# EC 401: Signals and Systems

## Course Staff

**Lecturer: Prof. Archana Venkataraman**
- Email: archanav@bu.edu
- Office Hours: Wednesdays, 10:30–11:30am
- Office: PHO 422

**Graduate Teaching Fellow: Nina Servan-Schreiber**
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- Additional Office Hours: Thursdays, 6:30–8:15pm
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**Undergraduate Teaching Fellows: Henry Bega, Jon Cili, and David DeAcereto**
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## General Information

**Lecture Schedule: M/W 12:20–2:05pm, PHO 203**

**Discussion Sections: Mon 6:30–8:15pm, EPC 204 & Tues 6:30–8:15pm, EPC 209**
- The discussion sections will be student-led office hours. The weekly sections are scheduled for Monday and Tuesday evenings. There will also be two *ad hoc* Thursday sections (Feb 20th and April 3rd) due to the Friday HW due dates on those weeks. You may attend any or all of the discussion sections as needed.

**Required Textbook**
- Oppenheim, Willsky and Nawab, *Signals & Systems (2nd Edition)*, Prentice Hall, 1997. ISBN: 0-13-814757-4

**Homework Assignments**
- Homework will be assigned weekly and due either on Wednesday or Friday. They are intended for you to clear up any confusion with the material, develop proficiency through practice, and internalize the concepts.
- HW assignments are due at **12pm on the specified date**. There is an automatic 50% deduction for assignments turned in between 12:01–11:59pm on the specified date. No credit will be given after this.
- Each HW problems will be graded on the following coarse scale:
  **0** – No attempt
  **1** – Partially complete and/or major errors
  **2** – All parts completed but with minor mistakes
  **3** – All parts done correctly
- Some problems may require coding. We recommend MATLAB for this course but will accept Python code.
- **All assignments should be uploaded electronically to Blackboard.**

**Examinations**
- **In-Class Quiz 1:** Wednesday, February 26th
- **In-Class Quiz 2:** Wednesday, April 9th
- **Final Exam:** TBD, Scheduled by Registrar
- Students may bring two $8.5 \times 11$" double-sided formula sheets to each in-class quiz and four $8.5 \times 11$" double-sided formula sheets to the final exam. Otherwise, the exams are closed book and closed notes.

**Grading**
- Your final score for the course will be computed as follows:
  **Homework:** 15%
  **Quiz 1:** 20%
  **Quiz 2:** 20%
  **Final Exam:** 35%
  **Class Participation:** 10%
- Grades will be curved according to the overall class performance (Median $\approx$ B)

## Course Policies

**Academic Misconduct**
- The student handbook defines Academic Misconduct as follows: "Academic misconduct occurs when a student intentionally misrepresents his or her academic accomplishments or impedes other students' chances of being judged fairly for their academic work. Knowingly allowing others to represent your work as theirs is as serious an offense as submitting another's work as your own." This basic definition applies to EC401. If you are ever in doubt as to the legitimacy of an action, please contact me immediately.

**Make-Up Exams**
- There will be no make-up exams. If you have a legitimate excuse, as confirmed by BU student services, then the scores of your other exams will be weighted more highly to compensate for the missed exam. If you do not have a legitimate excuse, you will be given a grade of zero for any missed exam.

**Incomplete Grades**
- Incompletes will not be given to students who wish to improve their grade by taking the course in a subsequent semester. An incomplete grade will only be given if accompanied by an official accommodation request from BU student services. Students will not be given an opportunity to improve their grade by doing "extra work".

## Course Objectives

This course is designed to provide students with
- A thorough understanding (and appreciation!) of the nature of continuous and discrete signals and their applications in engineering and data analysis
- An understanding of the use of transform methods for signal classification and system analysis
- **ABET #1:** An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- **ABET #6:** An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- **ABET #7:** An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

The following table outlines the topic progression and HW deadlines. While the content pacing is subject to change during the semester, the HW assignments will always be released and due as noted below.

| Date | Topic | Textbook Reading | HW Out | HW Due |
|------|-------|------------------|--------|--------|
| 1/22 | Introduction; Signals | Chapter 1 | 1 | |
| 1/24 | — | — | | |
| 1/27 | Signals and Systems | Chapter 1 | | |
| 1/29 | DT LTI Systems | Chapter 2 | 2 | 1 |
| 1/31 | — | — | | |
| 2/3 | CT LTI Systems | Chapter 2 | | |
| 2/5 | CT Fourier Series | Chapter 3 | 3 | 2 |
| 2/7 | — | — | | |
| 2/10 | CT Fourier Series Cont'd | Chapter 3 | | |
| 2/12 | CT Fourier Transform | Chapter 4 | 4 | 3 |
| 2/14 | — | — | | |
| 2/18 | CT Fourier Transform Cont'd | Chapter 4 | | |
| 2/19 | CT Fourier Transform Wrap-Up | Chapter 4 | | |
| 2/21 | — | — | 5 | 4 |
| 2/24 | In-Class Review Session | — | | |
| 2/26 | **Quiz 1:** Signals, LTI, CTFS, CTFT | Ch. 1–2, 3.1–3.5, 4 | | |
| 2/28 | — | — | | |
| 3/3 | DT Fourier Series | Chapter 3 | | |
| 3/5 | DT Fourier Transform | Chapter 5 | 6 | 5 |
| 3/7 | — | — | | |
| 3/10 | | — | | |
| 3/12 | SPRING RECESS | — | | |
| 3/14 | | — | | |
| 3/17 | DT Fourier Transform Cont'd | Chapter 5 | | |
| 3/19 | DT Fourier Transform Wrap-Up | Chapter 5 | 7 | 6 |
| 3/21 | — | — | | |
| 3/24 | Sampling & Reconstruction | Chapter 7 | | |
| 3/26 | Sampling & Reconstruction Cont'd | Chapter 7 | 8 | 7 |
| 3/28 | — | — | | |
| 3/31 | AM Modulation | Chapter 8.1–8.3 | | |
| 4/2 | Modulation Cont'd | Chapter 8 | | |
| 4/4 | — | — | 9 | 8 |
| 4/7 | In-Class Review Session | Chapter 9 | | |
| 4/9 | **Quiz 2:** DTFS/T, Sampling, Mod. | Ch. 3.6–3.8, 5,7,8 | | |
| 4/11 | — | — | | |
| 4/14 | Laplace Transform | Chapter 9 | | |
| 4/16 | Laplace Transform Cont'd | Chapter 9 | 10 | 9 |
| 4/18 | — | — | | |
| 4/21 | PATRIOT'S DAY – NO CLASS | — | | |
| 4/23 | Z-Transform | Chapter 10 | 11* | 10 |
| 4/25 | — | — | | |
| 4/28 | Z-Transform Cont'd | Chapter 10 | | |
| 4/30 | Linear Feedback Systems | Chapter 11 | | |
| 5/2 | Final Exam Review | Time/Location TBD | | |

*HW 11 will be due at 11:59pm on Thursday 5/1.