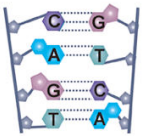


syllabus for

DNA

comp/bio 242

ATTGCGCGATGCGTAGGGC
ATGCATGGCAAAACGGTAT
ATATGCGTATTGCAAAGGC
TATGCT**ATCGC**ATTATGCT

Instructor: **Mark LeBlanc** SC-103 508.286.3970
mleblanc@wheatoncollege.edu Office Hours:
T 2:30-3:30, W 10:30-11:30
R 9:30-10:30

Meeting Times: Tuesday and Thursday 11:00 – 12:20
Room SC-1315, csLab

Text (online): http://interactivepython.org/runestone/static/thinkcspy/toc.html
Brad Miller and David Ranum

10 GOALS for this course

(0) You are at a cocktail party and the topic of genomes comes up. You are able to **recall** significant phrases, terms, and techniques and your **understanding** of the main ideas and concepts enables you to lead the conversation for a while … which causes your friends to raise their eyebrows.
(1) You learn to **identify** and **classify** problems that are candidates for a computer to handle; this is the start of "computational thinking" …
(2) You **demonstrate** the ability to **think algorithmically**, breaking what originally seems like an overly complicated problem into a series of smaller, manageable tasks.
(3) You learn to **craft creative solutions** by "**writing software**" ("to program", "to script", "to cut code", …).
(4) You appreciate the importance of the **Human Microbiome Project**.
(5) You **design experiments** to first solve small computationally-intensive tasks (e.g., on one gene sequence) and then **scale** your solutions to very large sets of data (e.g., all genes in a genome).
(6) You **learn** to move around and perform some work in **the Linux (Unix)** operating system.
(7) You learn to professionally **document** your software and produce quality summaries, graphs, and reports of your results.
(8) You begin to appreciate the (soon to be) revolution in **personalized medicine**, including knowing your way around a **23andMe** report.
(9) You feel empowered to **evaluate** the ethical implications of your work and learn to **appraise**, **critique**, and **defend** your own as well as the work of others.

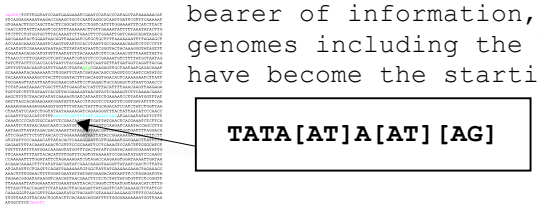
Connections: The Bigger Picture

This course is part of the ***connection "Genes in Context"*** *with Philosophy 111 (Ethics) or Philosophy 241 (Bio-Ethics).* Throughout the semester, students will be exposed to the ethical aspects of living in a post-genomic world and the increasing use and challenges of sequenced genomes as applied to "**personalized medicine**". A series of assignments and events with students from other classes will include:

- We watch the 1997 movie **GATTACA** together …
- Wheaton's bioethics professor Dr. Teresa Celada leads us in a discussion of "**Designer Babies**".
- Student-produced, **one-minute YouTube "commercials"** of companies currently promoting and selling medical profiles based on individual genomes. The commercials will be framed from one of two points of view: (i) from the point of view of the company (e.g., 23andMe) or (ii) from a consumer advocacy point of view.

Catalog Description

An amazing blend of science, computing, and mathematics emerges when considering the molecule "Deoxyribonucleic Acid" (DNA). DNA is the blueprint of life for all organisms on Earth and throughout evolutionary time. Its distinctive and beautiful physical nature, a double helix of four bases, maps onto its functionality as a bearer of information, generation after generation. Fully sequenced genomes including the human genome and hundreds of microbial genomes have become the starting point for attempts to answer a wide range of biological and quantitative questions.



This DNA-242 course satisfies the **Quantitative Analysis (QA**) requirement.

Exact pages to read (in our online, interactive text) and use of web sites will be **assigned in class**. URLs are listed as assigned/needed in the onCourse (Moodle) website.

Notes on grading, due dates, and submission procedures

You must attend all classes. When **homework** is "due in class", this means at the beginning of the class on that particular day, e.g., homework will be collected at the start of class. Homework that arrives after the class and up to one day late will lose 10%. No homework is accepted after one-day late.

Programs are due on various dates (see syllabus for approximate due dates; but all *real* due dates will be listed on the program directions, the specification or "spec"). Since I know from experience that many students like to use the last night for testing, I will allow you to submit your programs until 5am the following day. For example, Program #1 is **due FRI, Sept 6th, but you can submit it electronically until 5am SAT, Sept 7th** -- Careful! The course website (onCourse) makes it appear as if the program is due on **Saturday**, but remember, **Saturday at 5am**! In addition to **electronically submitting** your Python programs (more instructions will be given in class as to how to do this via onCourse), you must also submit (i) a **hardcopy printout** of your program (your "source code") and (ii) a copy of your program's OUTPUT [all stapled!] in class after it is due.

Note that Python programs must *always* be **printed** in **landscape mode** and your source listing must be **stapled** to your sample **output**. (Your professor will mutter: "@%^$#&*" and will deduct points if you do not print your code in landscape (sideways) mode or if you do not staple your code and output together).

It is expected that you spend *at least* **2 hours** on **reading and practice problems** for every hour of lecture. This computes to *at least* **6 hours of work outside of class per week**. This should be done throughout the semester. Please assume all deadlines are fixed. Obviously, see your professor if you know of a conflict beforehand.

Honor Code Revisited: It goes without saying that all submitted work will be the student's own, in keeping with the Wheaton Honor Code. For in-class labs, you may get help from fellow classmates, but remember that all submitted work must be your own. All homework, Python programs, and other hand-written work must be your own from beginning to end unless otherwise noted in the instructions (e.g., paired work).

Guest Lectures

Dr. Jenny Lanni, Biology	"The Central Dogma", TBD (in class)
Dr. Teresa Celada, Philosophy	"Designer Babies", TBD (in class)

YOUR GRADE

5% **ATTENDANCE/PARTICIPATION** - based on attendance/participation in all sessions
10% **QUIZZES** (about 5) - see detailed schedule (usually at start of class)

15% **HOMEWORKS**

Aug 29	Homework #1 – 1 point	- Building Quiz #1
TBD	Homework #2 – 4 points	- RegEx (Parts I and II)
TBD	Homework #3 – 10 points	- 1-minute "personalized medicine" YouTube video

50% **PROGRAMS** (six)

Fri Sept 6	Program #1 (5%)	- String Play
Fri Sept 20	Program #2 (5%)	- Chargaffin Counts
Fri Oct 04	Program #3 (10%)	- Gene Finder
Fri Oct 18	Program #4 (10%)	- "eLmer" a motif finder
Fri Nov 01	Program #5 (10%)	- Fuzzy Olfactory Gene Counter
Fri Nov 15	Program #6 (10%)	- Building a Concordance

20% Final **Project**

Tue Nov 26	DRAFT Written Proposal (Intro & Methods)	(5%)
Dec 3rd and 5th	Oral Presentation	(5%)
Dec 5th	Final Paper, Software, and Results	(10%)

Throughout the semester, you will have the opportunity to show Superior Effort, for example, a homework or programming assignment has additional (extra credit) steps. Remember, when determining each assignment and your final, overall grade: an 'A' is superior, 'B' is above average, 'C' is average effort, etc.

As you can see, the final projects are a significant part of your final grade (20%). Your professor will determine the team pairs. Each pair of students will be given a certain number of points and it will be up to the pair to determine how those points should be allocated. For example, if the pair was given 150 points, then the pair could decide that Person A, who did more of the work, should get 80 and Person B should get 70. If they pair felt they each did the same amount of effort, then each would get 75 points. Each of the three parts (Proposal, Oral Presentation, Final Paper including your software and results) will receive a separate grade.