

**COL726: Numerical Algorithms**

# **1: Introduction**

# General information

- **Instructor:** Rahul Narain (<http://www.cse.iitd.ac.in/~narain/>)
- **TAs:**
  - Siddharth Shrivastava (PhD)
  - Ankita Gupta (MTech)
  - Mankaran Singh (BTech)
- **Lectures:** Mon, Thu 5–6:30pm on Microsoft Teams
- **Office hours:** TBD

# Textbooks

- Heath, *Scientific Computing: An Introductory Survey*, 2nd Ed.
- Trefethen and Bau, *Numerical Linear Algebra*
- Boyd and Vandenberghe, *Convex Optimization*  
(<https://web.stanford.edu/~boyd/cvxbook/>)

**Prerequisites:** COL106 or equivalent. Overlaps with MTL704. Familiarity with linear algebra and calculus is assumed.

# Evaluation

- 40%: 5 or 6 assignments
  - Theory component (~80%) + programming component (~20%)
  - Programming component will use Python3 + Numpy/Scipy
- 25%: Minor exam
- 35%: Major exam

# Evaluation (cont.)

**Grading:** Minimum 80% for A, 30% for D

**Late policy:** Total 5 free late days over the semester

**Audit policy:** Minimum 40% marks

**Attendance policy:** Possibly 1 grade penalty (A to A–, or A– to B) if <50% attendance in online lectures

# Today's topics

- Numerical analysis is “the study of algorithms for the problems of continuous mathematics” (Trefethen and Bau)
- Any problem can be seen as a function  $f : X \rightarrow Y$
- Neither the input  $x \in X$  nor the computation  $f(x)$  can be done with perfect accuracy
- Condition number measures the worst-case amplification of errors in  $x$  to errors in  $y = f(x)$

# Homework

- If not familiar with Python3 or Numpy/Scipy, go through one of these tutorials:
  - “Getting started with Python for science” (<https://scipy-lectures.org/intro/>)
  - “Python Numpy Tutorial” (<http://cs231n.github.io/python-numpy-tutorial/>)
- Read Heath 1.1–1.2 and Trefethen and Bau 12.
- Do Heath Exercises 1.1–1.6.