COURSE SYLLABUS

ENV 320 Aquatic Biology (Freshwater) Spring 2010
Instructor - James (Jim) L. Hulbert

OBJECTIVES OF COURSE

This course satisfies the GED O/N/P requirements

The General Education Requirements of the Rollins College Hamilton Holt School state that "As preparation for active and responsible citizenship in a global society, students need both breadth and depth in their learning experience" and "In keeping with the College's mission to educate students to think critically across disciplines, the general education curriculum exposes students to the ways various areas of knowledge may reinforce and enrich each other." Therefore, the College has set goals for courses for the **Scientific Perspective (O/N)** designation and students.

The goals and the methods of attainment of these goals for Freshwater Biology are:

Goal 1: Demonstrate knowledge of scientific principles, and paradigms or models at the appropriate level of analysis.

In tests/quizzes students will demonstrate knowledge of the following: scientific principles and methods pertinent to freshwater biology; appropriate unifying themes of aquatic biology; hierarchical levels of organization of biology; the River Continuum Concept (RCC) and how aquatic biological principles and techniques are applied to the U.S. "Clean Water Act". Laboratory exercises, reports and tests will be used evaluate students' knowledge of taxonomic techniques, as well as, the biological structure of major aquatic organisms.

Goal 2: Evaluate competing theories using empirical evidence.

In tests/quizzes students will demonstrate knowledge of different methods, metrics and biological groups used in the evaluation of stream and stream ecosystems and, likewise, used in water pollution biology for evaluating water quality. They will use biological metrics and indices to evaluate water quality and will demonstrate knowledge of these uses through testing, as well as, in a submitted report on such work. In a literature search/article file students will evaluate situations causing biological problems in freshwater. In addressing this project students will explore research on the internet, in scientific journals or technical reports.

Goal 3: **Find, analyze and evaluate scientific material, which may include quantitative and qualitative data, to make an informed decision.**

Students will locate and evaluate chemical, physical and biological data from internet sites/technical reports. They will use biological metrics and indices to evaluate biological data for a freshwater lake, stream or wetland of their choice that they must visit either on a class field trip or on their own. Knowledge of those ecosystems will be assessed through their data evaluation reports and through tests.

Students will also explore the differences shown with water quality data versus biological and physical data in evaluating biological integrity (ability of an aquatic ecosystem to support and maintain a balanced community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitats within a region). They will analyze the differences shown as being either due to natural effects of the River Continuum Concept or due to human disturbance of some type.

Goal 4: Upon completion of the laboratory requirement (N), students will be able to:

formulate a hypothesis; identify the dependent and independent generic experiment; and discuss the sources of error involved in the acquisition of experimental data by various methods.

Laboratory requirements will include: taxonomic classification and identification to order, in most cases, and to genera and species level, in some cases. Specimens covered in lab identification include freshwater macroinvertebrates , algae, micro-crustaceans, rotifers, protozoans, fish, aquatic macrophytes. Labs will involve use of microscopes (compound/dissecting), spectrophotometers and hydrolabs. Field work will involve different types of aquatic sampling equipment. Through the above laboratory exercises and field trips to local aquatic ecosystems, including Lake Virginia on the Rollins campus and local rivers, students will be introduced to the diverse flora and fauna of Florida's freshwater resources.

Lab tests and lab and field trip reports will indicate students' understanding of this material. These exercises should give them practical exposure to bioassessments, organism identification, aquatic food webs, predator/prey relationships, trophic levels and methods of determining the health/biological integrity of the ecosystems. Hypothesis formulation, independent/dependent variables and controls will be covered in the classroom. The labs are identification/taxonomy labs and sampling techniques labs. How that subject matter is used in applied biology is covered in detail.

The **American Association for the Advancement of Sciences has also determined that scientists think everyone should know enough science to:**

- Make personal decisions on matters involving science
- Understand and be able to critique newspaper articles on science
- Engage in scientifically informed discussion on contemporary issues
- Track down scientific information when needed
- Interpret basic scientific graphs, charts and tables
- Distinguish between scientific evidence and personal opinion
- Be familiar with laboratory and field work to ask appropriate scientific questions and to recognize what is involved in experimental approaches to the solutions of such questions

THE ACADEMIC HONOR CODE

The following pledge is a binding commitment by the students of Rollins College:
"The development of the virtues of Honor and Integrity are integral to a Rollins College education and to membership in the Rollins College community. Therefore, I, a student of Rollins College, pledge to show my commitment to these virtues by abstaining from any lying, cheating, or plagiarism in my academic endeavors and by behaving responsibly, respectfully and honorably in my social life and in my relationships with others."
This pledge is reinforced every time a student submits work for academic credit as his/her own. Students shall add to all submitted papers, quizzes and tests the following handwritten abbreviated pledge**: "On my Honor, I have not given, nor received, nor witnessed any unauthorized assistance on this work"** followed by their signature.

CLASS ATTENDANCE:

Class attendance is very important, especially since a lot of the lecture material is not from the texts. Therefore, if you miss class, be sure to obtain the notes from another class member. Taping lectures is acceptable and encouraged. In addition, my estimate is that about **6 questions** on the tests come from each lecture class. Taping of lectures is acceptable and encouraged.

LITERATURE REVIEW:

- Do literature review for **10 articles or book chapters (only review 1 or 2 chapters** relating your subject matter). Mainly do articles from journals or magazine. Pick a freshwater ecosystem, such as lakes or streams, and then select articles relating to various aspects of those systems. It'll be more meaningful if you, at least to some extent, follow the subject matter in our schedule. For example do an article or 2 during the first few weeks of the course on the physical and/or chemical aspects of your chosen ecosystem.
- Suggested journals include: ***Environment, National Geographic, Natural History, Journal of the North American Benthological Society, Journal of the North American Lake Management Society, The Florida Scientist*** or just google your subject matter. Most will be able to be obtained on-line at the Rollins library through **JSTOR or Proquest**.
- Articles need to relate to the course in general; but, preferably should relate directly to the a particular part of the course such as your field trip or some freshwater environment.
- Reviews are **due on April 27.** If late **five points will be deducted for each class past April 27 and then 5 points per day for each day past the last class.**
- When taking notes, remember to write out the complete bibliographic citation for each work. Don't forget the page number(s) as they may be necessary later for the footnotes and bibliography. Also write all direct quotations precisely, word-for-word, as the original. Use quotation marks, so it can be recognized as a directly quoted text and not a paraphrase. Failure to put a direct text in quotation marks or to credit the author sets the stage for plagiarism.
- Avoid copying too many direct quotations. Take down the substance of the author's idea in your own words, i.e**. paraphrase**. Most of the review should be primarily in your own words with appropriate documentation of others' ideas.
- Should start on literature review right away and continue throughout the course; to keep it from being a big burden approximately 1 per week.
- It's not due until the field trip report is due so some of the articles might be useful for writing that report.
- No specific length but should probably take at least one page per article to cover the subject adequately.
- Avoid copying too many direct quotations. Put the author's ideas in your own words, i.e**. paraphrase**. Most of the review should be primarily in your own words with appropriate documentation of others' ideas.
- Don't just use the abstracts of the books or articles.

FIELD TRIP REPORT: (You must actually go on a field trip with the class, on your own, or with other students; do not report on ecosystem you have not visited in person)
Then write an ecosystem report covering the items below.

- **It should take approximately 5 - 8 page, double-spaced and typed; however, the main point is to adequately cover every item in the outline** below. The report is **due on April 27.** If late **five points will be deducted for each class past April 27 and then 5 points per day for each day past the last class.**
- You can work with other students on visiting the ecosystem and gathering the information; however, **each student must turn in their own report written by them.** Example field trip reports will be brought to class a couple of time.

Information to be covered on report and Rubric for grading follow:

- **Introduction:** Information on water body: chemical characteristics, type of water, how formed, size, geological history, geography, stream flow **(25 points)**
- **Biology:** Organisms observed (birds, fish, macroinvertebrates, plants), number of species, diversity, indicator plants and animals, evaluation of what the biology means/indicates! **(25 points)**
- **Observations:** Make relevant to material covered in class. **(25 points**) e.g., sources of pollution, storm drains, rare species, etc. Put in ideas on correcting problems and/or protection of the resource.
- **Summary (10 points**)
- **Grammar, Spelling, Punctuation, Typing, Length (10 points**)
- **References:** Include at least **three** references **other than your text books (5 points).**

Course Grading will be based on:

- **Two tests** of equal value on the material assigned for that period (2nd test/final is not all inclusive) - **30%**
- **Best two** of three **quizzes - 20%**
- **Best one of two lab tests,** taken on the same days as the lecture tests, on the assigned labs for that period. (Lab tests cannot be made up) - **15%**
- **Lab sheets** best 5 of 6 labs, which will allow for1 missed lab - **10%**
- **Literature Review - 10%**
  - **Field trip report - 15%**

Subjective part on participation, interest shown, attendance, contribution in class, preparation for lab and class, and overall effort will figure into borderline grades.

All missed tests/quizzes can be taken after test is given but must be taken **before class meets again**. However, if a test/quiz has to be made up contrary to the above conditions, it will be a different test, **more of a short answer/short essay type test** and can be done anytime during the semester. If you anticipate missing a test, arrangements can be made to take it early. Arrangements for any makeup tests must be made with me.

Material on tests will come from topics covered in lecture and the texts, handout materials, videos, and other material specifically called to your attention.

I will keep tests, along with any other materials that you turn in, for one semester after the course is completed. You may make arrangements to review any of this material anytime during the semester or up to one semester after completion of the course.

**No extra credit is allowed since, with quizzes, tests, field trip reports and literature review, there is a good diversity of items making up the grades.

DISABILITY SERVICES:

Rollins College is committed to equal access and does not discriminate unlawfully against persons with disabilities in its policies, procedures, programs or employment processes. The College recognizes its obligations under the Rehabilitation Act of 1973 and the Americans with

Disabilities Act of 1990 to provide an environment that does not discriminate against persons with disabilities.

If you are a person with a disability on this campus and anticipate needing any type of academic accommodations in order to participate in your classes, please make timely arrangements by disclosing this disability in writing to the Disability Services Office at (box 2613) - Thomas P. Johnson Student Resource Center, 1000 Holt Ave., Winter Park, FL, 37289.Appointments can be scheduled by calling 407-646-2354 or email:gridgeway@rollins.edu

REFERENCES:

- Cain, M., W. Bowman, and S. Hacker, ***Ecology***. Sinauer, Inc., 2008 – for freshwater ecology
- Dressler, R., D. Hall, K. Perkins & N. Williams, ***Identification Manual for Wetland Plant Species of Florida.*** IFAS, University of Florida, 1987 – for macrophytes
- Fernald, E. and E. Purdum, editors, ***Water Resources Atlas of Florida.*** Florida State University, 1998 – for entire course
- Hynes, H. B., ***The Biology of Running Water***. University of Toronto Press, 1970 – for all biological aspects of stream ecology
- Hynes, H. B., ***The Biology of Polluted Waters.*** Liverpool University Press, 1966 – for the classes toward the end of the course
- Myers, R. and J. Ewel, editors, ***Ecosystems of Florida.*** Univ. of Central Fla. Press, 1990 – for detailed aspects of all freshwater ecosystems and field trips
- Reid, G., and R. Wood, ***Ecology of Inland Waters and Estuaries*****.** D. Van Nostrand Co., 1976 – out of print but could be obtained from Amazon.com - for entire course
- Waters, T., ***Wildstream***. Riparian Press, 2000 – best reference I've seen for streams; out of print but can be obtained from Amazon.com. – for stream ecology and biology
- Wetzel, R., ***Limnology: Lake and River Ecosystems.*** Academic Press, most current edition – very technical, but probably the best current text in Limnology; entire course
- Whitney, Ellie, Bruce Means, and Anne Rudloe, ***Priceless Florida***. Pineapple Press, Inc., 2004 – for entire course, especially for field trip report; used in many classes at Rollins
- **http://lakewatch.ifas.ufl.edu** – to copy booklets #101 – 109. I highly recommend all of them; together they form a succinct limnology book! **At least print #101,** ***A Beginner's Guide to Water Management-The ABC's: Descriptions of Commonly Used Terms,*** 1999

LABORATORY WORK:

- **USE PENCIL IN FILLING OUT YOUR LAB SHEETS/REPORTS!!!!**
- **NO FOOD OR DRINKS ARE ALLOWED INSIDE OF THE LAB ROOMS!**
- **LAB COATS for labs will be available for use in the labs.**
- Read over the lab exercise before you come to the lab class if it is handed out the class before.
- The lab classes, along with the field trip, will be "**hands on**" supplements to the lecture/text material.
- Will work in groups of two for most labs (it's fine if you want to do the lab by your self). Following **introductory remarks** concerning the lab you may start on the lab.
- Take breaks whenever you want.
- Feel free to consult with other students; the lab is a big "**Think Tank**" and consulting with other students is encouraged.
- **BEFORE YOU LEAVE LAB, CLEANUP YOUR LAB AREA. PUT EVERYTHING BACK FROM WHERE YOU OBTAINED IT, e.g., ON LAB CART OR BENCH!!**
- **LABORATORY SHEETS ARE DUE AT THE END OF EACH LAB UNLESS TOLD OTHERWISE.**
- **LABORATORIES CANNOT BE MADE UP IF MISSED**. However, only the best 5 of 6 labs are counted.
- **Lab Sheet Grading**: (**One lab grade will be dropped, either the lowest grade or a missed lab.)**

  100 points = all answers complete, correct or at least on right track; work neat/legible; correct grammar, spelling, clear writing expected on all sheets.

  90 – 99 points = 1- 4 errors or incomplete answers; work legible and neat.

  80– 89 points = 3 or 4 errors; work not neat or difficult to read.

  < 80 points = > 4 major errors, incomplete or illegible in many places

Course Schedule

Class meets in Bush 271 on Tuesday and Thursday, 6:45 PM-9:25 PM. Labs will be in Bush 220. Appointments are welcomed! This course satisfies the **GED O/N** requirement.

TENTATIVE COURSE SCHEDULE

DATE	TOPIC	DVD's/VIDEO's	MackieText Readings
1/12	Introduction History of Aquatic Biology and Limnology	part of "**Freshwater**" DVD Planet Earth Series	Chapter 1
1/14	Properties of Water	Univ. of Fla. booklet 101 (Website under references)	Chapter 1
1/19	Properties of Water	rest of "**Freshwater**"	Chapter 4
1/21	Properties of Water	"**What Makes a Quality Lake?**"	
1/26	Properties of Water	"**Sweet Fresh Water**"	Chapter 5
1/28	Lake Types/Origin		Chapter 3
2/02	Lake Types/Origin Eutrophication		Lake Booklet
2/04	**FIRST QUIZ** (Chapters 1, 4 & 5; Handout materials) **Lab #1**: **Use of microscopes; Use of Spectrophotometer; Use of Hydrolab automatic monitoring equipment**		
2/09	Knowing a Lake's Healthy Signs	"Polluting the Fountain of Youth"	Chapter 5
2/11	**Lab #2: Algae Lab - Prepared slides**		Chapter 7
2/16	Algae; Biological Nomenclature Taxonomy		Chapter 7
2/18	**Lab #2: Algae Lab – Live Algae**		
2/23	Streams	"**Down Upon the Suwannee**"	Chapter 2
2/25	**Lab #3: Zooplankton Lab** - Live and Preserved Protozoa; Rotifers, Hydra, Copepods, Cladocera	"Silent Explosion"	Chapter 7
3/02	Streams; Power of Water:	Rocky Mountain Flood Slides	
3/04	**1st LECTURE TEST** (Chapters 1 – 5 & 7; "What Makes a Quality Lake?" video; Handout materials) **1st LAB TEST (**Labs #1-3**)**		
3/09	**NO CLASS - SPRING BREAK**		
3/11	**NO CLASS - SPRING BREAK**		
3/16	Wetlands	"**Life in a Pond**"	Handout on Wetlands & pp. 47-49
3/18	Protozoa, Mollusks**,** worms, Rotifers, Crustaceans		Chapter 8
3/23	Insecta & other Macroinvertebrates	Macroinvertebrate PowerPoint	Chapter 8 Voshell text*
3/25	**Lab #4: Macroinvertebrate Lab** – preserved specimens		Voshell text*
3/26	**Last Day to Drop a Class without Penalty!**		
3/30	Macroinvertebrates	**"Wekiva Legacy or Loss?"**	

4/01 2nd Quiz: (chapters 8 & material from macroinvertebrate Power Point and Voshell text)
Lab #4: Macroinvertebrate Lab – Live preserved specimens

4/06 Fish, Amphibians, Reptiles, Birds "**Fascinating Fishes**" Chapter 9
4/08 Higher Plants (Macrophytes) "**The Fla. Aquatic Plant Story**" Chapter 6

4/13 3rd Quiz (Chapters 6 & 9)
Freshwater ecology "**Ecosystems**" Voshell text*
4/15 Lab # 5: Macrophyte Lab Chapter 6

4/20 Bioassessments Chapter 12
4/22 Lab # 6: Fish Lab Chapter 9

4/27 Pollution sources; Laws; Restorations
Waterfalls: Biology/Physical and Chemical aspects of
4/29 **2nd Lecture Test** (chapters 6 through rest of covered material)
2nd Lab Test (Labs 4 – 6)

Main Text: ***Applied Aquatic Ecosystem Concepts*** by Gerald L. Mackie, 2004
A Guide to Common Freshwater Invertebrates of North America by Voshell**,** 2002
The McDonald & Woodward Publishing Co.

* For macroinvertebrate lectures, labs and field trips.
** **Will try to schedule in 2 Saturday/Sunday field trips, e.g., Rock Springs Run from King's Landing; Black Water Creek from Seminole; Econ at 419; Wekiva River from the old Katie's Landing or Wekiva Falls**
*** **Maybe a 4 or 5 PM class to go to Baldwin Park to walk around Lakes Baldwin and Susannah and around Lake Virginia on campus**

Course Goal / Learning Outcome. describes broad aspects of behavior which incorporate a wide range of knowledge and skill. Upon completion of this course the student will have reliably demonstrated the ability to use the conventions of grammar when creating paragraphs. Learning Objectives. tend to describe specific, discrete units of knowledge and skill can be accomplished within a short timeframe. aims and objectives of the study The ultimate objective of the course is to satisfactorily prepare and present the research topic proposal for the BA thesis project. Learning Outcomes: After completion of the course students are expected to be able to: â€¢ identify research methods appropriate to particular kinds of problems in Formulating detailed instructional objectives for a course, or even for a single topic in a course, is not nearly as easy as simply listing the course topics in a syllabus. The effort, however, is worthwhile. Many professors who re-formulate objectives for a course â€“ even one they have taught for years â€“ find themselves with a course that is more interesting and more challenging to the students and more enjoyable for them to teach. Action Verbs for Writing Instructional Objectives. analyze classify contrast describe draw illustrate recite.