COMPUTATIONAL EPIDEMIOLOGY

CSCE 4820.001 / CSCE 5820.001
BIOL 4820.001 / BIOL 5820.001
Course Information & Syllabus

Instructor: Marty O'Neill, Ph.D.
Lectures: MW 1:00 – 2:20 pm in NTDP D215
Office Hours: MW 2:30 – 3:30
E-mail: Marty.ONeill@unt.edu
TA: Sultanah Alshammari
TA Office Hours: TBA

Class Web Page: Blackboard
Textbook:　　"Introduction to Epidemiology" by Ray Merrill (5th, 6th, or 7th Edition)
　　　　　　　"Python For Everybody – Exploring Data in Python 3" by C. Severance – online pdf

Course Objective: As part of the specialization in Computational Life Science, this course will focus on applications of *computational methods* to problems in the field of Epidemiology and Public Health. After a survey of different types of problems from the domain of public health, and current methodologies for addressing these problems, this course will explore a variety of computational science paradigms that are deemed suitable to support epidemiological research. Specifically, this course will be structured as follows:

TOPIC	In-Class Week #
Computational Thinking in the Public Health Domain	
a.　What is Computational Epidemiology	1
b.　From Problem to Program – Introduction to Programming	2
c.　Programming Python	3 - 4
Mathematical / Computational Concepts – The SIR Model	5 - 6
Introduction to Public Health and Epidemiology	7 - 8
a.　Disease and Population	
b.　Properties of different classes of diseases:	
Airborne infectious diseases　(Influenza)	
Vector borne diseases　(Malaria, West-Nile)	
Waterborne diseases　(Cholera)	
Sexually transmitted diseases (HPV, HIV)	
Chronic diseases (Cancer)	
SPRING BREAK	9
Computational Paradigms and their role in Public Health	10 -11
a.　The role of geo-spatial information and GIS	
b.　Modeling and Simulation of Infectious Diseases	
i. Agent-Based Models	
ii. Contact Models	
iii. Cellular Automata	
Bioterrorism, Response Plan Design, Planning at Population Level	12 - 14
Presentations of Semester Projects	**15**

Course Outcomes: CSCE/BIOL 4820 Computational Epidemiology

1. Understand the interdisciplinary nature of Computational Epidemiology.
2. Understand the principles of Epidemiology and its challenges to identify the cause of outbreaks.
3. Understand the fundamentals of mathematical outbreak models and their interpretation.
4. Understand the basics of computational modeling and simulation.
5. Learn the fundamental study designs in epidemiology.
6. Understand the difficulties of communicating among researchers in an interdisciplinary setting.
7. Learn to present Public Health related information and study results.

Grading:

Assignments (x)	20%
Programming Project(s)	15%
Midterm (1)	25% (take home exam)
In Class Presentation (1)	10% (Disease Topics)
Research Project + Poster (1)	30%

Assignments: Assignments will include homework, participation on discussion boards, completion of online tutorials, etc.

Submission: All submissions, including assignments, projects and exams, shall be turned in electronically on Canvas. Late submissions will and cannot be accepted.

Graduate vs. Undergraduate Work: Since this is a combined course, *graduate* students will be assigned some additional assignments and projects as appropriate.

Attendance: Attendance will not be taken in class, but is expected. However, all students are responsible for everything done or said in class.

Guest Speakers: There will be 2-3 presentations by invited speakers. These guest lectures will cover the corresponding course contents. The specific dates for guest lectures will depend on their availability and will be announced in advance. This will result in a re-arrangement of the sequence of topics.

Plagiarism: Plagiarism of any kind will automatically result in a grade of F for the course.

Americans with Disabilities Act: We cooperate with the Office of Disability Accommodation to make reasonable accommodations for qualified students (cf. Americans with Disabilities Act and Section 504, Rehabilitation Act) with disabilities. If you have not registered with ODA, we encourage you to do so. If you have a disability for which you require accommodation please discuss your needs with the instructor or submit a written Accommodation Request on or before the fourth class day.

Note: This course will be open for graduate students in Computer Science, Biology, Geography, and UNT Health Science Students who pursue degrees in Epidemiology or Biostatistics, and related fields.