

**EE 380**

# **Linear Control Systems**

## **Lecture 6**

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# Lecture 6 Topics

- State-Space Representation
  - Eigenvalues and vectors
  - Relationship between eigenvalues and poles
  - Example
- Mathematical Foundation for Lecture 8: Can we determine the initial state vector  $x(0)$  by observing the response  $y$ ?
  - Vectors and vector spaces
  - Linear independence

# Eigenvalues and Eigenvectors

- A scalar  $\lambda$  is called an eigenvalue of the matrix  $A$  if there exists a nonzero vector  $v$  such that

$$Av = \lambda v \quad (E)$$

- Any nonzero vector  $v$  satisfying equation (E) is called an eigenvector of  $A$  associated with the eigenvalue  $\lambda$  of  $A$
- Eigenvectors of  $A$  are not unique; if  $v$  is an eigenvector, so is  $w = \alpha v$ , where  $\alpha$  is any nonzero scalar
  - The important attribute of an eigenvector is its direction, not its length