



**Gifted LearningLinks Program
Course Syllabus**

Instructor name: Alec Resnick
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Course Title: Mathematical Puzzling in Python

Session Date: Monthly Enrollment, 2011-2012

Course Description:

Inspired by online puzzle collections like [Project Euler](http://projecteuler.net), this course will examine solving mathematical puzzles through computer programming. There are tons of questions, which though easy to frame mathematically, aren't especially amenable to traditional, pencil-and-paper methods of solution. Computers and high-level programming languages have a lot to offer here. We're going to be exploring a wide range of exciting mathematics—ranging from geometry to combinatorics to graph theory—using Python, a prominent, high-level programming language.

This course requires no background in computer science and a basic comfort with algebra.

Outcomes: Upon successful completion of this course, students will:

- a. Know Python's syntax and the broad strokes of the landscape of mathematical ideas underlying combinatorics and geometry
- b. Understand the basics of control flow, object-oriented programming, and a wide breadth of combinatorial and geometric principles
- c. Be able to take a well-posed combinatorial or geometric problem, reformulate it in a computational form (Python code), and optimize that code for clarity and efficiency.

Resources and Materials:

- a. *Python Essential Reference (ISBN 0672329786)* & *How to Think Like a Computer Scientist (ISBN 0971677506)*
- b. <http://projecteuler.net/> and <http://projecteuler.net/>
- c. *Students should have computers of their own. All other software will be provided.*

CTD Statement on Third-Party Web Sites

Instructors are required to thoroughly review any third-party web sites they intend to use in their courses for inappropriate content. However, because web content continuously changes, CTD disclaims any responsibility for any of the content contained on third-party web sites used in course materials. If you become aware of anything that may be inappropriate, please notify CTD staff immediately.

Schedule:

SEMESTER ONE				
	Topic/Focus	Activities & Reading Assignments	What do I need to post to the Discussion Board?	What do I need to turn in?
Week 1	Getting started	+ Preface to <i>Concrete Mathematics</i> + Ch. 1 of <i>HiTLACS</i> + puzzle article (TBA)	+ interview questions	+ survey results + screencast running and modifying the example project
Week 2	Getting acquainted with Python	+ Ch. 2 of <i>HiTLACS</i> + puzzle article (TBA)	+ reading reaction	+ puzzle brainstorm + three project euler puzzle attempts
Week 3	Getting acquainted with Python	+ Ch. 3 of <i>HiTLACS</i> + puzzle article (TBA)	+ reading reaction	+ puzzle brainstorm + three project euler attempts
Week 4	Getting acquainted with Python	+ beautiful explanation 1 + Ch. 4 of <i>HiTLACS</i> + puzzle article (TBA)	+ reading reaction	+ puzzle brainstorm + three project euler attempts
Week 5	Getting acquainted with Python	+ Ch. 5 of <i>HiTLACS</i> + puzzle article (TBA)	+ puzzle review + reading reaction	+ puzzle brainstorm + three project euler attempts
Week 6	Graph theory	+ Ch. 6 of <i>HiTLACS</i> + puzzle article (TBA)	+ puzzle brainstorm + reading reaction	+ puzzle brainstorm + three project euler attempts
Week 7	Graph theory	+ beautiful explanation 2 + Ch. 7 of <i>HiTLACS</i> + puzzle article (TBA)	+ reading reaction	+ puzzle brainstorm + three project euler attempts
Week 8	Graph theory	+ Ch. 8 of <i>HiTLACS</i> + puzzle article (TBA)	+ puzzle review + reading reaction	+ puzzle brainstorm + three project euler attempts
Week 9	Graph theory	+ Ch. 9 of <i>HiTLACS</i> + puzzle article (TBA)	+ puzzle brainstorm + reading reaction	+ puzzle brainstorm + three project euler attempts
Week 10	Number theory	+ beautiful explanation 3 + Ch. 10 of <i>HiTLACS</i> + puzzle article (TBA)	+ reading reaction	+ puzzle brainstorm + three project euler attempts
Week 11	Number theory	+ Ch. 11 of <i>HiTLACS</i> + puzzle article (TBA)	+ puzzle review + reading reaction	+ puzzle brainstorm + three project euler attempts
Week 12	Number theory	+ Ch. 12 of <i>HiTLACS</i> + puzzle article (TBA)	+ puzzle brainstorm + reading reaction	+ puzzle brainstorm + three project euler attempts
Week 13	Combinatorics	+ Ch. 13 of <i>HiTLACS</i> + puzzle article (TBA)	+ beautiful explanation 4 + reading reaction	+ puzzle brainstorm + three project euler attempts

SEMESTER ONE				
	Topic/Focus	Activities & Reading Assignments	What do I need to post to the Discussion Board?	What do I need to turn in?
Week 14	Combinatorics	+ Ch. 14 of <i>HtTLaCS</i> + puzzle article (TBA)	+ puzzle review + reading reaction	+ puzzle brainstorm + three project euler attempts
Week 15	Combinatorics	+ Ch. 15 of <i>HtTLaCS</i> + puzzle article (TBA)	+ puzzle brainstorm + reading reaction	+ puzzle brainstorm + three project euler attempts
Week 16	Geometry	+ Ch. 16 of <i>HtTLaCS</i> + puzzle article (TBA)	+ reading reaction + puzzle review	+ puzzle brainstorm + three project euler attempts
Week 17	Geometry	+ Ch. 17 of <i>HtTLaCS</i> + puzzle article (TBA)	+ puzzle brainstorm + reading reaction	+ puzzle brainstorm + three project euler attempts
Week 18	Finishing up	+ beautiful explanation 5 + survey feedback	+ interview questions	+ beautiful explanation review + survey feedback

Student Evaluation and Grading Policies for Credit Courses Only:

a. CTD Grading scale

A+ 97-100	B+ 87-89	C+ 77-79	D+ 67-69	F Below 60
A 93-96	B 83-86	C 73-76	D 63-66	
A- 90-92	B- 80-82	C- 70-72	D- 60-62	

- a. Breakdown of final grade: 20% explanations, 50% documented puzzle solving, 20% design reviews, 10% feedback/journaling

Instructor Biography:

Alec started and runs a science education research organization, sprout & co, in Somerville, MA. This is the first year he's joined the CTD team. Before working at sprout, he started an electromechanical design consultancy creating educational tools and toys after studying computational biology at MIT. Alec has been designing educational programs, software, and hardware for deployment in formal and informal environments for all ages for the past five years.

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