ERHS 732. Advanced Epidemiological Analysis

Course Overview

Brooke Anderson and Andreas Neophytou

Course Aims

This course provides the opportunity **to implement theoretical expertise** through designing and conducting advanced epidemiologic research analyses and **to gain in-depth experience analyzing datasets** from the environmental epidemiology literature.

This course will **complement the student's training in advanced epidemiological methods**, leveraging regression approaches and statistical programming, providing the opportunity to implement their theoretical expertise through designing and conducting advanced epidemiologic research analyses.

Although basic theoretical frameworks behind analysis and statistical modeling approaches will be introduced, this course will not go into depth into statistical and epidemiologic theory and students are expected to be familiar with general epidemiologic concepts such as confounding, selection bias etc.

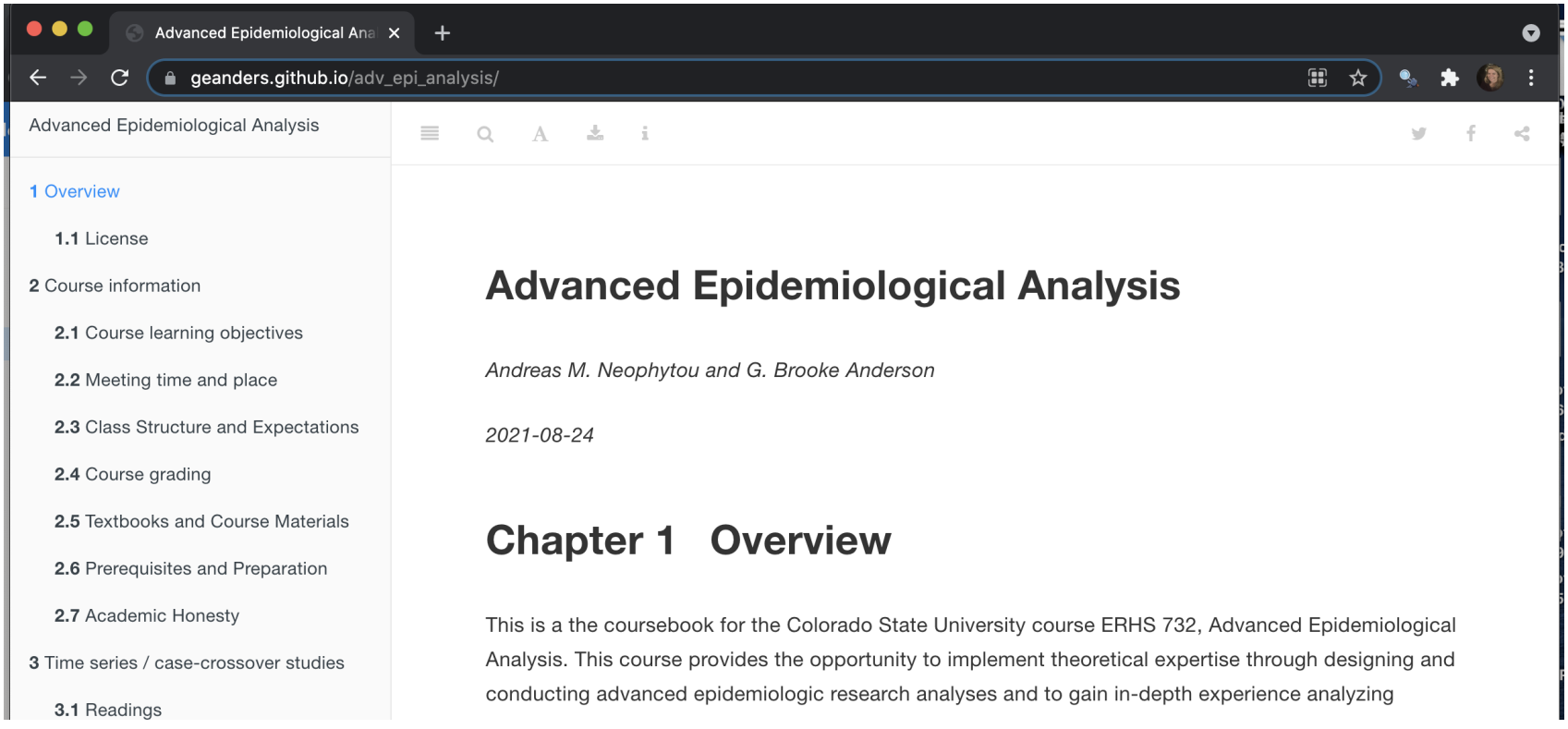
Topics

1. Time series studies in environmental epidemiology
2. Observational cohort studies in epidemiology

Topics

Study type	Topic	Class
Time series	Time series / case-crossover study designs	1–2
Time series	Generalized linear models	3–4
Time series	Natural experiments	5
Time series	Risk assessment	6
Time series	Group midterm reports	7
Cohort	Longitudinal cohort study designs	8–9
Cohort	Inverse probability weighting, Propensity scores	10
Cohort	Mixed models	11
Cohort	Instrumental variables	12
Cohort	Counterfactuals / Causal inference	13
Cohort	Finals prep and presentation	14–15

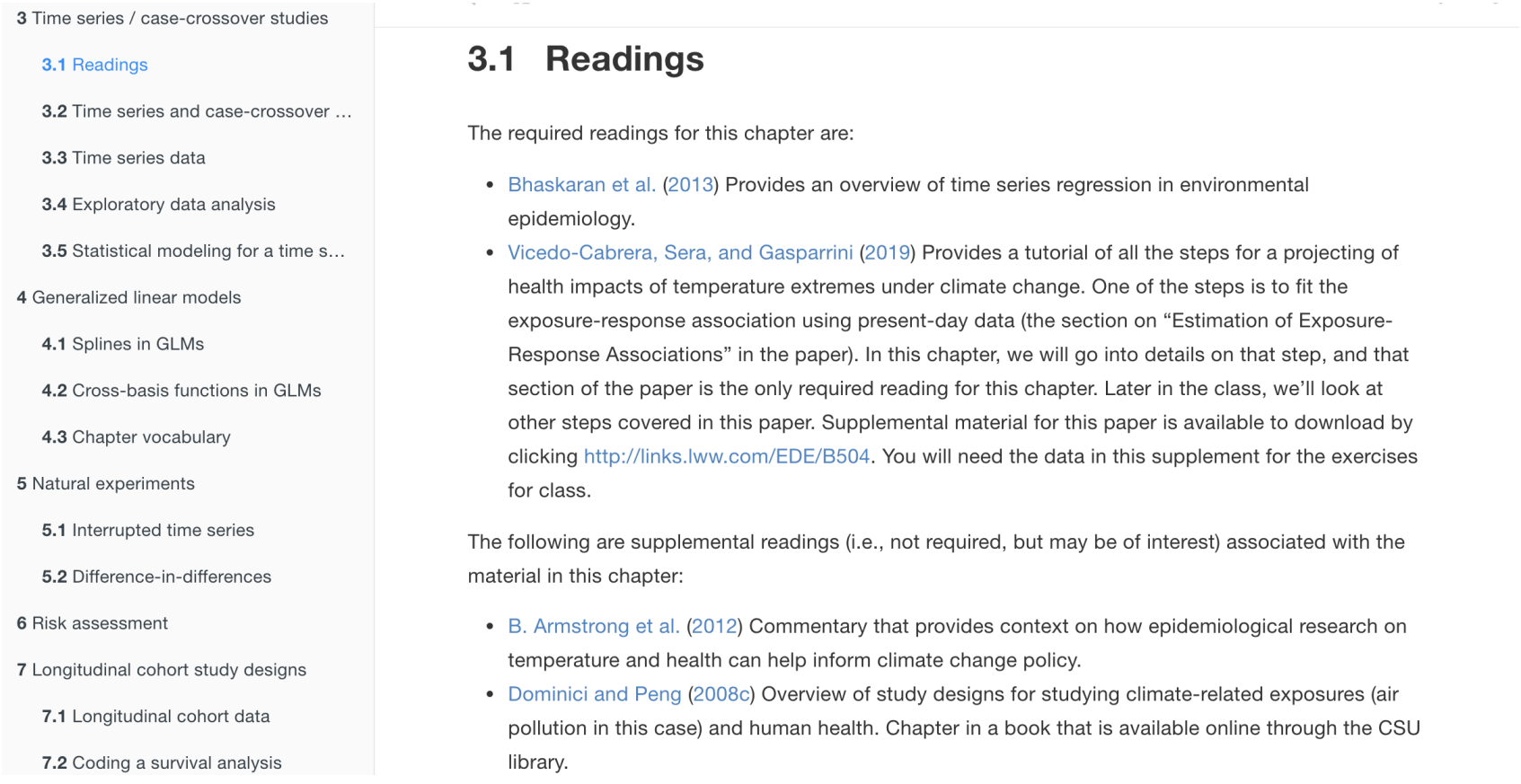
Online Coursebook



https://geanders.github.io/adv_epi_analysis/

Required Reading

Required reading will include sections of the online coursebooks, as well as peer-reviewed articles, which are listed in the coursebook at the start of each chapter.



Required Reading

Class Date	Coursebook reading
August 19	3.1–3.4 (complete by next week)
August 26	3.5
September 9	4.1–4.2
September 16	4.3

In-class Schedule

- **Topic overview**: Each class will start with a brief overview of the week's topic. This will focus on the material covered in that week's assigned reading in the online book and papers.
- **Discussion of analysis and coding points**: Students and faculty will be divided into small groups to discuss the assigned reading and think more deeply about the content. This is a time to bring up questions and relate the chapter concepts to other datasets and/or analysis methods you are familiar with.
- **Group work**: In small groups, students will work on designing an epidemiological analysis for the week's topic and developing code to implement that analysis. This will follow the prompts given in the assigned reading from the online book for the week.
- **Wrap-up**: We will reconvene as one group at the end to discuss topics that came up in small group work and to outline expectations for students before the next meeting.

Grading

Assessment Components	Percentage of Grade
Midterm written report	30
Midterm presentation	15
Final written report	30
Final presentation	15
Participation in in-course exercises	10

Midterm Report

Students will work in groups to prepare an **oral presentation** and accompanying **written report** presenting an epidemiologic analysis using a time series dataset similar to the London dataset used for the first half of the course. The group may pick a research question based on the topics covered in the first half of the course.

These Midterm reports will be due (and presented) the eighth week of class (seventh class session, since there will be no class for Labor Day).

Midterm Report

The **presentation** should be 15 minutes and should be structured like a conference presentation (Introduction, Methods, Results, and Discussion).

The **written report** should be approximately six pages (single spaced) and should cover the same topics. It should include at least two (up to four) well-designed figures and / or tables. The written report should be created following reproducible research principles and using a bibliography referencing system (e.g., BibTex if the student uses RMarkdown to write the report). The report should be written to the standard expected for a peer-reviewed publication in terms of clarity, grammar, spelling, and referencing.

Participation

Attendance is an essential part of participating in the class. We understand things come up, however it is expected you attend every class and come prepared. Further, it is expected that you will actively participate in discussions and group work during the class period.

It is expected that *before* coming to class, students will read the required papers for the week, as well as the online book sections assigned for the week. Reading assignments will be announced the week before each class session. Students should come to class prepared to prepared to do statistical programming (i.e., bring in a laptop with statistical software, download any datasets needed for the week).