Linear Algebra Course Plan:

Basic Notations and Clarifications.

- Notation I will be using for vectors, sets etc.
- Clarification that theorems may not extend entirely, but will pretty much hold for anything most people can think of.

Vector Spaces:

- What are vectors?
- What is a vector space?
- Examples of some vector spaces.
- Examples of sums of vectors.
- Extend to general linear sums of vectors. (Spans)
- Definition of linear independence, followed by examples.
- What is a basis of a vector space?

Inner Products and Norms on a Vector Space:

- What are norms and what is their purpose? (What is their relevance to Data science? Refer to a little about how K-Means and clustering works).
- What are inner products and what is the point of them?
- Orthogonality, normalisation and orthonormal basis. (Must know for understanding how PCA works).

Matrix Theory:

- What is a linear map?
- Converting a linear map to a matrix, show that there is a one to one correspondence, ie that whenever we see a matrix, we can think of a linear map.
- Link to 3B1Brown video on matrices.
- Matrix notation (R^{mxn})
- Operations on matrices (add ,subtract, multiply).(Lack of division)
- General idea of inverting a function.
- Tranpose and inverting matrices.
- Definition of Eigenvectors and Eigenvalues.
- Orthogonal Projection onto an n-dimesnional subspace and relate to PCA.
- Explain PCA in more depth.

Theorems (Only for the keen students):

- SVD
- Decomposition