



## **BES 301: Science Methods and Practice University of Washington, Bothell, Au 2010**

Section A: MW 11:00 – 1:00 UW1-102

Section B: TuTh 3:30 – 5:30 UW2-240

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Office Hours:  
M: 1:00-2:00, Th: 2:30 – 3:30  
and by appointment

### **Description**

This class introduces you to how natural scientists conduct their research. You'll learn by doing, working with your classmates to be the first people to analyze newly collected data. It is a required course for science students in IAS (STE, STS, ES and BSES) and S&T (Biology), and is also open to others who are interested in scientific inquiry. You'll learn approaches to communicating science, analyzing and presenting data and reviewing literature. These skills are used in advanced science courses at UWB and to interpret science in general.

### **Prior preparation**

I assume that you have had lower division science courses before and, therefore, that you have developed a basic familiarity with the way natural scientists investigate their questions. In the second half of the course, we will use MS Excel to analyze common statistical methods for analyzing quantitative data. A prior course in statistics would be helpful, but at the very least you should be comfortable with algebra and probability and be able to interpret graphs and tables. In addition to help from me, you can find assistance on how to use MS Excel and conduct statistical analyses at the Quantitative Skills Center (QSC). The QSC offers online workshops in beginning and intermediate excel, and these may be good introductions or refreshers for you. If you don't have this background, talk to me before taking this course.



### **Readings and Websites**



All of the readings, assignments, notes, documents, etc. are present through links on the course website on Blackboard. This website contains links to ERes (where you'll find selected readings) and the course blogs, assignments, the gradebook and other resources. Note that Blackboard functions best when you use Internet Explorer as your web browser. When you enroll for the course, please make sure to select the correct section.

[BES301a: Science Methods and Practice, Section A \(MW\)-Fall 2010](#)

[BES301b: Science Methods and Practice, Section B \(TuTh\)-Fall 2010](#)

Haven't used Blackboard at UWB? You'll need to enroll as a new user.

- Go to [bb.uwb.edu](http://bb.uwb.edu).
- Click on Create Account.
- Complete the info tagged with the red asterisk. I recommend that your user ID be the same as your UW NetID. Click on Submit and then OK.
- Click on the Courses tab. Type the course ID into the Course Search box and then select it.
- Click on Enroll on the right side of your course. Click on Submit at the bottom of the screen and then click on OK.

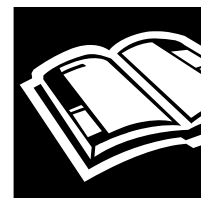
If you have used Blackboard before and already have an account:

- Go to [bb.uwb.edu](http://bb.uwb.edu).
- Log on. Forgot your password? Click on the link to have your password mailed to you.
- Click on the Courses tab. Type the course ID into the Course Search box. Select your course.
- Click on Enroll on the right side of your course. Click on Submit at the bottom of the screen and then click on OK.

## Skills and Outcomes

The outcomes for this course reflect the learning goals for the Interdisciplinary Arts and Sciences Program at UWB ([www.uwb.edu/ias/portfolio/learningobjectives](http://www.uwb.edu/ias/portfolio/learningobjectives)). Think about how this course provides you with opportunities to think critically, share leadership and collaborate in your learning, conduct interdisciplinary research and communicate your scholarship both orally and in writing. My aim is to teach you about scientific research in particular, but also to help you develop basic, transferable skills that prepare you for any pursuit. Upon successfully completing this course, you will

- make scientific discoveries.
- read and write scientific papers.
- examine and participate in the steps of observation-driven investigations, including crafting scientific questions and hypotheses, designing experiments, collecting and analyzing data, interpreting and presenting results.
- document your scientific experiences in a lab notebook.
- conduct research collaboratively, participating in peer review.
- locate and review scientific literature related to a specific question.



## How to Succeed

- Attend class. Arrive on time.

- Participate. Read the course material, enter into discussions, ask questions when you are confused and help your classmates master the material.
- Be courteous. Don't use cell phones in class. Be quiet when others are talking.
- Use your computer in class to help you complete your course work. If you are using your computer inappropriately (e.g., email, facebook, browsing on unrelated topics), I will ask you to close your computer so that you aren't distracting other students; in extreme cases, I will ask you to leave.
- Your classmates depend on you to complete your work on time. All of your assignments are due electronically (including the quizzes and exam), so even if you have to miss class, you can still complete your work. If you know ahead of time that you won't be able to complete an assignment, email and speak to me *at least one week prior* to the scheduled due date to request accommodation; I will decide whether to grant your request. Otherwise, I do not accept late work.
- Practice academic integrity. In particular, don't plagiarize. See the UWB General Catalog, the documents you signed upon admission to IAS, and the policy statements at [www.uwb.edu/academic/policies/academic-conduct](http://www.uwb.edu/academic/policies/academic-conduct) for crucial information regarding campus-wide policies about academic integrity. You are responsible for knowing what constitutes a violation of the University of Washington Student Code, and you will be held responsible for any such violations even if they were not intentional. The campus has compiled two extremely useful website with resources about avoiding plagiarism:  
[www.uwb.edu/library/guides/research/plagiarism.html](http://www.uwb.edu/library/guides/research/plagiarism.html)  
[www.uwb.edu/learningtech/plagiarism](http://www.uwb.edu/learningtech/plagiarism)
- When you have questions, use class time, office hours, and email to obtain answers. I do my best to answer email messages within 24 hours during the work week, although I tend not to check email over the weekend. I encourage attending offices hours or scheduling an appointment to receive one-on-one help or to discuss any topic in greater depth. I will answer questions pertinent to a particular assignment up until 5 pm the day before it is due. Let me know if you're struggling. I want you to enjoy this material as much as I do.
- Additional support services are available to help you succeed:



<b>Library</b>	<a href="http://library.uwb.edu/">library.uwb.edu/</a>	425-352-5340
<b>Writing Center</b>	<a href="http://www.uwb.edu/WritingCenter/">www.uwb.edu/WritingCenter/</a>	425-352-5253
<b>Quantitative Skills Center</b>	<a href="http://www.uwb.edu/qsc">www.uwb.edu/qsc</a>	425-352-3170
<b>Student Success and Career Services</b>	<a href="http://www.uwb.edu/student-services/success-services">www.uwb.edu/student-services/success-services</a>	425-352-3776
<b>Student Counseling Services</b>	<a href="http://www.uwb.edu/student-services/counseling">www.uwb.edu/student-services/counseling</a>	425-352-3183

- I encourage students with disabilities who would like academic accommodations to contact Disability Support Services at (425) 352-5307 (phone), (425) 352-5303 (TDD), (425) 352-3581 (FAX), or [dss@uwb.edu](mailto:dss@uwb.edu). They will be happy to provide assistance. You will need to provide documentation of your disability as part of the review process that determines what accommodations to offer you. See [www.uwb.edu/students/services/dss/index.xhtml](http://www.uwb.edu/students/services/dss/index.xhtml) for more information.

## Inclement Weather



The campus may be closed due to weather. You can check the status of campus operations from the website or by calling the Campus Information Hotline (425) 352-3333. You may also sign up with an alert system that will contact you via email or text message if classes are canceled ([www.uwb.edu/alert](http://www.uwb.edu/alert)). Class activities will be rescheduled as needed.

## Assignments

*IAS students:* As you learned in BIS 300, IAS is a portfolio-based program. Your degree concludes with a capstone project, which in most cases is the three-credit BIS 499 Portfolio Capstone course. To assemble your portfolio, you'll analyze influential and formative assignments from your classes. Any of the assignments from this class are suitable, especially the final paper. If you'd like to use these in your portfolio, please remember to keep your peer's and my own comments along with your drafts of the paper. See [www.uwb.edu/ias/iasdegreeportfolio](http://www.uwb.edu/ias/iasdegreeportfolio) for more information.

## Data Analysis Test

This exam includes multiple choice questions and essay questions. I expect you to be able to apply the statistical tests we discuss. I will test you on the concepts behind the analyses we've done and on your ability to interpret data.



## Demonstrate commitment to collaborative learning

Extensive research demonstrates that people don't learn much from lecture (feel free to ask me for references supporting this claim!). Instead, we learn best by *doing*. So, we'll spend our class time *doing science*. Science is a social activity; scientists work collaboratively, so we'll be working in groups in class. That means that the onus is on you to come to class prepared. To demonstrate your commitment to collaborative learning, keep up with your lab notebook, come to class with your completed worksheets in hand, and participate in good group discussions.

*Lab notebook, worksheets and participation*



Please see the "Lab Notebooks" handout under "Course Documents" on the Blackboard site for instructions on how to build and maintain your online lab notebook. This is where you'll record notes from each class meeting, as well as the answers to the worksheets that are assigned for homework. The worksheets help you prepare for our class meetings. I'll grade a random sample of worksheets and other lab notebook posting throughout the quarter. Your participation grade is

based on the overall quality of the lab notebook, discussions in-class and your interactions with group members.

### *Peer reviews*



Peer review is an essential component of research, and it's one of the main reasons journal articles have such credibility. You'll help each other improve your analysis, interpretation and writing skills by reviewing each others' papers. These reviews receive a pass/fail grade. A passing grade reflects careful consideration, constructive comments and valuable advice.

In order to obtain a useful peer review, you need to turn in an adequately prepared paper. If your paper is not finished on time or if the work is too sloppy to assess, then you will not receive your peer review (I won't let your group mates complete the review!). Instead, you will receive a 10% deduction from your final paper grade. In lieu of receiving a peer review, you will need to visit the Writing Center to gain feedback about your assignment. And, of course, you will still need to conduct peer reviews of your colleagues' work.

### *Letter to the editor*

Once we receive feedback in the form of a peer review, we need to respond with a cover letter that (1) convinces the editor of a journal that we've carefully considered the reviewers' comments, (2) explicates the changes that we made and (3) justifies why we chose not to make some changes. You'll have the chance to respond to your first peer review just this way.



### **Quizzes and surveys**

A few quizzes and surveys help me assess where the class is standing on different topics, but more meaningfully, they help you understand where your pitfalls are. Quizzes are graded. For surveys, however, you receive full credit simply by taking them.

### **Paper**

Although scientists communicate through a variety of informal means including poster and oral presentations, the most common form of currency is published papers. To be a successful scientist, you need to know how to write. Thus, you'll be working on a scientific paper throughout the term. The whole class will be working on a similar question (what ecological conditions favor fast shell growth in sea snails?), but you will be the first people to analyze these data and write-up these results. You're going to be part of the amazing process of making discoveries!



## Grades

Assignment	% of Grade
Data Analysis Test	15
Demonstrated commitment to collaborative learning <ul style="list-style-type: none"> <li>• lab notebook, worksheets and participation</li> <li>• peer reviews</li> <li>• letter to the editor</li> </ul>	15 10 5
Quizzes and Surveys	10
Paper	35
Total	100

Use the table below to convert your points to a grade. Note that the bins in this table overlap, affording me some flexibility in how I determine your grade. Thus, if your performance improves drastically, or if I feel that your assignments do not reflect your clear and innovative thinking, I will boost your grade. However, once grades are assigned, I will not change them!

Your points	94 – 100 %	90 – 94%	86 – 90%	82 – 86%	78 – 82%	74 – 78%
Grade	3.9-4.0	3.6-3.9	3.2-3.6	2.8-3.2	2.4-2.8	2.0-2.4
Your points	70 – 74%	66 – 70%	62 – 66%	60 – 62%	<60%	
Grade	1.6-2.0	1.2-1.6	0.8-1.2	0.7	0.0	

## Deductions

Certain habits are common among students in university classes and, while not wrong, they detract from the learning experiences that I aim to create in this class. To discourage their use, I deduct points from your assignment grade if you use them.

### Direct quotes

For every direct quotation that you use, I will deduct 5% of your grade for that assignment. That is because I want you to practice paraphrasing scholarly writing, using indirect quotes. Remember to cite your sources in text when you use *indirect* quotes. Failure to do so is a form of plagiarism.

### Inadequate preparation

The final paper is a cumulative project that you will write throughout the quarter. You'll be conducting two peer reviews, one on the paper's Results and another on the paper's Discussion. In order to make the most of your peer review, need to do your best job at meeting the criteria for writing a good Results section and a good Discussion. All too often, we are



tempted to turn in less-than-stellar work for a draft. If this were to happen in the real world, the editor would immediately reject your paper, deeming it not worth scientists' time to review. To emulate that in the classroom, if either your Results or your Discussion section is not adequately prepared by the due date, then (1) your peers will not have to complete that review, (2) I will deduct 10% from your final paper grade and (3) you will need to make an appointment with the Writing Center to gain feedback.




## Incompletes

University rules state that "an incomplete is given only when the student has been in attendance and has done satisfactory work until within two weeks at the end of the quarter and has furnished proof satisfactory to the instructor that the work cannot be completed because of illness or other circumstances beyond the student's control." IAS strongly discourages incompletes.

## Proposed Outline

*Please remember to update your lab notebook every day.*

Do this to prepare for class on	this date.		We'll discuss
	Section A	Section B	
	W 9/29	Th 9/30	Science as a way of knowing
Read Syllabus, Zongker 2007 Survey: Getting to know you Survey: Nature of Science	M 10/4	Tu 10/5	Case studies: the scientific process
Quiz: Plagiarism Quiz: Syllabus Lab Notebook worksheet Yamane and Gilman 2009 worksheet	W 10/6	Th 10/7	Our research project Introduce Results
Survey: What I think about science Hypotheses worksheet	M 10/11	Tu 10/12	Variables
t-test worksheet Read Hinton 1995	W 10/13	Th 10/14	Data Analysis 
Data analysis worksheet	M 10/18	Tu 10/19	Data Analysis 
Exam: Data Analysis	W 10/20	Th 10/21	Library
Library worksheet. Bring the three articles from this worksheet with you to class for the rest of our meetings.	M 10/25	Tu 10/26	Introduce Discussion
Results	W 10/27	Th 10/28	Peer review
Peer review of Results	M 11/1	Tu 11/2	Finish Results Introduce Introduction

Cover letters worksheet	W 11/3	Th 11/4	Cover letters
Cover letter: Results	M 11/8	Tu 11/9	Catch up
<b>No meeting 11/10 or 11/11</b> because of Veteran's Day. Extra office hours 11/10 11a – 1p.			
Discussion	M 11/15	Tu 11/16	Abstracts, Materials & Methods
Catch up	W 11/17	Th 11/18	Scientific Conferences 
Peer Review of Discussion	M 11/22	Tu 11/23	Finish Discussion
<b>No meeting 11/24 or 11/25</b> because of Thanksgiving 11/25. Extra office hours 11/24 11a – 1p.			
Popular science worksheet. <b>Last day to solicit feedback from me about your paper.</b>	M 11/29	Tu 11/30	Popular Science
Catch up	W 12/1	Th 12/2	Posters
Careers worksheet	M 12/6	Tu 12/7	Careers in science
Survey: The scientific process	W 12/8	Th 12/9	Interviews with scientists
<b>Paper</b>	<b>W 12/8</b>		<b>Due 3:30 pm online. No exceptions. (no meeting)</b>