

Welcome to EECS 127/227A

The logo for the University of California, featuring the word "Cal" in a stylized, blue, cursive font with a yellow outline.

# Lecture 0: orientation

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## Topics to be covered today

- What is EECS 127/227A?
- Instructors, GSIs, UGSIs, readers, team
- How to learn the material?
- Labs, supplement, discussion sessions
- Office hours
- DSP
- Grading
- Schedule
- Exams
- Cheating
- Misc. administrative stuff

# What is EE127/227A (in one slide)?

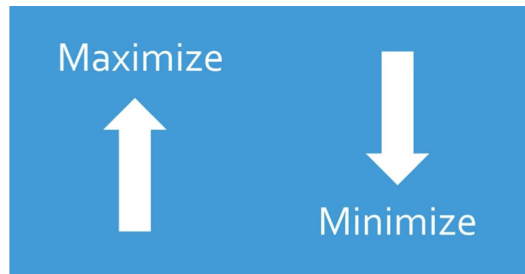
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**This course offers an introduction to optimization models and their applications, ranging from machine learning and statistics to decision-making and control, with emphasis on numerically tractable problems, such as linear or constrained least-squares optimization. The course covers two main topics: practical linear algebra and convex optimization.**

**In this class you will learn how to formulate engineering problems as optimization programs**

**You will learn how to solve them numerically**

**You will apply your knowledge on numerous datasets gathered from practical problems**



# Laurent El Ghaoui, instructor

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**Professor, EECS/IEOR**

**Office: 421 Sutardja Dai Hall**

**elghaoui@berkeley.edu**

**OH: 2:00-3:00pm Tu/Th**

**After class on weeks of teaching**

**Interesting fact:**

**Laurent would like to play the “hang” one day.**



# Alexandre Bayen, instructor

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**Professor, EECS/CEE**

**Office: 109 McLaughlin Hall**

**bayen@berkeley.edu**

**OH: 2:00-3:00pm Tu/Th**

**After class on weeks of teaching**

**Interesting fact:**

**Alex likes to play the piano and improvise in the style of Liszt and ask people which pieces of Liszt they recognize.**



# Patricia Hidalgo-Gonzalez, Head GSI

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**5th year PhD candidate at ERG/EECS**

**Office: 425 Sutardja Dai Hall**

**patricia.hidalgo.g@berkeley.edu**

**OH: Tuesdays 10am - 11am (location TBD)**

**Interesting fact:**

**Once a year, I go to a silent meditation retreat where we meditate 10 hours/day for 10 days. One of my life goals is to do this for a full year... someday haha.**



# Romain Lopez, GSI

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**PhD student Y3 EECS**

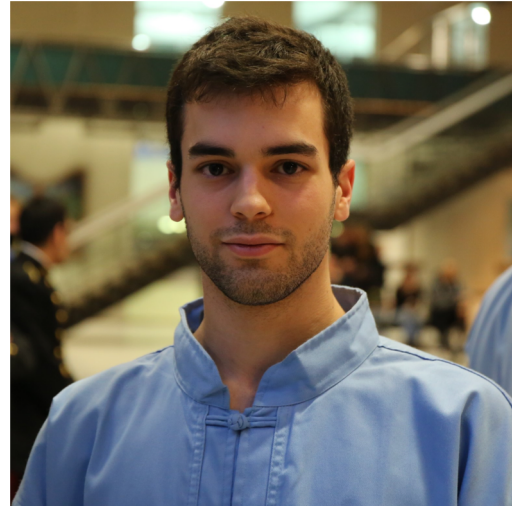
**Office: 378 Stanley Hall**

**romain\_lopez@berkeley.edu**

**OH: TBD**

**Interesting fact:**

**Judo Black Belt since 10 years, interned in Tokyo for a summer in 2016 to regularly train with policemen (they were strong...).**



# Nilesh Tripuraneni, GSI

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**Third-year PhD student in CS**

**Office: Soda 465H (back of the RISELab)**

**nilesh\_tripuraneni@berkeley.edu**

**OH: Monday 10am-12pm (Soda-Alcove-341A)**

**Interesting fact:**

**In my (limited) free time I enjoy lifting weights and hope to pick up the guitar again. Some of my research focuses on optimization so am happy to be TAing for EE127/227A!**





# Larry Yang, GSI

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**5th Year Masters in CS**

**[larrywyang@berkeley.edu](mailto:larrywyang@berkeley.edu)**

**OH: Friday 3pm - 4pm Soda 651**

**Interesting fact: I can't work or read with the television on in the background but love listening to music instead.**

# Mong H. Ng (CK), uGSI

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**Third Year CS Undergraduate Student**

**monghim.ng@berkeley.edu**

**OH: Friday 10-11am Soda Room 651**

**Interesting fact:**

**I am currently a yellow-green belt holder in Taekwondo. But don't be intimidated, because yellow-green is one of the lowest of the lowest rank. Aye, 'tis my dream to get a black belt after years and years of arduous training.**



# Helen Yang, uGSI

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**Fourth Year EECS Undergraduate Student**

**[helenyang@berkeley.edu](mailto:helenyang@berkeley.edu)**

**Interesting fact:**

**I once ate three pounds of ice cream in under ten minutes! Would not recommend to others...**



# Aurelia Guy, uGSI

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Senior CS Undergraduate Student

[lia@berkeley.edu](mailto:lia@berkeley.edu)

**Interesting fact:**

**I enjoy writing and once wrote a novel. In my free time I like to exercise, and enjoy outdoor activities including hiking and swimming.**



# Shikhar Bahl, uGSI

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**4th Year CS and Applied Math Student**

**shikharbahl@berkeley.edu**



**Interesting fact: It took me a month to come up with an interesting fact about myself.**

# Tanya Veeravalli, uGSI

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**Senior CS and Economics Student**

**tveeravalli19@berkeley.edu**

**Interesting fact: I'm very interested in magic, especially card tricks :) I also have an extremely sweet tooth, and have had exactly 1 cup of coffee. I enjoy sports, especially soccer and badminton.**



# Jason Wang, reader

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Senior CS/AppMath Undergrad student

zhanshi\_wang@berkeley.edu

Interesting fact:

**This is an Interesting Fact**

**I used to eat five times a day and gained 20 more pounds.**



# Yiran Jia, reader

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**Third Year CS Undergraduate Student**

**yiranjia@berkeley.edu**



**Interesting fact:**

**I'm from Shanghai and I've lived briefly in Lyon and Montreal. In my free time, I enjoy hiking, playing music, traveling, and watching Grey's Anatomy.**



# Wenxin Li, reader

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**Senior CS/Stats Undergraduate Student**

wenxin\_li@berkeley.edu

**Interesting fact:**

**In my free time I like reading Japanese comics.  
My favorite series is One Piece and the  
story is as old as I am.**



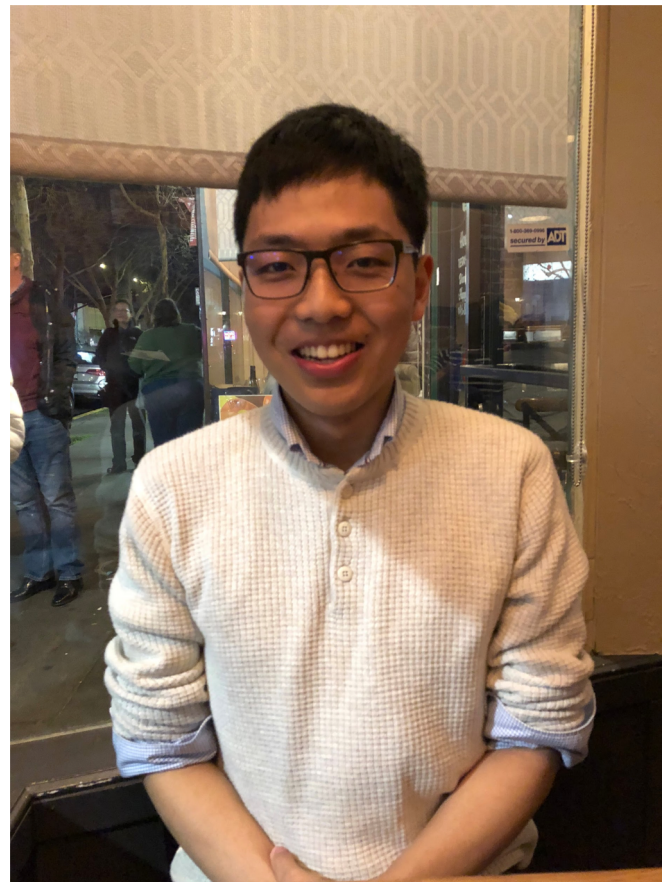
# Andrew Li, reader

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**Junior EECS Student**

**[andrewyli@berkeley.edu](mailto:andrewyli@berkeley.edu)**

**Interesting fact: I'm a classical singer, and have done solos and private chorus for seven years!**



# Material at your disposal to learn

This class comes with an integrated set of material


- Book [For broader context, superset of slides]
- **Set of slides [The reference for exams]. We will outline in the slides what is required for the exams.**

The spectral theorem

Any symmetric matrix is orthogonally similar to a diagonal matrix. This is stated in the following so-called *spectral theorem* for symmetric matrices.

**Theorem 1 (Spectral Theorem)**

Let  $A \in \mathbb{R}^{n,n}$  be symmetric, let  $\lambda_i \in \mathbb{R}$ ,  $i = 1, \dots, n$ , be the eigenvalues of  $A$  (counting multiplicities). Then, there exist a set of orthonormal vectors  $u_i \in \mathbb{R}^n$ ,  $i = 1, \dots, n$ , such that  $Au_i = \lambda_i u_i$ . Equivalently, there exist an orthogonal matrix  $U = [u_1 \cdots u_n]$  (i.e.,  $UU^T = U^T U = I_n$ ) such that

$$A = U\Lambda U^T = \sum_{i=1}^n \lambda_i u_i u_i^T, \quad \Lambda = \text{diag}(\lambda_1, \dots, \lambda_n).$$


Theorems

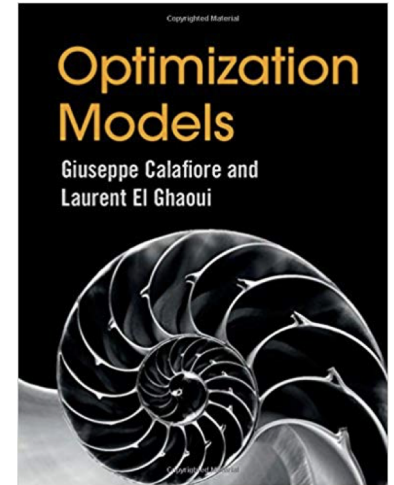
Sometimes, examples, proofs

# Material at your disposal to learn

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– **Book [For broader context, superset of slides]**

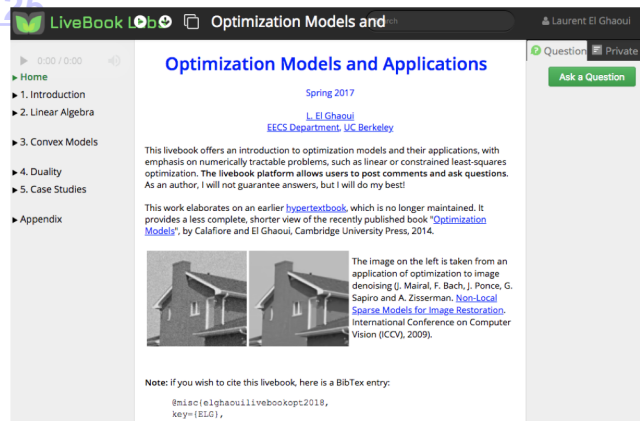


*Optimization Models*, G.C. Calafiore and L. El Ghaoui, Cambridge University Press , October 2014

# Material at your disposal to learn

This class comes with an integrated set of material

- Book [For broader context, superset of slides]
- Set of slides [The reference for exams]
- “Livebook”
  - Hypertext where users can post comments / ask questions
  - Available at <http://livebooklabs.com/keepies/c5a5868ce26b8125>
  - Simplified version of Book, Slides



The screenshot shows a web browser displaying a LiveBook page. The page title is "Optimization Models and Applications" by Laurent El Ghaoui. The page content includes a table of contents on the left, a main text area with a description of the livebook, and a small image of a house. The table of contents lists: Home, 1. Introduction, 2. Linear Algebra, 3. Convex Models, 4. Duality, 5. Case Studies, and Appendix. The main text area contains the following text: "This livebook offers an introduction to optimization models and their applications, with emphasis on numerically tractable problems, such as linear or constrained least-squares optimization. The livebook platform allows users to post comments and ask questions. As an author, I will not guarantee answers, but I will do my best!" and "This work elaborates on an earlier [hypertextbook](#), which is no longer maintained. It provides a less complete, shorter view of the recently published book "Optimization Models", by Calafiore and El Ghaoui, Cambridge University Press, 2014." Below the text is a small image of a house, with a caption: "The image on the left is taken from an application of optimization to image denoising (J. Mairal, F. Bach, J. Ponce, G. Sapiro and A. Zisserman, [Non-Local Sparse Models for Image Restoration](#), International Conference on Computer Vision (ICCV), 2009)." At the bottom, there is a note: "Note: if you wish to cite this livebook, here is a BibTex entry:" followed by a BibTex entry: "El Ghaoui, L. (2018). Optimization Models and Applications. LiveBook Labs. doi:10.1007/978-1-4939-9888-8\_1." The page also features a "Question" button and a "Private" toggle.

# Material at your disposal to learn

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- Set of slides [The reference for exams]
- Livebook [For additional material]
- **Reading material for the discussion sessions**

**Exercise 3 (Inner product)** Let  $x, y \in \mathbb{R}^n$ . Under which condition on  $\alpha \in \mathbb{R}^n$  does the function

$$f(x, y) = \sum_{k=1}^n \alpha_k x_k y_k$$

define an inner product on  $\mathbb{R}^n$ ?

**Exercise 4 (Orthogonality)** Let  $x, y \in \mathbb{R}^n$  be two unit-norm vectors, that is, suppose that  $\|x\|_2 = \|y\|_2 = 1$ . Show that the vectors  $x - y$  and  $x + y$  are orthogonal. Use this to find an orthogonal basis for the subspace spanned by  $x$  and  $y$ .

**Exercise 5 (Extrema of inner product over a ball)** Let  $y \in \mathbb{R}^n$  be a given non-null vector, and let  $\mathcal{X} = \{x \in \mathbb{R}^n : \|x\|_2 \leq r\}$ , where  $r$  is some given positive number.

1. Determine the optimal value  $p_1^*$  and the optimal set (i.e., the set of *all* optimal solutions) of the problem  $\min_{x \in \mathcal{X}} |y^\top x|$ .
2. Determine the optimal value  $p_2^*$  and the optimal set of the problem  $\max_{x \in \mathcal{X}} |y^\top x|$ .
3. Determine the optimal value  $p_3^*$  and the optimal set of the problem  $\min_{x \in \mathcal{X}} y^\top x$ .
4. Determine the optimal value  $p_4^*$  and the optimal set of the problem  $\max_{x \in \mathcal{X}} y^\top x$ .

**Exercise 6 (Gradient of log-sum-exp function)** The log-sum-exp function  $\text{lse} : \mathbb{R}^n \rightarrow \mathbb{R}$  is defined as

$$\text{lse}(x) \doteq \ln \left( \sum_{i=1}^n e^{x_i} \right).$$

Determine the gradient of this function at  $x$ .

**Problem sets to be solved in discussion session so you can absorb the material better.**

**Solutions will be available**

# Material at your disposal to learn

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- Set of slides [The reference for exams]
- Livebook [For additional material]
- Reading material for the discussion
- **Homework aligned with material taught in class**

**Problem sets you have to turn in electronically.**

EECS 127 / 227AT  
A. Bayen, L. El Ghaoui

8/23/18

## Homework Assignment #1

**Due date:** 9/6/18, before class. Please  $\LaTeX$  or handwrite your homework solution and submit an electronic version.

**Exercise 1 (About general optimization)** In this exercise, we test your understanding of the general framework of optimization and its language. We consider an optimization problem in standard form:

$$p^* = \min_{x \in \mathbb{R}^n} f_0(x) : f_i(x) \leq 0, \quad i = 1, \dots, m.$$

In the following we denote by  $\mathcal{X}$  the feasible set. For the following statements, provide a proof or counter-example.

1. Any optimization problem can be expressed as one with a linear objective.
2. Any optimization problem can be expressed as one without any constraints.
3. Any optimization problem can be recast as a linear program, provided one allows for an infinite number of constraints.
4. If there are strict inequalities we can always replace them with non-strict ones. *Note:* you are not required to provide a formal justification.
5. If one inequality is strict at the optimum, then we can remove it from the original problem and obtain the same solution.
6. If the problem involves the minimization of an objective function of the form

$$f_0(x) = \min_y F_0(x, y),$$

# Material at your disposal to learn

This class comes with an integrated set of material

- Book [For broader context, superset of slides]
- Set of slides [The reference for exams]
- Livebook [For additional material]
- Reading material for the discussion
- Homework aligned with material taught in class
- **bCourse site with all other material (hwk, sols etc.)**

The screenshot shows the bCourse site interface for the course EECS 127 / 227AT. The left sidebar contains navigation options: Home, Announcements, Assignments, Discussions, Grades, People, Pages, Files (highlighted), Syllabus, Outcomes, Quizzes, Modules, Conferences, and Collaborations. The main content area displays a file management view for the 'Files' section. A search bar is present with the text '0 items selected'. Below the search bar, a table lists the files and folders:

| Name                                   | Date Created | Date Modified | Modified By | Size |
|--|--------------|---------------|-------------|------|
| Optimization Models in Engineering (R) |              |               |             |      |
| • Admin                                |              |               |             |      |
| • Discussions                          |              |               |             |      |
| • Homeworks                            |              |               |             |      |
| • Slides                               |              |               |             |      |
| Admin                                  | Jul 16, 2018 |               |             | --   |
| Discussions                            | Jul 16, 2018 |               |             | --   |
| Homeworks                              | Jul 16, 2018 |               |             | --   |
| Slides                                 | Jul 16, 2018 |               |             | --   |

At the bottom of the interface, there is a progress indicator showing '0% of 2.1 GB used' and a link for 'All My Files'.



# Homework policies

For completing the class you need to turn in homeworks  
– 6 homeworks total

|    | A    | B         | C        | D            | E                          | F  | G                                 | H                    | I        | J      | K                                  |
|----|------|-----------|----------|--------------|----------------------------|--|-----------------------------------|----------------------|----------|--------|------------------------------------|
| 1  | Week | Lecture # | Date     | Instructor   | Part                       | Lecture                                  | Reading (book)                    | Reading (livebook)   | Hw given | Hw due | Hw Topic                           |
| 2  | 1    | 1         | 8/23/18  | AB & LEG     | <i>Linear algebra</i>      | Introduction                             | Ch. 1                             | Sec. 1               | Hw1      |        | Vectors, matrices, scalar products |
| 3  | 2    | 2         | 8/28/18  | AB           |                            | Vectors and functions                    | Ch. 2                             | Sec. 2.1             |          |        |                                    |
| 4  | 2    | 3         | 8/30/18  | AB           |                            | Matrices and linear maps                 | Ch 3, except sec. 3.3, 3.4.9, 3.7 | Sec. 2.2, except 2.5 |          |        |                                    |
| 5  | 3    | 4         | 9/4/18   | LEG          |                            | Quiz and mini-review / extra topic       |                                   |                      |          |        |                                    |
| 6  | 3    | 5         | 9/6/18   | LEG          |                            | Symmetric matrices and their eigenvalues | Ch. 4                             | Sec. 2.5             | Hw2      | Hw1    | SVD, PCA, covariance matrices      |
| 7  | 4    | 6         | 9/11/18  | LEG          |                            | Singular value decomposition             | Ch. 5                             | Sec. 2.6             |          |        |                                    |
| 8  | 4    | 7         | 9/13/18  | LEG          |                            | Linear equations                         | Ch. 6, except 6.5                 | Sec. 2.3             |          |        |                                    |
| 9  | 5    | 8         | 9/18/18  | AB           |                            | Least-squares and variants               | Ch. 6, except 6.5                 | Sec. 2.4             |          |        |                                    |
| 10 | 5    | 9         | 9/20/18  | AB           |                            | Review                                   |                                   |                      |          | Hw2    |                                    |
| 11 | 6    |           | 9/25/18  |              |                            | MIDTERM                                  |                                   |                      |          |        |                                    |
| 12 | 6    | 10        | 9/27/18  | AB           | <i>Conic optimization</i>  | Linear optimization                      | Ch. 9, sec. 9.3                   | Sec. 3.2             | Hw3      |        | LP, QP, SOCP, LS                   |
| 13 | 7    | 11        | 10/2/18  | AB           |                            | Quadratic optimization                   | Ch. 9, all sections except 9.7    | Sec. 3.2             |          |        |                                    |
| 14 | 7    | 12        | 10/4/18  | AB           |                            | Second-order cone optimization           | Ch. 10, sections 10.1 and 10.2    | Sec. 3.3             |          |        |                                    |
| 15 | 8    | 13        | 10/9/18  | AB           |                            | Robust optimization                      | Ch. 10, section 10.3              | Sec. 3.4             |          |        |                                    |
| 16 | 8    | 14        | 10/11/18 | AB           |                            | Review                                   |                                   |                      | Hw4      | Hw3    | Convexity, robust optimization     |
| 17 | 9    |           | 10/16/18 | AB           |                            | Quiz and extra topic TBD                 |                                   |                      |          |        |                                    |
| 18 | 9    | 16        | 10/18/18 | LEG          | <i>Convex optimization</i> | Convexity                                | Ch. 8, sections 8.1, 8.2          | Sec. 3.1.1, 3.1.2    |          |        |                                    |
| 19 | 10   | 17        | 10/23/18 | LEG          |                            | Convex optimization problems             | Ch. 8, sections 8.3, 8.4          | Sec. 3.1.3           |          |        |                                    |
| 20 | 10   | 18        | 10/25/18 | LEG          |                            | Weak duality                             | Ch. 8, section 8.5                | Sec. 3.1.5           | Hw5      | Hw4    | Duality                            |
| 21 | 11   | 19        | 10/30/18 | LEG          |                            | Strong duality                           | Ch. 8, section 8.5                | Sec. 3.1.5           |          |        |                                    |
| 22 | 11   | 20        | 11/1/18  | LEG          |                            | Applications of duality                  |                                   |                      |          |        |                                    |
| 23 | 12   |           | 11/6/18  |              |                            | MIDTERM                                  |                                   |                      |          |        |                                    |
| 24 | 12   | 21        | 11/8/18  | LEG          |                            | Overview of algorithms                   | Ch. 12                            | Sec. 3.1.4           | Hw6      | Hw5    | Applications                       |
| 25 | 13   | 22        | 11/13/18 | AB / LEG TBD | <i>Applications</i>        | Machine learning                         | Ch. 13                            | Sec. 3.2.5, 3.4.4    |          |        |                                    |
| 26 | 13   | 23        | 11/15/18 | AB / LEG TBD |                            | Engineering design                       | Ch. 16                            | Sec. 3.5             |          |        |                                    |
| 27 | 14   | 24        | 11/20/18 | LEG          |                            | Finance                                  | Ch. 14                            | Sec. 5.5             |          |        |                                    |
| 28 | 15   | 25        | 11/27/18 | AB           |                            | Control applications                     | Ch. 15                            | Sec. 2.6, 5.1,       |          | Hw6    |                                    |
| 29 | 15   | 26        | 11/29/18 | AB           |                            | Review                                   |                                   |                      |          |        |                                    |
| 30 | 16   |           | 12/4/18  | RRR          |                            | RRR                                      |                                   |                      |          |        |                                    |
| 31 | 16   |           | 12/6/18  | RRR          |                            | RRR                                      |                                   |                      |          |        |                                    |
| 32 |      |           | 12/14/18 |              |                            | FINAL (8-11am)                           |                                   |                      |          |        |                                    |

# Homework policies

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For completing the class you need to turn in homeworks

- 6 homeworks total
- HWKs are for working on assignments, which are out on the day outlined in the xls file (and posted on bCourses), at 5:00pm, and due 5:00pm the day outlined in the xls file (and posted on bCourses)
- There will be a grace period until 7:00pm, this avoids problems of ‘upload traffic jam’ at 4:59pm. If you have this problem at 6:59pm, you are responsible for it.
- **To be clear: HW IS DUE AT 5:00PM, NOT 7:00PM**
- The submission procedure is very simple, explained in the next slide

# Homework submission process

For completing the class you need to turn in homeworks through gradescope: <https://www.gradescope.com>

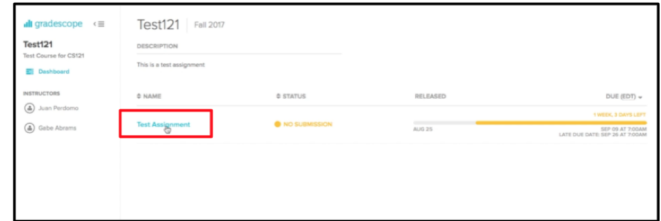
- Once you make an account, click “Add a course”
- Our course entry code is: **9DJ885**



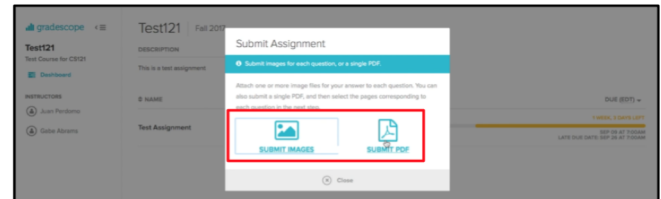
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3



# Homework parties

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- There will be one homework party per homework
- On Mondays or Tuesdays depending on the HW#
- uGSIs will run the parties
- Parties' schedule:
  - HW # 1: Tuesday Sept 4th, 6pm - 7.30pm, Soda 306 HP
  - HW # 2: Monday Sept 17th, 6pm - 8pm, Soda 306 HP
  - HW # 3: Tuesday Oct 9th, **5pm - 7pm, Cory 540AB**
  - HW # 4: Monday Oct 22nd, 6pm - 8pm, Soda 306 HP
  - HW # 5: Tuesday Nov 6th, 6pm - 8pm, Soda 306 HP
  - HW # 6: Tuesday Nov 20th, 6pm - 8pm, Soda 306 HP

# Homework cycle process: 7 weeks cycle

The homework process is as follows, to ensure quality, fairness and relevance to the class



**With 250 students we need to treat this like a production line process, no exceptions!**

# Homework cycle process: 7 weeks cycle

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**The homework process is as follows, to ensure quality, fairness and relevance to the class**

- Week n-3: Homework m created by blue team, solutions created by blue team.
- Week n-2: Homework m tested by red team without solutions, homework modified by red team without solutions, solutions modified by red team, new homework and solutions delivered to instructors
- Week n-1: Instructors final check for homework and solutions
- Week n: Homework released
- Week n+2: Homework due (5pm), grading starts
- Week n+3: Homework back to the students, solutions posted, grades posted and available to the students, one week regrade period for homework starts, regrade requests received and addressed
- Week n+4: Regrade period for homework stops (5pm), new grade is posted and final, request is returned by once completed

**With 250 students we need to treat this like a production line process, no exceptions!**

# Homework and midterms regrade process

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**In order to be considered, your regrade request needs to comply with the following guidelines**

- Request must be submitted within the one week following release of grades
- Request needs to be submitted to [eeecs127requests@gmail.com](mailto:eeecs127requests@gmail.com)
- Request needs to submit a single pdf containing (1) typed nature of the request and explanations of the request, (2) original scanned / graded homework/midterm
- Be aware that **your grade can go up or down**

**With 250 students we need to treat this like a production line process, no exceptions!**

# Homework and midterms regrade process

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Only request regrades when needed, when legit, when fair



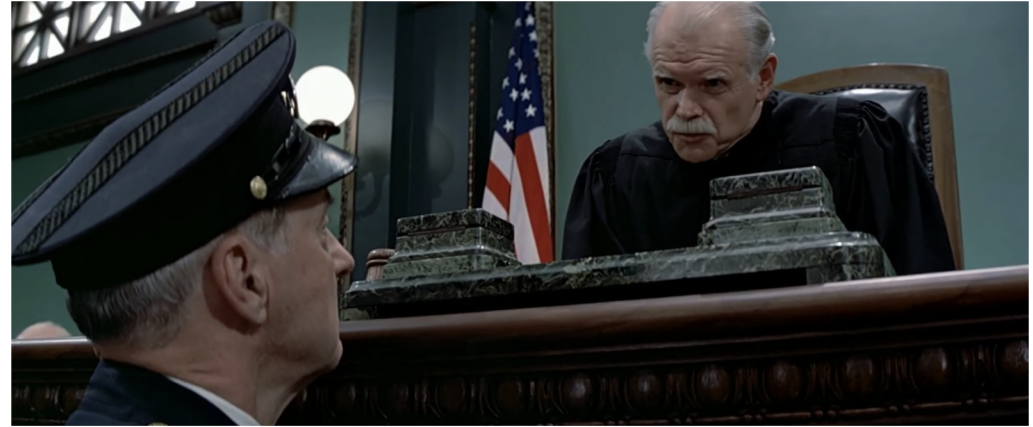
**With 250 students we need to treat this like a production line process, no exceptions!**



# Homework and midterms regrade process

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Only request regrades when needed, when legit, when fair



**With 250 students we need to treat this like a production line process, no exceptions!**

# Lectures, Discussions, Office Hours, Hwk parties

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**You will have lectures on TuTh 12:30-2:00**

- Lectures are mandatory, we do not check, but you will be responsible for knowing the material covered in the lectures. Lectures are not videotaped, it is your responsibility to either attend or have a way to access the material covered in class on the board.**
- There might be supplemental sections to cover
  - Either not critical path material**
  - Review for the exams**These are not mandatory.**
- In general, lecture is given by the instructors**
- Instructor in charge of the lecture is responsible for the corresponding OH (the same week).**

# Office hours

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## When are office hours?

- **Instructor office hours are held by instructor teaching that week**
  - **Bayen: Tu/Th 2-3pm 109 McLaughlin**
  - **El Ghaoui: Tu/Th 2-3pm 421 SDH**
- **GSI office hours are**
  - **PHG - set on Tuesday 10am - 11am, TBD**
  - **CK - set on Friday 10am - 11am, Soda 651**
  - **RL - TBD**
  - **LY - set on Friday 3pm - 4pm, Soda 651**
  - **NT - set on Monday 10am - 12pm, Soda-Alcove-341A**

# Discussions

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**Discussions sections are on (start next week):**

**W: 5 - 6pm, Stanley 106**

**Th: 5 - 6pm, LeConte 4**

- Choose one of those time slots (same content W and Th)**
- Discussion sections are not mandatory, but encouraged**
- They help you see things in a less formal setting**
- They are taught by the Head GSI and they are more interactive**
- They reinforce what you see in lecture**
- Problems to be solved will be posted on Wednesday's morning**

# Lectures, Discussions, Office Hours, Hwk parties

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## Office hours and homework parties recommended topics

- Instructor office hours:
  - Material seen in class
  - Other topics related to the class
- Head GSI / GSI
  - Material seen in class
  - Discussion material, hwk
- uGSIs / homework parties
  - Hwk material
  - Material seen in class when in the context of hwk

**We will adjust these for the exam weeks**

# Email

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## Ex. of appropriate use of email with instructors

1. Emergency (“need to go to funeral”, “in hospital cannot come to exam”, “held outside of the US by immigration”)
2. Personal issues that cannot be solved by rest of the team

## Ex. of **not appropriate** use of email with instructor

1. “Equation (4) on p. 3 should have a minus sign”
2. Will the Hessian be on the final?
3. Do you think I should go to Stanford for my PhD? Is that a good school?

**We will not answer email unless appropriate. Use your judgement to communicate with us.**

# To communicate with us

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To communicate with the teaching team

1. In class, in session, in hwk party
2. In office hours
3. On piazza
4. With the appropriate email channels
5. For personal cases or emergency, by email, otherwise: please consider this



**Instructor**

# Disabled Students Program

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## If you are in this situation

- You need to have the DSP send us your letter as soon as possible.
- Without the letter from the DSP we cannot help you, because we do not know what you need (and we cannot do it legally).
- With the letter from the DSP, we know exactly what to do, and we can ask for the resources to do it. **IT WORKS WELL.**
- Talk to us ahead of time.
- Share your concerns.
- We will do everything we can to help, tell us how to help you.

## Other personal needs (please remember previous slide)

- Let us know
  - In person in OH
  - In email
  - After class, in the lab, make special appointment if needed.



# Exam policies

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There will be 2 midterms (held in-class) and 1 final.

- Each midterm will be approximately 80 minutes.
- The final will be a standard 3 hour written final in the appointed exam time slot (12/14/18 8-11am).
- We will allow each student one, double-sided (handwritten) cheatsheet of notes for each exam.
- **There will be no make-up exams, except for medical emergencies.**
- Regrade policy for exam problems is identical to HWK regrade policy.

# Extra Credit

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**The following activities will receive extra credit:**

- Scribing (next slide)**
- Top five students posting correct answers on Piazza**
- Bonus problems in some homeworks**

# Scribing

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This year we will be having several scribes produce high-quality Latex notes for each lecture.

- **You will receive extra-credit for this!**
- Please see <https://github.com/nileshtrip/EE127Notes> for detailed instructions (in instructions.pdf) scribes are required to follow.
- Link also contains a Google doc sign-up sheet.
- Scribes should follow the example template in Lecture0 to produce their notes.

# Grading system: we value consistency

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## Grade breakdown is as follows.

- Homework: 40%
- Midterm Exam: 20%
- Final: 40%

## Specifics on grading.

- We will drop the lowest of the two midterms: two midterm exams, the highest grade counts for 20%
- We will drop the lowest hwk grade through the semester.
- The quiz does not count. The quiz is for you to be in an exam situation, see how you do, and learn from not knowing how to solve a question. Use it as practice for the exams.

# This is not a grading scale

This is not a grading scale, ceci n'est pas une pipe

- A : 93 – 100%
- A-: 90 – 93%
- B+: 87 – 90%
- B :83 – 87%
- B-: 80 – 83%
- C+: 77 – 80%
- C :73 – 77%
- C-: 70 – 73%
- D+: 67 – 70%
- D : 63 – 67%
- D-: 60 – 63%
- F : < 60%



*Ceci n'est pas une pipe.*



*This is not a hammer.*

# Cheating

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Throughout the semester, you are encouraged to collaborate with other students in the class. However, directly copying from your peers' assignments will not be tolerated. Here we give our formal definition of cheating in this course.

## **CHEATING:**

**Turning in work done by another person as if were your own.**



# Topics covered in lecture

| A    | B         | C        | D            | E                          | F  | G                                 | H                    |
|------|-----------|----------|--------------|----------------------------|--|-----------------------------------|----------------------|
| Week | Lecture # | Date     | Instructor   | Part                       | Lecture                                  | Reading (book)                    | Reading (livebook)   |
| 1    | 1         | 8/23/18  | AB & LEG     | <i>Linear algebra</i>      | Introduction                             | Ch. 1                             | Sec. 1               |
| 2    | 2         | 8/28/18  | AB           |                            | Vectors and functions                    | Ch. 2                             | Sec. 2.1             |
| 2    | 3         | 8/30/18  | AB           |                            | Matrices and linear maps                 | Ch 3, except sec. 3.3, 3.4.9, 3.7 | Sec. 2.2, except 2.5 |
| 3    | 4         | 9/4/18   | LEG          |                            | Quiz and mini-review / extra topic       |                                   |                      |
| 3    | 5         | 9/6/18   | LEG          |                            | Symmetric matrices and their eigenvalues | Ch. 4                             | Sec. 2.5             |
| 4    | 6         | 9/11/18  | LEG          |                            | Singular value decomposition             | Ch. 5                             | Sec. 2.6             |
| 4    | 7         | 9/13/18  | LEG          |                            | Linear equations                         | Ch. 6, except 6.5                 | Sec. 2.3             |
| 5    | 8         | 9/18/18  | AB           |                            | Least-squares and variants               | Ch. 6, except 6.5                 | Sec. 2.4             |
| 5    | 9         | 9/20/18  | AB           |                            | Review                                   |                                   |                      |
| 6    |           | 9/25/18  |              |                            | MIDTERM                                  |                                   |                      |
| 6    | 10        | 9/27/18  | AB           | <i>Conic optimization</i>  | Linear optimization                      | Ch. 9, sec. 9.3                   | Sec. 3.2             |
| 7    | 11        | 10/2/18  | AB           |                            | Quadratic optimization                   | Ch. 9, all sections except 9.7    | Sec. 3.2             |
| 7    | 12        | 10/4/18  | AB           |                            | Second-order cone optimization           | Ch. 10, sections 10.1 and 10.2    | Sec. 3.3             |
| 8    | 13        | 10/9/18  | AB           |                            | Robust optimization                      | Ch. 10, section 10.3              | Sec. 3.4             |
| 8    | 14        | 10/11/18 | AB           |                            | Review                                   |                                   |                      |
| 9    |           | 10/16/18 | AB           |                            | Quiz and extra topic TBD                 |                                   |                      |
| 9    | 16        | 10/18/18 | LEG          | <i>Convex optimization</i> | Convexity                                | Ch. 8, sections 8.1, 8.2          | Sec. 3.1.1, 3.1.2    |
| 10   | 17        | 10/23/18 | LEG          |                            | Convex optimization problems             | Ch. 8, sections 8.3, 8.4          | Sec. 3.1.3           |
| 10   | 18        | 10/25/18 | LEG          |                            | Weak duality                             | Ch. 8, section 8.5                | Sec. 3.1.5           |
| 11   | 19        | 10/30/18 | LEG          |                            | Strong duality                           | Ch. 8, section 8.5                | Sec. 3.1.5           |
| 11   | 20        | 11/1/18  | LEG          |                            | Applications of duality                  |                                   |                      |
| 12   |           | 11/6/18  |              |                            | MIDTERM                                  |                                   |                      |
| 12   | 21        | 11/8/18  | LEG          |                            | Overview of algorithms                   | Ch. 12                            | Sec. 3.1.4           |
| 13   | 22        | 11/13/18 | AB / LEG TBD | <i>Applications</i>        | Machine learning                         | Ch. 13                            | Sec. 3.2.5, 3.4.4    |
| 13   | 23        | 11/15/18 | AB / LEG TBD |                            | Engineering design                       | Ch. 16                            | Sec. 3.5             |
| 14   | 24        | 11/20/18 | LEG          |                            | Finance                                  | Ch. 14                            | Sec. 5.5             |
| 15   | 25        | 11/27/18 | AB           |                            | Control applications                     | Ch. 15                            | Sec. 2.6, 5.1,       |
| 15   | 26        | 11/29/18 | AB           |                            | Review                                   |                                   |                      |
| 16   |           | 12/4/18  | RRR          |                            | RRR                                      |                                   |                      |
| 16   |           | 12/6/18  | RRR          |                            | RRR                                      |                                   |                      |
|      |           | 12/14/18 |              |                            | FINAL (8-11am)                           |                                   |                      |