data and make interpretations. Students are also given a graph of CO_2 data for the last 30 million years and asked to interpret the data in a geologic context.*
- *El Nino: Students are given a figure of sea surface temperatures from the equatorial Pacific over a period of time. They determine the number of El Nino and La Nina events and the recurrence interval for El Nino events. Students are also given two maps of the equatorial Pacific Ocean with sea surface temperature anomalies for an El Nino year and a La Nina year plotted on the map. Students contour the data to see the differences in sea surface temperature between the two extreme events. Students are also asked to find information about how El Nino and La Nina events impact their local weather patterns.*
- *Exotic species: This is a web-based exercise where students find their own information on Zebra Mussels and the damage they have done in the Great Lakes. They are given a series of questions and must find the answers, for example, "How were Zebra Mussels first introduced to the Great Lakes?"; "What damage are Zebra Mussels responsible for, both financially and ecologically?"*
- *Toxic chemicals in seawater: Students are given PCB emission data as well as EPA guidelines for PCBs in seawater. They are asked to evaluate the data in terms of environmental health. They are also asked to calculate what the PCB concentration in the ocean could be if all the PCBs in the environment reached the ocean. Finally, they are also asked to find information about PCBs in Indiana waterways.*

Class Attendance and Participation
You are expected to attend every class, pay attention, and participate when appropriate. Although attendance will NOT be graded, it will be taken every day in some way. If you miss class, it is your responsibility to obtain any handouts, notes, or assignments for that class. Keep

in mind that in-class assignments and exercises cannot be made up. Also, be aware that I make no distinction between excused or unexcused absences. An absence is an absence.

Participation
Class participation is an important part of your final grade. Your grade will be based partly on your level of participation during in-class group assignments, discussions, and activities, and participation in the final group project. These assignments cannot be made-up if missed.

Reading Assignments
Your textbook reading assignments are listed above in the tentative schedule. Additional reading assignments based on journal articles will be available on the course Blackboard site as appropriate for class discussions. Lecture notes will be available prior to class on Blackboard (blackboard.indstate.edu) under course documents. Lecture notes that I provide are not meant to be all encompassing or stand alone documents. You need to take additional notes and add information as necessary. During the semester we will also have supplementary readings that will be the basis of small group discussions. Group discussion will be followed by whole class discussion about the assigned readings. You are also expected to keep up with current events. As events come up that are related to the course (important legislation, oil spill, hurricane, tsunami, rogue wave, unusual El Nino/La Nina related weather, fishery collapse, red tide, etc.), we will deviate from the tentative schedule and discuss the current issues.

Quizzes and Exams
There will six (6) online quizzes during the course of the semester, each worth 30 points. Your lowest quiz score will be dropped. Quizzes and exams will consist of multiple choice and short answer questions. Quizzes cannot be made up. You will only be given one chance to take the quiz. If you close your browser without completing the quiz, you will be locked out, and will not be able to continue. You will also have a limited amount of time to take each quiz. Quizzes will be made available the date they are listed on the syllabus and must be completed by 11:59 pm the following Monday. The scheduled exams can be made up; however, make-up exams will be a comprised of a limited number of short-answer questions. It is highly advised that you do not miss any quizzes or exams. There will be 3 exams, each worth 100 points. The final exam for this class will not be comprehensive.

Pop Quizzes, Homework, and Classroom Disruptions
If it becomes apparent that students are not grasping course material or paying attention, random pop quizzes may be given or additional homework will be assigned. Pop quizzes cannot be made up, and homework will have strict deadlines. Turning in homework late will result in a penalty of 10% per calendar day late. Pop quizzes may also be given for classroom disruptions. Classroom disruptions may include cell phone ringing, instant messaging, inappropriate use of a laptops (surfing, doing other assignments, email, etc.) arriving late/leaving early, private conversations, etc.

Research Papers
You will have three short research papers (~800 - 1000 words) due during the course of the semester. Each paper will be worth 50 points. You are expected to write an original paper with proper citations using either MLA or APA format. While components of these papers may be related to personal experiences, you must have scholarly references (at least 3 – 5 is recommended). Note that Wikipedia and other similar websites are *NOT* scholarly resources. If you choose to use this type of resource, you will need at least 5 additional resources to verify the information you obtained. If you have any questions about how to write a research paper or properly cite your references, please come see me, a classmate, or visit the writing center. You

are encouraged to turn in your papers early for comments without a grade, but they must be turned in at least 2 class periods before the final paper is due. Late papers will be accepted with a penalty of 10% per calendar day late. Paper grades will be based on both content and readability: 50% on content (including appropriate scholarly resources) and 50% on grammar, spelling, punctuation, organization, and the proper use of the English language. You should proof read your paper and/or have a friend proof read your paper prior to turning it in. All papers should be double spaced in 12-point font with one inch margins. Plagiarism will not be tolerated, and will result in a *minimum* punishment of a zero (0) for the assignment. You are expected to use scholarly references (i.e. not websites unless they are known to be reputable and of high quality). Please note that Wikipedia is not a reliable or scholarly reference and should not be used in scholarly writing. Papers must be submitted electronically through Blackboard as a *TurnItIn* assignment, which means that each paper will be automatically checked for plagiarism once it has been submitted. The link for the assignments can be found under assignments, and you simply click on the assignment to complete it. Do NOT submit your papers using the Digital Dropbox.

Writing Assignment 1: The oceans and technology - Investigate how oceanographers obtain the data they need to evaluate ocean chemistry, physics, biology, and geology. Identify one type of technology and explore how the technology works, the development of the technology over time, the important applications, and the resulting data. For example, you might consider investigating how oceanographers acquire data today that was very different than in the past. Examples include ocean drilling science, the use of satellites, ocean observatories, marine laboratories, types of sensors, multibeam geophysical surveys, remotely operated vehicles, or particular types of studies (marine mammals, ocean chemistry, etc.).
Due: September 10 by 11:59 pm

Writing Assignment 2: Marine Biology - Identify one marine organism or group of organisms for your paper. Papers should include photos, descriptions of appearance, habitat, etc. Your paper should also include how the organism is impacted by humans (i.e. overfishing, as by-catch, pollution, etc.), if the organism is a protected species of any kind, what role they play in their ecosystem, and a description of the most important threats to their success, if any. **Due: October 15 by 11:59 pm**

Writing Assignment 3: Reducing your impact on the oceans - Identify how your behavior (or the behaviors of your collective community) impact the oceans. Several links will be provided on Blackboard for carbon calculators. You can use this information to evaluate some of your personal behaviors (driving, recycling, etc.). Also identify strategies for reducing your (or your community's) impacts (i.e. recycling, green energy options, etc.). While this paper includes more personal reflection, you also need to have scholarly references.
Due: December 3 by 11:59 pm

Group Projects
You will be expected to participate in all aspects of the final group project related to environmental oceanography. Presentations should include a discussion of the scope of the environmental problem, including relevant history and policy/regulations, economic and societal impacts, and potential solutions. The project is worth 100 points. 30% of your group grade will be based on a peer review of your contribution to the project. Plagiarism will not be tolerated, and will result in a *minimum* punishment of a zero (0) for the assignment. Each group must have a different and unique topic that must have my prior approval. Project topics will be handled on a first come-first served basis. Each group will prepare a PowerPoint presentation to be presented the last week of classes. Presentations should be no more than 15 minutes in

length. While the group assignment is due later in the semester; it is recommended that you not wait until the last minute to begin the project. Group members should consider assigning tasks and deadlines for each other. Late group assignments will not be accepted and all members of the group will receive a zero. If a particular group member is not participating, we can discuss actions the group may take to remove that member. The group member that is removed will receive zeros for the assignment. If you do not attend both presentation days, you will receive a zero (0) for the group assignment, regardless of your contributions to the project. Your PowerPoint presentations must be uploaded to the digital dropbox in Blackboard by 11 am December 8.

Extra Credit
Extra credit opportunities are limited to those presented in the syllabus – the three items below. All extra credit (excluding number 4 below) must be completed by **December 1** unless otherwise stated. Extra credit assignments will only be accepted from students who attend class regularly and have completed both writing assignments and the group assignment.

1. Bring in a picture (photo) related to oceanography and discuss it in the context of what we are discussing in class. Each picture is worth up to 5 points and you can bring in up to 3 different pictures that depict 3 different ocean features or processes. You must have prior approval by me for any pictures that you are considering presenting to the class.
2. "Oceans in the News" Present a news article to the class related to the ocean sciences. Describe the particular news item and how it relates to course material.
3. Visit the Oceans Exhibit at the Indianapolis Zoo (or other zoo or aquarium) and describe the interactions between the different organisms. Describe anything you learned or found interesting and relate that material to the course.
4. Write a short paper describing the marine and marginal marine history of Indiana.

Laptop Not Required for Course: Usage Permitted
Your use of a laptop is generally permitted as long as such usage remains within the bounds of the Code of Student Conduct and it conforms to the provisions of its use as laid out in this syllabus. There may be occasions where laptop usage is forbidden and if that occurs, failure to comply with this direction will be viewed as a violation of the Code of Student Conduct. Use of your laptop for non-course related work during class time may result in a loss of laptop privileges during class.

Academic Dishonesty
Academic dishonesty is a serious offense because it undermines the bonds of trust and honesty between members of the community and defrauds those who may eventually depend upon our knowledge and integrity. All students are expected to adhere to the Code of Student Conduct. Academic dishonesty (including plagiarism) in any portion of the academic work in this course shall be grounds for awarding a grade of F for the work or the entire course and Student Judicial Programs will be notified of the academic integrity violation.

University Policies can be found on the Office of General Education Website:
http://www.indstate.edu/gened/docs/Foundational%20Studies/Info%20on%20Sycamore%20Standard%20and%20ADA%20and%20Laptops%20and%20Academic%20Freedom.pdf

Academic Freedom
"Teachers are entitled to freedom in the classroom in discussing their subject, but they should be careful not to introduce into their teaching controversial matter which has no relation to their subject."

Grades
Grades will be assigned based on the following distribution of points and percentages.

Exams	100 points each
Quizzes	30 points each (lowest quiz score dropped)
In-class assignments	10 points each
Group project	100 points
Written assignments	50 points each
Pop Quizzes	Variable
Homework	Variable (usually 15-20 points each)

Incomplete Policy: Incompletes will be given in only extreme circumstances and will not be given because of procrastination.

Grading Scale:

100 – 93	A	76 – 73	C
92 – 90	A-	72 – 70	C-
89 – 87	B+	69 – 67	D+
86 – 83	B	66 – 63	D
82 – 80	B-	62 – 60	D-
79 – 77	C+	< 60	F

Course Assessment
In addition to the assessments described above, students are also asked to complete a Blackboard survey to evaluate their perceptions of the course and their learning. Some of the questions included in the survey have been modified from the survey given to ENVI110 students. The survey uses a Likert Scale and the questions are included below:

Blackboard Survey
The student response options are, "strongly agree", "agree", "disagree", or "strongly disagree"

1. *I needed significant effort to learn the content in this course.*
2. *I was motivated to do my best work to meet the instructor's standards.*
3. *I needed to spend a significant amount of time on class material to be successful in this course.*
4. *I felt the instructor was approachable to discuss course-related issues.*
5. *The learning environment created by the instructor had a positive influence on my class performance.*
6. *I received useful feedback on my ability to meet course assignments.*
7. *The teaching strategies actively engaged me in learning the content.*
8. *I spent time thinking deeply about a number of course topics.*
9. *I have a stronger understanding of the content compared to the beginning of this course.*
10. *I developed knowledge and skills that can be applied outside of the course.*

11. *I was challenged to reconsider my point of view on some course topics.*
12. *I understand how content I learned in this class is related to other courses I have taken or may take in the future.*
13. *I developed positive relationships with other students from this class.*
14. *Appropriate technology was used in the course.*
15. *Group discussions were useful.*
16. *The course helped me to evaluate the ideas of others.*
17. *This course helped me to improve my writing skills.*
18. *This course increased my understanding of global issues.*