

## COURSE MECHANICS

### 1.0 OVERVIEW

#### 1.1 Goal and Approach:

The primary goal of this course is to develop physical thinking skills that are useful in biological applications by exercising them on the transfer of mass, momentum and information to and from marine organisms. That's a complicated way to state that the purpose of the class is to unravel how physical constraints control form and function in marine organisms. Because the environment is an expansive material (fluid, solid or granular), rather than a point mass, this exercise will involve continuum mechanics, a kind of physics that is generally not well covered in introductory physics classes but perhaps the most relevant physics to daily living and biology. An underlying theme is that biological, physical, chemical and geological processes are not separate in the natural world, and that recognizing and understanding abiotic constraints makes form and function of organisms easier to understand. The course recognizes that people do not all learn in the same way. Important concepts will be covered orally, in readings, visually (demonstrations and graphs), mathematically (where appropriate) and — most importantly — experientially, by doing. Students may use any combination of writing, sketching and equations to demonstrate understanding. Equations often are avoided by biology students as “too scary” or “too hard.” As an incentive, no credit will ever be taken away in this class for incorrect use of equations, and extra credit will be given for correct and relevant application of equations within essays and exams. Potential credit will be lost, however, by failing to attempt the weekly quantitative exercises.

#### 1.2 Grading:

Grading will be based on a combination of weekly assignments (40% essay; 10% word problems), two midterms (15% each), and a final (20%). The weekly assignments can be done either individually or in groups, but each individual is responsible *separately* for creating and turning in his or her version in a form that he or she understands and can explain, point by point in his or her own words. Most students find that working in groups of two to five accelerates and deepens their learning. **Identical or nearly identical phrasing or mathematical derivation is unacceptable plagiarism, whether taken from a fellow student, the web or another source. Anything you write, you need to be able to explain.** It is understanding and reasoning about which I care most.

#### 1.3 Textbook:

We have a textbook, but I will follow it neither slavishly nor sequentially. Rather, I will use it as reference and reading material. I've picked it because fluid dynamics are not intuitive, at least initially, and Vogel does an excellent job of both building intuition and staying readable. Don't panic; you will not be held responsible for all the material in this book:

Vogel, Steven. 1994. *Life in Moving Fluids. The Physical Biology of Flow*, 2nd Ed. Princeton University Press, Princeton, NJ. 467 pp.

I have lots of other material to read, if you want alternative explanations, and I will copy some of it for your use. You are welcome to come to my office at any time (the double-wide with fake green shutters on the south side of the road on the upper campus of the Darling Marine Center) to read other material. **My library is a reading, not a lending library, however, so no books can be removed from the premises.**

#### 1.4 Instructor:

My name is Pete Jumars (pronounced you'-mars), phone 563-3146, x. 242, e-mail <jumars@maine.edu>. I have a FirstClass account but prefer to use the less cumbersome UNET account. If you have no particular preference, outside class I prefer e-mail queries because they can be answered and delivered whenever I get them, usually speeding feedback. This fall I will be in Orono most weeks from Wednesday through Friday, and you can reach me there on a Darling Center phone (other than the one just outside the mail room) by dialing 400 until directed to dial an extension and then dialing 1-4431. Most Mondays and Tuesdays I will be at the Darling Center (1-3321 from the

Orono campus). I also carry a cell and can be reached on it if you are having trouble tracking me down (207-592-0717). I do not believe that authority should have any strong role in science, so I prefer to be addressed simply as “Pete” unless doing so makes you feel either uncomfortable or like you are not getting your money’s worth. If convenient for you, I prefer short, “hot-pursuit” kinds of questions and discussions during or immediately after labs and lectures, when the feedback will do you the most good. Feel free to drop into my office at any time, but I may need to reschedule longer discussions. If you want to schedule some time, the easiest thing to do is send me an *e-mail*. You are living in a remote field location, but mine is even more remote in Whitefield. By all means if you have an emergency of any sort please feel free to call me at home (549-3505). If it is not an emergency, please call before 2100 hours (9:00 PM).

## **2.0 FEEDBACK TO THE INSTRUCTOR**

Although they may help future students, leaving suggestions for improvement until the end of the semester will do you little good. I encourage feedback while your memory is fresh. After any lab or lecture, please give feedback that might prevent or improve the lecture or exercise the next time or might change the next lecture that you get. Here’s a short list to “prime the pump.” Include any other kinds of items that you see fit. I may ask for feedback more formally on specific topics.

- (1) If you would like to make sure that you got the point, in one to two sentences, state the principal message of the lecture.
- (2) Phrase questions raised in your mind by the lecture but left unanswered.
- (3) Suggest ways that your understanding could be improved (*e.g.*, more examples or more graphics).
- (4) What was the clearest point made?
- (5) What point was made the least clearly (or not made)?

I will address your concerns either in writing to you or the class as a whole or in my prefatory remarks for the next lecture. These feedbacks *are not* required but are appreciated and are an ongoing opportunity to improve and individualize what you get from me.

## **3.0 DETAILS ON GRADED ASSIGNMENTS**

### **3.1 Weekly assignments:**

Weekly assignments based on the lab are due by 1700 hours on Friday by *e-mail* in any of the following formats rtf, doc, docx, pages, eps or pdf formats. If you have difficulty with one of these formats, scans or photos of your papers (tiff or raw) are acceptable but make feedback more difficult. I expect material from the lectures to be used whenever applicable — material from the early part of the quarter being used throughout. They will vary from series of short questions to single, longer questions. For the typical week, shoot for an answer about one single-spaced page or two double-spaced pages long. That’s pretty short, so you should be thinking of producing a sentence each of introduction and conclusions, not a long paragraph. We will have had the rest of the introduction in the week’s work and sometimes in the question itself.

On your returned essays, you will find a list of 9 numbers giving credit as follows:

- (1) 40 points (Free!) for handing in a serious try on time;
- (2) 0-20 points for overall clarity and content;
- (3) 0-10 points for evidence of absorbing (not regurgitating) lecture material, *including all prior weeks*;
- (4) 0-10 points for proper use of terms and concepts;
- (5) 0-10 points for evidence of work beyond lecture. [Please use standard author-date format for citations and give the full reference (author, date, title, journal, volume, pages) at the end of your paper for any reference not provided by me in class.] You may begin information search either with references given in class, with supplemental references provided by me upon your request, or with references obtained through library resources (various software and abstracting journals).

Don't go crazy looking for extra material: You will be given full credit for *evidence* that you read the text and other material provided in class and did lab work. Listing a reference is not evidence of its use.

(6) 0-5 points for creativity (Is there a new synthesis or derivation that I can't find in the lectures or readings? Reading your own ideas gets pretty boring.);

(7) 0-5 points for organization (For answers longer than a paragraph, I strongly encourage outlining as an aid to organization. Depending on your preference, you may want to write from an outline or outline after writing to help with revision.);

(8) 1 bonus point each for perfectly correct spelling and grammar (I was a professional editor for six years.); and,

(9) 0-5 bonus points for correct and relevant use of equations.

I strongly urge you to grade each of your own papers according to these criteria before your final draft. It will materially improve your grade as well as your understanding. If you experience chronic low grades on one of the criteria, please discuss it with me.

I will throw out your lowest weekly score. In addition, I will average in extra, optional assignments. I suggest that you keep a running tally of your scores so that you can see how much an optional assignment might help your grade. In no case will I decrease your grade for doing optional assignments. Please see me for details if you are interested. I can design assignments either to cover some topic of special interest to you or to extend the work of a particular week's lab.

For the weekly word problems that request a quantitative answer, grading will be as follows:

(1) 40 points (Free!) for handing in a serious try on time;

(2) 0-25 points for my being able to follow what you did;

(3) 0-25 points for correct (consistent) handling of dimensions and units; and,

(4) 0-10 points for correct calculation of the numeric value requested.

For the week, if your word problem is graded higher than your essay, you get a grade equal to the unweighted mean (the median) of your essay and word problem grades. Failure to submit an answer to a word problem in a timely fashion will result in a 10-point reduction of your grade on the weekly essay. Submission of a serious effort that gets the wrong answer has no effect on your class grade. Word problems are due in my virtual (electronic) or physical mailbox at the DMC at 0900 hours on the Monday following their assignment.

### 3.2 Tests

To reduce fear of the unknown, I will use the same essay criteria to grade your exams and give extra credit for relevant and correct use of equations. No credit will be subtracted from test grades for failure to use equations or failure to use them correctly. On a test, you cannot reduce your grade by attempting (or not) to use equations.

### 3.3 Grades

I don't grade on a curve because it is an unreliable approach with this small a sample size, and I have developed a pretty good sense of what I can expect students to know from teaching this course over several iterations. Numerical scores convert to UMaine grades as follows: 100-96.67, A; 96.66-93.33, A-; 93.32-90.01, B+; 90.00-86.67, B; and, so on. I reserve the right to increase grades in case of poorly designed tests or other doubts about the way I present or evaluate.