

Biomathematics Seminar (BIOL 380/MATH 383)

Theme = Diversity and Complexity

Spring 2016

Item	Details
Meetings	Wed., 4:00 - 4:50 in Newton 209
Professors	G. Hartvigsen , ISC 360, hartvig@geneseo.edu, 245.5448, office hours: MWF 10:32 - 11:43, Tues. 1:59-3:45 C. Leary , South 324, leary@geneseo.edu, 245.5384, office hours: MF 10-11, Tu 11-12, W 1:30-2:30, or by appointment
Textbook (required)	Scott E. Page. 2011. Diversity and Complexity. Princeton Univ. Press.

1 Expected Learning Outcomes

After successfully completing this course students should expect to be

1. able to discuss a variety of mathematical and computation models that are used to understand the dynamics and complexities of biological systems.
2. able to discuss the contribution of a scientific paper to the field of biomathematics,
3. able to develop and lay the foundation to the solution of a problem in biomathematics.
4. be able to effectively lead a discussion on a chapter and a primary literature paper. This will include the preparation and dissemination of questions that will guide participant reading.

2 Overview

The primary goal of this seminar is to bring together people interested in learning more about topics that span the disciplines of biology, mathematics, and computation. Your job is to have fun and participate. There will be some complicated material discussed. You might feel lost with some of the primary literature papers. This is fine - we're having an experience together! We hope you become engaged with the material. We encourage you to **try building some of the models yourself**. This would be particularly useful when you are a discussion leader (show us the model in class!). Keep your eyes out for possible research projects.

The readings are from the textbook and from papers from the primary literature (original findings that describe methods used to make the discovery). We expect everyone to be able to discuss the details of the book chapters completely each week. Papers will be provided on MyCourses on Thursday the week before they are discussed (unless the discussion leaders let us down!).

This class fulfills a requirement of the biomathematics minor (see <http://www.geneseo.edu/bulletin>).

3 Responsibilities

1. **Hartvigsen/Leary**. We organize the class, make sure additional readings are chosen by discussion leaders, make the readings available in a timely fashion on MyCourses, assess participation and discussion leadership.

2. **Discussion leaders.** To work effectively in teams to lead two interesting, interactive discussions (two different chapters). For each you also will choose a primary literature paper to accompany the chapter, provide a pdf of the paper to us one week before discussion is to take place. You will co-lead discussions with another student and provide questions that will promote participation by the Saturday just prior to the Wednesday discussion. During discussions your job is to call on students to participate, being mindful to allow everyone the chance to earn participation points. It is your job to not let one or two people do all the talking and to help the shy ones contribute.
3. **Discussion participants.** Participate in discussion by making useful additions to discussions each week. This is not just read the chapter and paper. It means you're expected to actually think about how the system works and how you might actually model this. Consider being able to discuss the framework for modeling the system under discussion. What would you need to be able to build the model? If something is unclear you can bring up pertinent, leading questions to get the discussion moving on how we would actually model this. Explore the topic beyond the provided resources. Note that contributions like "I don't get the figure on page 33" don't count toward participation points.
4. **GREAT Day Presentation.** One of the activities is to see a GREAT Day oral presentation in the field of biomathematics. Your job is to give a 2 minute talk at the white board about what was found by the researchers. This should include a statement of the problem, how the research was done, what was found (a graph), and what it means. Use of the white board is mandatory and should include only the graph of the findings as you talk. **You may not use any notes!**

4 Characteristics of a good discussion

A good discussion occurs when everyone has done the reading and participates to highlight and extend the important points from the chapters and papers. Sometimes discussions are downright painful because few have done the reading and/or the questions do not evoke participation (e.g., "What did the author mean by "complexity" on page 98, third paragraph, second sentence?"). Here are some characteristics of discussion leadership that get and/or keep things going well.

1. Do not summarize the book chapter or paper! It's always tempting to review the major points of the chapter or paper. This is NOT the job of the discussion leader!
2. Leading a dynamic, interactive, and interesting discussion on the chapter is done by **asking leading questions** that are core to the book chapter and paper, stimulate discussions, and give all students the chance to earn participation points. Good questions often lay a foundation for an idea and then ask participants to extend the idea. This might include asking for examples other than those found in the book. Sometimes it involves asking a question about a figure. Failing to make participation points easy to earn will deny your colleagues opportunities to share their thoughts (and get a good grade). Be sure to offer the opportunity for shy people to speak up. This is done by asking "Is there anyone who hasn't had a chance to speak who would like to add something?" You then have to **wait** to give them a chance. If you're a shy person we understand - but this will be your chance to participate. Please try to not let such opportunities go by.
3. Consider asking the following question and have, in reserve, an answer to "**Can someone describe how you might model this?**"
4. Avoid making fun of an answer to a question. An answer might not be relevant to the question you *thought* you were asking! This is common in this course. If that happens say "that's an interesting point" then try restating the question.

4.1 Getting the paper

1. It's important to choose a decent primary literature paper that can generate lots of interesting discussions. This is best if the paper is comprehensible. Most paper rejections occur because the papers are too long and/or complicated. Consider the following sources:
 - (a) <http://scitation.aip.org/content/aip/journal/chaos>
 - (b) <http://www.ploscompbiol.org/>
 - (c) <http://www.pnas.org/>
 - (d) <https://www.sciencemag.org/>
 - (e) <http://www.nature.com/>
 - (f) <http://www.journals.elsevier.com/physica-d-nonlinear-phenomena/>
2. Submit the discussion paper to Leary and Hartvigsen no less than one week prior to the day of your discussion. Not being able to find the paper in electronic form is not an excuse. Find it well ahead of the deadline.
3. Supply us with a document containing the leading questions you will ask about the chapter and paper at the time you provide the paper (or by Sat. is okay). These will be distributed to students for them to have while they do the reading.

5 Grading

Grading for this class is based on the following:

Activity	Points Available
Discussion Leadership	30 (15 pts ea.)
Participation	60
GREAT Day assignment	10
Total	100

Your engagement with the class each week affects your grade. See section 4 above for the criteria that will be used to assess your leadership performance. For participation you are expected to contribute in ways that add knowledge to the discussions, based on the readings and any additional knowledge you share which advances the discussion. Asking insightful questions that lead to further discussion also may count. Questions asked on matters that were, for example, defined in the required reading or could have easily been looked up, are okay but do not count.

Each unexcused absence as a participant results in the loss of full letter grade. Unexcused absences as discussion leader results in the loss of two full letter grades.

Your final grade will be converted from a percentage of points earned of the total to a letter grade using the following ranges. We will use three significant figures.

Score	Letter Grade	Score
0.933	A	$\leq \infty$
0.900	A-	< 0.933
0.867	B+	< 0.900
0.833	B	< 0.867
0.800	B-	< 0.833
etc.		

6 Electronic distraction devices, drugs, and other disabilities

Taking this course means you agree not to text, chat, “do Facebook,” watch YouTube videos, or do similar electronic gaming or distracting activities during class. Also, you agree not to consume alcohol or other recreational drugs during class or come to class impaired by such activities. If you find scheduling these activities around class time difficult then you should seek professional help (e.g., through the Lauderdale Center for Student Health & Counseling).

Additionally, SUNY Geneseo will make reasonable accommodations for persons with documented physical, emotional, or cognitive disabilities. Accommodations will be made for medical conditions related to pregnancy or parenting. Students should contact Assistant Dean Buggie-Hunt in the Office of Disability Services (tbuggieh@geneseo.edu or 585-245-5112) and their faculty to discuss needed accommodations as early as possible in the semester.

7 Schedule

Data	Topic	Read
1/20/2016	Introductions - Discussion Leader Assignment	
1/27/2016	1 On diversity and complexity	Preface + C1
2/3/2016	2 Measuring diversity	C2
2/10/2016	3 The creation and evolution of diversity	C3
2/17/2016	4 Constraints on diversity	C4
2/24/2016	5 Variation on complex systems	C5
3/2/2016	6 Diversity's benefits I - averaging	C6
3/9/2016	7 Diversity's benefits II - diminishing returns	C7
3/16/2016	Spring Break	
3/23/2016	8 Diversity's impact in complex systems	C8
3/30/2016	Paper of your choosing (2)	
4/6/2016	Paper of your choosing (2)	
4/13/2016	9 Parting thoughts	C9
4/20/2016	No class - you must go to GREAT Day (Tues., 4-19-16)	
4/27/2016	Presentations of presentations from GREAT Day	
5/11/2016	Final - 7:00 - 9:30 pm (Wed.)	