

**Term:** 2024 Fall / Full Term

**Instructor:** [Heng \(Hank\) Yang](#)

**Teaching Fellow:** Shucheng Kang, Davide Bray

**Meeting Time:** Monday / Wednesday 11:15 AM - 12:30 PM

**Classroom:** SEC 1.413

**Enrollment Limit:** N/A

**Course Description:**

This course and its follow-on course ENG-SCI 156 concern the fundamentals of information systems in the real world. Together they provide a comprehensive foundation in signal processing, systems design, and analysis, control, and communications, while also introducing key linear-algebraic concepts in the context of authentic applications. The first course, ENG-SCI 155, focuses on the basic principles of feedback and its use as a tool for inferring and/or altering the dynamics of systems under uncertainty. Topics include linear algebra, the elemental representations of dynamic systems, stability analysis, the design of estimators (e.g., Kalman Filter) and feedback controllers (e.g., PID and Optimal Controller). The class includes both the practical and theoretical aspects of the topic.

**Attendance, mask policy, and sick policy:**

Because there will be group activities in class, every student is expected to attend every class unless special circumstances (sickness, job interviews, etc). If you feel sick, please stay at home/dorm and take a good rest. If you need to miss a class, please send me (Lina) a short note before the class so she could plan the course activities accordingly.

**Contact:**

Please email Heng Yang ([hankyang@seas.harvard.edu](mailto:hankyang@seas.harvard.edu)) for questions and comments related to the course.

**Textbook:**

Å...strÅ¶m, Karl Johan, and Richard Murray. [\*Feedback systems: an introduction for scientists and engineers\*](#). Princeton university press, 2021.

**Google drive:**

Will host course materials:

<https://drive.google.com/drive/folders/1iVg2sDqDMX5lLXEPdqsxNVJZJqAC4R7o?usp=sharing>

**Course schedule:**

[https://docs.google.com/document/d/1eOAGH4F5vua5b2lSkj9LjLoA6Ut7pcJ3tapBmcio\\_6U/edit?usp=sharing](https://docs.google.com/document/d/1eOAGH4F5vua5b2lSkj9LjLoA6Ut7pcJ3tapBmcio_6U/edit?usp=sharing)

**Fun things about control:**

- The map of control theory: <https://engineeringmedia.com/maps>
- Boston dynamics: [https://www.youtube.com/watch?v=\\_sBBaNYex3E](https://www.youtube.com/watch?v=_sBBaNYex3E)
- Massive parallel reinforcement learning training in simulation: <https://www.youtube.com/watch?v=8sO7VS3q8d0>
- Diffusion policy: <https://diffusion-policy.cs.columbia.edu/>