

BIOS Linear Algebra Bootcamp

August 2023

Class Time: M-F 1:00-3:00 p.m. in person consisting of approximately 1 hour of lecture and 1 hour of group work and office hours.

Location: RO 133 (August 7-11)

MHRC 0001 (August 14, 16, 17)

MCG 2306 (August 15)

Instructor: Elena Kharitonova (ekhar@ad.unc.edu)

Office Hours: Immediately following class

Grader: TBD

Office Hours: TBD

Website: <https://uncch.instructure.com/courses/45594>

Zoom Link: <https://unc.zoom.us/j/99662222439?pwd=ZURyc2hUKzQ1OVBudUtQOUU1Q0twdz09>

Meeting ID: 996 6222 2439

Passcode: 602621

Texts:

There are no required textbooks for this course. All relevant material will be provided in the notes which come directly from Dr. Ibrahim's BIOS 762 notes. If you would like additional review, the notes cover Appendices A and B of the following textbook, which is required for BIOS 762. You can obtain a PDF version online from the [UNC Chapel Hill Libraries](#).

- Christensen, R. (2011). Plane Answers to Complex Questions: The Theory of Linear Models, 4th Edition, Springer-Verlag

Course Description:

This course will review linear algebra concepts and techniques which will be used extensively in BIOS 762 and the doctoral theory qualifying exam. The purpose of the boot camp is to prepare you to excel in BIOS 762 by reviewing key linear algebra concepts used often in linear models, as well as building important skills for the year before your qualifying exams. These skills include collaboration with your classmates and asking questions of your professors. This course is mandatory for students enrolling in BIOS 762 in Fall 2023.

This course will be structured primarily as a flipped classroom with opportunities to take in information at your own pace. Before each class, lectures on key concepts will be made

available through videos posted to the course website. Lecture videos will expand upon and reinforce concepts from the notes. Students will be responsible for watching the lecture videos and reviewing the relevant notes before each class session.

Class time will consist of a blend of problem-solving in small groups, student-led discussions, and reviewing concepts as needed. All class sessions will be recorded for students who are not able to attend.

Video Lectures

Before each class, you will be responsible for covering the material found in the lecture videos and the course notes. Each video will be posted at least 24 hours before its associated class session. This should take you about an hour if you watch all videos.

Class Sessions

Class sessions will be in person every day and will consist of a review of covered material, student-led discussions of assigned problems, and small-group problem solving. First, we will go over any topics which were unclear from the previous day of work. Often, I will plan what to cover in this time based off of conversations from office hours or other student feedback (about 15-20 minutes). Then, small groups will present their assigned problem from the day before (see below).

For the remainder of the class time, students will split into groups and collaborate on assigned problems. I will be available to answer questions that come up in approaching each of the problems, or questions about the material covered so far in the course in the smaller group setting if concepts aren't clear to members of the group. Each group is responsible for writing up their attempt at solving the problem in a presentable format (scan of handwritten solution, picture, LaTeX, etc.) before the next course session. These solutions will be graded primarily on completion, and it is ok if you and your group were not able to solve the problem! During the following session, one group will be selected for each assigned problem to present their attempt to the class.

All group members are expected to make contributions to the problem-solving process over the course of the two weeks (asking questions, helping others grow in understanding, writing up the proof, etc.).

Students attending bootcamp via zoom will still be expected to work in groups via the break-out room feature and upload a copy of their solutions to Canvas before the next course session. Students unable to attend via zoom and watching recordings will be expected to complete as much as the problems as possible on their own and upload solutions to Canvas before the start of the next session.

Individual Assignments:

There will be 2 individual homework assignments which will serve as the midterm and final exams for this course. The purpose of homework in this course is to check individual understanding of the concepts covered by group problem solving. If you are not enrolled in BIOS 762 in the fall, you are welcome to do the assignments, but due to the large size of the

class your assignments will not be graded. Please note, this means that you must take the bootcamp the summer before the 700-level course for credit.

Mid-term Assignment: Due Friday, August 11th at 11:59 p.m.

Final Assignment: Due Friday, August 18th at 11:59 p.m.

Covered Topics:

1. Vector Spaces
2. Subspaces
3. Matrices
4. Matrix Properties
5. Matrix Decompositions
6. Projections
7. Vector/Matrix Differentiation

Attendance:

Attendance is required if you are enrolling in BIOS 762 in Fall 2023 for the review and presentation sections of each class session. If you and your group cannot work together during the allotted time for group problem solving, then you are not required to attend the remainder of the lecture. **It is required to include everyone in your group in the problem-solving process. Learning from your peers is one of the biggest keys to success in the year before your qualifying exams!**

Zoom:

Students are required to attend each class in person, unless previous approval was given by instructor. When joining bootcamp by zoom, students are asked to keep video on, especially when working in groups on the days problem set. I understand technical difficulties occur, so do not worry if your internet drops. Each class meeting will be recorded, but do not rely on this instead of attending each day.