

Patterning the World: Connecting Mathematics and Science – Winter 2014

Program Syllabus

Patterning the World is a 12-credit, one quarter introductory program that integrates the study of mathematics and physics around a theme of *patterns*. We approach the study of patterns from two complementary points of view: the *discovery* of patterns through hands-on work in lab and the *generation* of patterns through mathematical explorations. We will study mathematics as a language of patterns that unifies these viewpoints. As students discover and generate patterns, we will develop and identify mathematical structures that describe and help make sense of those patterns. Students who successfully complete this program should

- become mathematically and scientifically capable and confident,
- improve habits for achieving success in future work especially in math and science,
- develop increasingly sophisticated skills for learning from text and a variety of other resources.

Program Faculty

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Program Support

Kirana Bergstrom – Teaching Assistant
Madeleine Beatty – QuaSR Tutor

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Julian Putnam – Lab Aide

Required Texts

- *Precalculus: An Investigation of Functions*, available at <http://www.opentextbookstore.com/precalc/>. Rather than printing out the entire textbook, you may want to consider ordering the text from one of the links available at the textbook website.
- *College Physics*, available at <http://openstaxcollege.org/textbooks/college-physics>. We will work through selected chapters of this textbook (to be announced) so you likely would not want to order the entire text.
- You must have access to your own copy of these texts, as full participation in class activities requires your own copy to work from.

Program Learning Goals

Through your work in the program, you will make progress towards meeting many of the “Expectations of an Evergreen Graduate”, including how to:

- 1) articulate and assume responsibility for your own work;
- 2) participate collaboratively and responsibly in our diverse society;
- 3) communicate creatively and effectively;
- 4) demonstrate integrative, independent, critical thinking;
- 5) apply qualitative, quantitative and creative modes of inquiry appropriately to practical and theoretical problems across disciplines;
- 6) demonstrate breadth and synthesis of learning and the ability to reflect on the personal and social significance of that learning.

Additional program goals are taken from the Common Core States Standards for Mathematical Practice and the Next Generation Science Standards. You will develop your opportunities to:

- 1) make sense of problems and persevere in solving them;
- 2) reason abstractly and quantitatively;
- 3) model with mathematics;
- 4) use appropriate tools strategically;
- 5) attend to precision;
- 6) analyze and interpret data;
- 7) look for and make use of structure;
- 8) look for and express regularity in repeated reasoning;
- 9) construct viable arguments from evidence and critique the reasoning of others;
- 10) obtain, evaluate, and communicate information.

Program Schedule and Activities

Monday		Tuesday	Wednesday		Thursday
8:45 – 9:45 Lecture Lecture Hall 4		8:30 – 12:00 Math Lab CAL (Computer Applications Lab: Lab 2, 1 st floor)	8:30 – 10:00 Science Lab Lab 1 2046	8:45 – 10:15 Seminar Sem 2 E2105	
10:00 – 12:00 Science Lab Lab 1 2046	10:30 – 12:00 Workshop Sem 2 E2105		10:30 – 12:00 Science Lab Lab 1 2046	10:30 – 12:00 Seminar Sem 2 E2105	10:00 – 12:00 Lecture Lecture Hall 4
1:00 – 3:00 Science Lab Lab 1 2046	1:00 – 2:30 Workshop Sem 2 E2105	1:00 – 2:30 Seminar Sem 2 E2105			

All students will participate in *Lectures*, *Physics Labs*, *Math Labs*, *Seminars*, *Problem Sessions*, and the *Weekly Wrap*.

Lectures: There will be 2 Lecture sessions a week, on Monday and Thursday. In our interactive Lectures, we will provide context for the readings, labs, and seminars, work through conceptual difficulties, make connections between our various topics, and gather questions.

Science Labs: There are 2 Science Lab sessions a week, on Monday and Wednesday. Science Lab activities will allow us to discover patterns in nature in a structured and supportive environment. Science Lab will give us hands-on experience and transferable skills with equipment and computers.

Math Labs: In the Math Lab on Tuesday, we will analyze patterns discovered in the Science Labs as well as generate and explore purely mathematical patterns. We'll be learning and using tools for both the analysis and generation of patterns.

Seminars: Each student will be assigned to one of the Seminar sessions, on Tuesday afternoon or Wednesday morning. Seminars will be dedicated to collaborative learning through close reading and discussion of the texts. Our goal is to develop skills to engage in thoughtful and respectful conversations about the material, learning from each other as well as from the texts themselves.

Problem Sessions: Problem Session (Workshop) is on Monday. A set of homework problems will be assigned for each Problem Session. You should attempt all problems before Problem Session and complete as many as you can on your own, then bring both complete and incomplete attempts to Problem Session. You will work in small groups to understand and explain problems that posed particular challenges to you or any group member, with the goal of improving both your private internal understanding and your public external communication of that understanding.

Weekly Wrap: The Weekly Wrap is an all-class activity on Thursday (during the second part of the Thursday Lecture time) that provides an opportunity to collectively reflect on and synthesize the work of the week. This session will typically have some combination of discussion and writing.

Assignments and Assessments Overview

Regular weekly assignments include *Readings*, *On-line Skills Drills*, *Problem Sets*, and *Weekly Reflections*. Also, for one week in the quarter, you will complete a *Resource Posting and Review* assignment. Each week there will be a *Quiz*. In weeks 5 and 10, there will be an *Exam*. Throughout the quarter, you will maintain a *Portfolio* of your work.

Reading Assignments: Each week, you will have Reading Assignments from the math and physics textbooks along with supplementary readings. These Reading Assignments must be completed for Seminar. Details of Reading Assignments are provided at the Calendar links at the program web-site.

On-line Skill Drills & Problem Sets: You will have two forms of problem solving work each week: On-line Skill Drills and Problem Sets. While the On-line Skills Drills give you practice with and immediate feedback on important basic concepts and calculations, the Problem Set exercises are generally richer and more complicated, requiring an application of concepts and skills beyond the basics.

- **On-line Skill Drills** are interactive exercises posted for both the math text and the physics text. The skill drills are automatically evaluated and you will complete them as independent homework due on Friday by 5 pm.
- **Problem Sets** are due for Monday's Problem Session and you should be prepared to show the faculty your completed work at any problem session. Problem Sets will be included in your Portfolio, and will serve as tickets for Quiz Revision opportunities.

Weekly Reflection: Each week, students will reflect on their engagement in the week's activities, their assignment completion, and their learning (including highlights and places to improve). In addition, students will provide examples of meeting (or plans to meet) specific program learning goals. These reflections will be submitted on-line by Thursday midnight.

Resource Posting and Review: For one week during the quarter, students will find external learning resources related to the topics covered in that week. They will post the resources on the program forum by midnight Wednesday. In addition, students will also review and comment on the other resources posted in their week by midnight Thursday.

Quizzes: There will be an in-class Quiz each Tuesday beginning at 8:30. The Quiz will cover material from the previous week with emphasis on the Problem Set covered in Problem Session the previous day. You will also have the opportunity to take a Quiz Revision within two weeks of a Quiz (Quiz Revisions are held on Thursday mornings at 9 am); to be eligible for a Quiz Revision, you will need to show the corresponding completed Problem Set.

Exams: There will be an in-class mid-term exam in week 5 and an in-class cumulative final exam in week 10. These exams offer you an opportunity to demonstrate what you have learned in reading, lectures, labs, homework, and other program activities.

Portfolio: Throughout the program, you will maintain a portfolio of your work consisting of all the above assignments as well as any notes or other material that reflects your work. The portfolio will be submitted at the end of week 10 and will inform faculty evaluations. It will also provide a lasting record and resource for your own future reference.

- **Self-Evaluation:** Each student is required to write and submit to faculty an evaluation of their own work and achievements in the program. We will have short evaluation writing workshops to help you through this process. Self evaluations should be printed out for inclusion in your Portfolio.

<u>Sunday</u>	<u>Calculations</u>
<u>Monday</u>	
<u>Tuesday</u>	
<u>Wednesday</u>	<u>Notes</u>
<u>Thursday</u>	
<u>Friday</u>	
<u>Saturday</u>	
	<u>Important Dates</u>