

# **BB 317/BI 317: Scientific Theory and Practice, Spring 2017 (3 credits-WIC)**

## **Class meetings**

**MWF 11:00-11:50, ALS 2018**

## **Instructor information**

**Dr. Indira Rajagopal**

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**Office Hours: TR 1000-1100, other times by appointment.**

## **Aims of the course**

BB 317 / BI 317 is a course designed to help students approach problems scientifically, sharpen their critical thinking and analytical skills, learn the nuts and bolts of how science operates, and to guide them in planning their careers. As a WIC, BB/BI 317 will have numerous writing opportunities and assignments during the term. The course aims to prepare students for scientific/technical careers by teaching them

- To think critically and to analyze information presented to them
- To communicate scientific information effectively through writing, and
- To design a plan to achieve their career goals.

We will use discussions (in class and *via* an online discussion board) as well as written assignments to accomplish these goals.

## **Learning Outcomes**

Students will

- Develop and articulate content knowledge and critical thinking in the discipline through frequent practice of informal and formal writing.
- Demonstrate knowledge/understanding of audience expectations, genres, and conventions appropriate to communicating in the discipline.
- Demonstrate the ability to compose a document of at least 2000 words through multiple aspects of writing, including brainstorming, drafting, using sources appropriately, and revising comprehensively after receiving feedback on a draft.

*The above outcomes fall under the requirements for the Baccalaureate Core curriculum.*

In addition, students will

- Demonstrate knowledge of the conventions of peer review and publication in professional journals in the life sciences.
- Demonstrate knowledge of the criteria used to evaluate sources of information in the life sciences

Students will demonstrate competence in/knowledge of the nature and process of science by

- Analyzing, evaluating and interpreting evidence from peer-reviewed articles in the life sciences

- Formulating hypotheses and designing experiments to test hypotheses

### **Learning Resources**

There is no textbook for this course. Materials used in the course will be made available either as handouts, or online. To access the class materials, log in to Canvas and choose BB 317\_X001\_S2017. Look under Modules to find materials for the course.

It is each student's responsibility to check the website for new materials on a regular basis. I may also e-mail the class assigned readings or articles to be used in discussion, so it is your responsibility to check your mail daily. *Only OSU e-mail addresses will be used for this purpose, so be sure to check your onid accounts even if you use other addresses for your personal e-mail.*

I have posted office hours, but please feel free to come by at other times if you need to. I will be happy to talk to you as long as I don't have prior commitments. Or you may e-mail me your questions or request an appointment (my e-mail address is on the first page of this handout).

### **Course Philosophy and Class format**

This course is primarily concerned with the development of some basic skills and capacities that everyone trained in the sciences should possess and with informing students about the practice of science.

The first skill we will emphasize is scientific thinking. Most people, including many who major in the sciences, never learn to think scientifically. Their ideas about the physical world have been uncritically constructed. Most of their ideas have come into their minds without their having thought about it. They unconsciously absorb what the people around them think. They pick up impressions from television or the movies. In studying for classes, they memorize information with little questioning. To become a scientific thinker is to reverse that process by learning to practice skills that enable one to think consciously, carefully and deliberately.

The second skill we will focus on is writing and scientific communication. There are two major reasons for this. First, good writing is inextricably linked to clear and critical thinking. If you cannot reason well, you cannot write well. Conversely, writing is a form of thinking and writing your thoughts down can help to improve your thinking. Second, each discipline has its own vocabulary and conventions for communication. As a person trained in the life sciences, you must be able to use the language of your discipline accurately and in keeping with the educated usage of terms in your field. You must demonstrate knowledge of the conventions of scientific writing. Even if you do not plan to make science your career you must be able to communicate your ideas clearly, logically and in a manner appropriate to the readership or audience.

In addition to developing the two skills mentioned above, BB 317/BI 317 will also help you understand science as an enterprise- what is its place in society, who determines what research gets funded, how does one get money to do research, how are the discoveries of science used in medicine and technology, and last, but not least, what can you, as a person trained in science, do with your training and knowledge?

BB 317/BI 317 is primarily a discussion-based course. The class will focus on practice not on lecture. It will emphasize your figuring out things using your own mind, not memorizing what is in a textbook. I will regularly assign reading that you must complete before coming to class. You may also be required to bring in a short written assignment for the reading. Using the readings and your own analysis of the topic, we will have class discussions on the topic. On some days, we will devote a portion of class time to a short written exercise based on the readings. There will also be longer writing assignments that I will post from time to time on the class website. There are no “fact-testing” exams, but there are several criteria on which student performance in this class will be evaluated (see below).

### **Grading Policies**

Students will be evaluated on the basis of

1. Attendance, preparedness and professionalism: 25 pts
2. Class participation and in-class work: 100 pts (10 pts per week)
3. Informal writing (posts on the online discussion board): 100 pts (10 pts per week)
4. Formal written assignments: 200 pts
5. Final term paper: 75 pts.

These are discussed in greater detail below.

### **Attendance, preparedness and professionalism**

Since one of the aims of this class is to prepare you for your chosen career, you will be expected to behave in a professional and mature manner at all times. This includes, but is not limited to, being punctual and prepared for class. Being late or failing to do the required background work are not attributes that lead to success in the workplace or in professional or graduate school. Punctuality, personal responsibility and consideration for other people are qualities that will earn you respect. I will accordingly, emphasize the development of these traits in this class.

While punctuality and general professionalism are easy to assess, preparedness will be evaluated by the nature of your contributions to the discussion and by short assignments that may be assigned in or out of class time. These may vary from summaries of the main points of the reading to answers to questions on the assigned materials. Professionalism is also expected in the written assignments (specific guidelines will be provided).

### **Class Participation/In class work**

One of the aims of the course is to make you an active participant in learning. With this in mind, I will expect a significant amount of instructor-student and student-student interaction *via* discussions - in class and on the online forum. Since you will be graded on

both the *extent* and the *quality* of your contributions to the discussions, you will need to practice thinking critically about the topics that we are discussing. I will provide guidelines in class that will help you to critique thinking, so that you can assess your own and others' ideas for accuracy, clarity, relevance, etc. You must learn to avoid thinking that is vague, nebulous, confused, imprecise, sloppy, or indeterminate. *If you learn nothing else in the class, learn to be clear, precise, definite, specific, concrete, distinct, and exact in what you say and write.*

In-class work may include working with other students to analyze data, formulate hypotheses, design experiments, etc. Participation in class discussions and in class work will be graded on various criteria. These include plus points for productive contributions demonstrating good scientific/critical thinking skills, (e.g., taking a position on a topic, presenting evidence to support a position, making a relevant response to someone else's remarks, recognizing errors in someone else's or your own reasoning, listening actively, making a connection to another reading or topic previously discussed); and negative points for non-productive or disruptive behavior (such as not answering a direct question, not paying attention, interrupting others, monopolizing discussion time, being rude or disrespectful to another speaker). You are also encouraged to bring to the group's attention other sources that you may find that provide food for thought (articles related to the topic under discussion, for example).

One of the skills that class discussions aim to develop in you is the ability to critically analyze and discuss a topic in a civil and reasonable manner. It is vital that educated people, especially those educated in the sciences, be able to conduct discussions respectfully and without animosity, even on controversial topics. I hope to foster this skill in all of you. *I understand that many of you are not accustomed to speaking up in class and that some students may be nervous about participating.* It is important to get over your fear of speaking in front of others, so I will encourage you all to make an effort. This class is a safe and non-threatening place where you can gradually overcome your hesitancy and learn to enjoy a good discussion.

**Informal Writing (a.k.a., participation in the online forum).** We will use an online discussion board to supplement class discussions and to share ideas relating to science. Students are expected to participate in these discussions regularly. Posts on the online forum are less formal in structure than written homework assignments, but provide you with an opportunity to practice analyzing ideas and expressing yourself clearly. *Please note that contributions to the online forum must meet the same standards for thinking and writing as your written assignments, even if the tone is more informal. So, while humorous responses may be appropriate, sloppy thinking or poor writing are not acceptable.*

Please note that you are expected to make **a minimum** of 2 significant postings per week **to get a passing grade** in this section. There are 10 points per week for participation in the online forum, and the points don't carry over from week to week. This means you must participate every week to get points for that week (i.e., you can't make 20 contributions to the online forum in the last week of class and hope to pass). There are usually interesting discussions on the online forum, so it should be very easy for students to contribute to the conversation. To score well on this section, you should, naturally, do more than the minimum laid out above.

### **Formal Writing Assignments**

Assignments will be posted on a regular basis. You will be provided with detailed and explicit instructions for each assignment. *All out of class writing assignments must be typed.* One of the expectations of Writing Intensive Classes (WIC) is that students learn to improve their writing skills by revising their work based on feedback from instructors. Assignments will therefore be graded on the quality of the work (e.g., scientific thinking, clarity, accuracy, readability, completeness) and on the way in which the instructor's feedback is incorporated in revised work. You may opt to revise **any 2 assignments** of your choice during the term to improve your performance. This excludes the take-home final, which is graded separately (see below).

*Please note that if you wish to redo an assignment, you must request a redo within 2 class periods of the day that the graded assignment is returned to the class. The idea is for you to improve your skills by using feedback promptly, not to make elaborate calculations on whether you "need" the additional points at the end of the term to make the grade you desire. Any assignment that you ask to redo must meet two criteria: the first submission must have been a. completed in accordance with instructions and b. been submitted on time. Submissions that were not completed properly or were submitted late are not eligible for redos.*

### **Some Notes on Writing Assignments**

If you are to develop as a thinker, you will need to develop as a writer, as well. A key question I will ask in evaluating your written work is "What does your writing demonstrate about your ability to reason?" I will look for evidence that will indicate that you can think critically and communicate clearly and in ways that are appropriate for a person trained in the life sciences.

### **Due dates for assignments and policy on deadlines**

- When an assignment is posted, the due date will be clearly indicated.
- To allow for periods during the term when demands on you may be particularly heavy, you may request an extension of *no more than 2 days* on up to 2 regularly assigned deadlines during the quarter. For example, for an assignment that is due on a Monday, you may request an extension that will allow you to submit it on Wednesday of that same week. These requests must be negotiated *no later than two days before* an assignment is due.
- No other excused delays are permitted for any reason short of a documented hospitalization of the student or the death of a parent, partner or sibling. *Assignments that are turned in late without prior permission will lose 10% of the points for the assignment for each day that they are late.*

### **Final term paper**

Instead of a final exam you will have a take-home paper to write. I will post the instructions for the final paper at the beginning of the term. You may consult with me anytime thereafter about the paper till the week before it is due. I will gladly look over drafts of any of the sections of this paper and give you feedback, subject to the following conditions:

- You allow at least one week for me to provide you with feedback.
- You do not bring me your completed paper at the end of the term and ask me to critique the entire paper.

## **Grading Policies**

The class will not be graded on a curve. It is theoretically possible for the whole class to get an A or an F. No letter grades will be given before the final grade, although *you may discuss your standing with me at any time during the term*. You should focus on improving your performance, increasing your strengths and diminishing your weaknesses, not on looking for a grade.

## **General OSU and Departmental Policies**

### **Disabilities/ Special Accommodations**

Accommodations are collaborative efforts between students, faculty and [Disability Access Services \(DAS\)](#) with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 541-737-4098.

### **Expectations for Student Conduct**

Student conduct is governed by the university's policies, as explained in the [Office of Student Conduct: Information and Regulations](#).

### **Academic Integrity**

Students are expected to comply with all regulations pertaining to academic honesty. For further information, visit [Avoiding Academic Dishonesty](#), or contact the office of Student Conduct and Mediation at 541-737-3656.

OAR 576-015-0020 (2) Academic or Scholarly Dishonesty:

a) Academic or Scholarly Dishonesty is defined as an act of deception in which a Student seeks to claim credit for the work or effort of another person, or uses unauthorized materials or fabricated information in any academic work or research, either through the Student's own efforts or the efforts of another.

b) It includes:

(i) CHEATING - use or attempted use of unauthorized materials, information or study aids, or an act of deceit by which a Student attempts to misrepresent mastery of academic effort or information. This includes but is not limited to unauthorized copying or collaboration on a test or assignment, using prohibited materials and texts, any misuse of an electronic device, or using any deceptive means to gain academic credit.

(ii) FABRICATION - falsification or invention of any information including but not limited to falsifying research, inventing or exaggerating data, or listing incorrect or fictitious references.

(iii) ASSISTING - helping another commit an act of academic dishonesty. This includes but is not limited to paying or bribing someone to acquire a test or assignment, changing someone's grades or academic records, taking a test/doing an assignment for someone else by any means, including misuse of an electronic device.

It is a violation of Oregon state law to create and offer to sell part or all of an educational assignment to another person (ORS 165.114).

(iv) TAMPERING - altering or interfering with evaluation instruments or documents.

(v) PLAGIARISM - representing the words or ideas of another person or presenting someone else's words, ideas, artistry or data as one's own, or using one's own previously submitted work. Plagiarism includes but is not limited to copying another person's work (including unpublished material) without appropriate referencing, presenting someone else's opinions and theories as one's own, or working jointly on a project and then submitting it as one's own.

c) Academic Dishonesty cases are handled initially by the academic units, following the process outlined in the University's Academic Dishonesty Report Form, and will also be referred to SCCS for action under these rules.

Behaviors disruptive to the learning environment will not be tolerated and will be referred to the Office of Student Conduct for disciplinary action.

*"The goal of Oregon State University is to provide students with the knowledge, skill and wisdom they need to contribute to society. Our rules are formulated to guarantee each student's freedom to learn and to protect the fundamental rights of others. People must treat each other with dignity and respect in order for scholarship to thrive. Behaviors that are disruptive to teaching and learning will not be tolerated, and will be referred to the Student Conduct Program for disciplinary action. Behaviors that create a hostile, offensive or intimidating environment based on gender, race, ethnicity, color, religion, age, disability, marital status or sexual orientation will be referred to the Affirmative Action Office.*

### **Schedule**

The schedule we will use is flexible and will be driven by student interest. If a topic is especially stimulating and thought provoking we will spend more time on it. Below is the provisional list of topics. We may modify this schedule as appropriate to accommodate student interests.

- The Investigative Approach/ The Nature of Science
- Finding information and assessing sources.
- Reading and Analyzing a Scientific Paper
- Scientific Communication I
- Scientific Communication II
- Asking questions, formulating hypotheses, designing experiments
- Funding of Science/ Writing Research Proposals
- Ethics/Intellectual Property/Standards and Practices
- Science and Society
- Planning a Career