Preliminaries

Linear algebra, in its modern form, touches on many of the most important concepts in mathematics – indeed, there are "linear structures" present in almost every area of math. From the perspective of a student, there are two important consequences of this: abstraction and instructor bias.

Abstraction. Since the ideas present in linear algebra appear in a wide variety of concepts, it is desirable that linear structures be studied abstractly; that way whatever results we have can be applied to any situation having the corresponding linear structure.

While the abstract framework is useful and important, it does make for a several pedagogical challenges. I have decided to follow a certain tradition of starting the course by studying rather concrete problems; only in the second part of the course will the abstractions make a large appearance. You should know that there are other possible approaches; in particular, some of the resources listed above take alternate routes through the subject.

You need to be mentally prepared to work hard, and to celebrate, as the abstractions arise.

Instructor's bias. The second thing that you should know is that I, like any instructor of linear algebra, arrive at the subject with a certain bias. I am familiar with the ways in which linear structures arise in some fields of mathematics, and fantastically ignorant of how linear algebra relates to others. My understanding of linear algebra, and consequently this course, is heavily influenced by both my knowledge and my ignorance. When you encounter linear structures in other courses, be aware that at first it might feel different – you'll need to adapt what you learn in this course to those other settings.

Resources. There is no textbook required for this course. Nevertheless, it is helpful to have outside resources to consult.

There are several online resources from which I will sometimes assign problems, and which you can use as resources, supplementing the course lectures.

- *A First Course in Linear Algebra* by Robert Beezer, available at:
  http://linear.ups.edu/
- *Linear Algebra* by David Cherney, Tom Denton, and Andrew Waldron, available at:
  https://www.math.ucdavis.edu/~linear/
- *Linear Algebra* by Jim Hefferon, available at:
  http://joshua.smcvt.edu/linearalgebra/
- *Linear Algebra Done Wrong* by Sergei Treil, available at:
  http://www.math.brown.edu/ treil/papers/LADW/LADW.html

There are also many good linear algebra books. I am particularly fond of those by Anton and Rorres (especially the early editions); in the recent past, my colleagues have also used the book by Leon when teaching this course.

Be warned: There is a wide variety of notational conventions used in linear algebra. Pay attention to notational conventions when using outside resources.