

# 6.003 course description (Fall 2007)

## 1 Subject Contents

This subject introduces and develops the mathematical description of signals and systems with applications taken from engineering and science. Both continuous- and discrete-time processes are modeled and analyzed using time-domain and transform methods. Topics include filtering, audio and image processing, communications, and feedback systems.

## 2 6.003 Web Site

All handouts for 6.003 will also be posted on our web site [mit.edu/6.003](http://mit.edu/6.003). Please consult this site for up-to-date information on subject policies, office hours, lectures, recitations, tutorials, homework, and examinations.

## 3 Teaching Activities

Several kinds of activities are provided to help the learning process.

- Two lectures each week to introduce new material.
- Two recitations each week to review material, solve problems, and answer questions.
- One tutorial each week to provide more personalized instruction.
- Weekly homework assignments to help students to *actively* assimilate the course material.
- Open office hours (Monday and Tuesday in 32-044) to provide opportunities to discuss concepts with other students and the teaching staff.
- Two evening examinations and one final examination to provide an occasion for the student to integrate the subject material and to obtain an objective evaluation of the student's understanding of the material.

## 4 Prerequisites

This subject will focus on mathematical tools for design and analysis of physical systems, and will assume that you already have a solid background in math and physics. Prerequisites for the Fall 2007 edition of 6.003 are 18.03 and either 8.02 or 8.022.

## 5 Staff

<i>Name</i>	<i>Role</i>	<i>Office</i>	<i>Phone</i>	<i>E-mail at mit.edu</i>
Dennis M. Freeman	Lecturer	36-889	253-8795	freeman
Qing Hu	Recitation Instructor	36-465	253-1573	qhu
Jeffrey Lang	Recitation Instructor	10-176	253-4687	lang
Karen Livescu	Recitation Instructor	32-G482	253-5953	klivescu
Sanjoy Mahajan	Recitation Instructor	5-122	253-0602	sanjoy
Antonio Torralba	Recitation Instructor	32-D432	324-0900	torralba@csail
Demba Ba	Head TA	38-588,592	253-4619	demba
Paul Azunre	TA	38-588,592	253-4619	azunre
Dheera Venkatraman	TA	38-588,592	253-4619	dheera
Keng-Hoong Wee	TA	38-588,592	253-4619	khwee
Steve (Hao) Zhou	TA	38-588,592	253-4619	hzhou
Janice Balzer	Secretary	36-825	253-7349	balzer

## 6 Schedule

**Lectures:** Tuesday and Thursday, noon-1pm, Room 34-101.

**Recitations** Wednesday and Friday, at the following times:

<b>Section</b>	<b>Time</b>	<b>Room</b>	<b>Instructor</b>
1	10-11	36-301	Lang
2	11-12	36-301	Lang
3	11-12	24-307	Livescu
4	12-1	24-307	Mahajan
5	1-2	34-301	Torralba
6	2-3	24-402	Hu

**Tutorials:** To be scheduled. Sessions will begin September 11.

## 7 Scheduling

### 7.1 Recitations

Please fill out the Registration Information sheet (distributed in the first recitation and available on the 6.003 website) and hand it today if you haven't already handed it in. We will be using this information to balance recitation sections. Note that in order to balance recitation sections, it may be necessary to reschedule some students from the sections assigned by the Registrar. Consequently, please check the schedule information (posted on the 6.003 Web Site) **prior** to going to tomorrow's recitation.

## 7.2 Tutorials

Each week you will have a Tutorial that is taught by a TA. These Tutorials occur on Mondays and Tuesdays. The room number and time of your Tutorial will be posted on the 6.003 Web Site.

If you have a question or concern about the recitation or tutorial to which you have been assigned, if your name does not appear on the schedule, or if you did not hand in the Registration Information sheet, please contact the Head TA.

## 8 Lectures

The lectures will introduce new material and determine the pace of the subject. The lectures are based primarily on the subject text (Signals & Systems by A. V. Oppenheim and A. S. Willsky) but also build on materials in prerequisite subjects. Although we will cover all of the topics in the text, the order in lecture will differ from the order in the text.

Printed copies of the slides shown in lecture will be provided at the lecture so that you can take notes during lecture. Printed copies of the slides will NOT be available after lecture, but electronic versions will be available on the 6.003 Web Site.

## 9 Homework

Weekly homework assignments provide an opportunity to develop intuition for new concepts by actively applying the new concepts to solve problems and answer questions. The process of actively struggling with the use of new ideas until you understand them is an effective and rewarding form of education. Reading someone's solution to a problem is not educationally equivalent to generating your own solution.

Homework assignments will generally be issued one week before they are due, as listed on the 6.003 web site. The homework problems will be available online. Paper copies of homework assignments and solutions will not be distributed.

Some of the problems in the weekly homework assignments will introduce and develop practical applications of the subject matter in engineering contexts. These problems will often require the use of a computer (using Matlab, Octave, or Python) and serve as the basis for the 4 Engineering Design Points awarded for completion of 6.003.

The engineering problems replace the "laboratory" sessions that were a part of previous versions of 6.003. As such, they represent an **addition** to the ordinary homework. Consequently, you should expect that the homework assignments in 6.003 (a 15-unit subject) will take **more time** to complete than those in 12-unit subjects.

## 10 Use of computer

You may use any of the following software packages to solve homework problems that require computation and/or plotting:

**Matlab** is commercial software that is widely used in signal processing applications. Matlab is available on Athena. As a student at MIT, you can also obtain a copy of the student version of MATLAB (see <https://matlab.mit.edu/cgi-bin/matlab>).

**Octave** is free software (GPL license) with many features that are similar to Matlab. Octave is available on Athena.

**Python** is open-source software that is used in 6.01 and 6.02 (Introduction to EECS I & II). Python is available on Athena.

Some of the homework problems involve audio signals. Please use headphones when working on such problems in public clusters.

Introductory materials on the use of these programs can be found on the 6.003 web site.

## 11 Submitting Homework

Please submit your completed homework assignments at the beginning of your assigned recitation section on the date that the assignment is due. Homework will not be accepted in any other way, unless you have made **prior** arrangements with your TA.

## 12 Homework Grading

Homework problems will be graded on the following scale:

<i>Grade</i>	<i>Description</i>
A	Solution is clear, concise, and demonstrates firm understanding of the question.
B	Solution is clear and concise but has some significant shortcomings.
C	Solution is adequate.
D	Solution is inadequate or incomprehensible.
F	Solution is submitted, but contains nothing worthwhile.
O	Omitted. Homework not completed on time.
X	Excused for extenuating circumstances certified by the staff, Dean, or Physician.

Your weekly homework grades will be computed from a weighted average of the letter grades for each problem. Your final homework grade will be computed after dropping the lowest weekly grade.

## 13 Homework Solutions

Solutions to each homework assignment will generally be made available on the 6.003 Web Site a few days after the homework due date.

## 14 Extension Policy

Each student will be allowed exactly **one** extension that can be used for any reason on any one of the weekly homework assignments. To use your extension, you **must** notify your TA in person or by email by 11:59 pm on the day before the assignment is due. Once you request to use your extension, it cannot be rescinded. The extended due date, time, and location is the first recitation session following the published due date. Homeworks that are completed with extensions will be

graded with letter grades A–F or will be excused (grade X) at the discretion of the teaching staff. Grades of X are omitted from the computation of your final grade (e.g., your homework grade will be based on one fewer assignment).

## 15 Collaboration Policy

We encourage students to **discuss** the homework with other students and with the teaching staff to better understand the concepts. However, we expect that **you** wrote the solutions that you submit under your name. Students should **not** use solutions of other students (from this year or from previous years) in preparing their own solutions. Students should **not** take credit for computer code or electronic plots generated by other students. Students should **not** share their solutions with other students.

Any student caught plagiarizing will receive a grade of F on the assignment. All incidents of plagiarism will be reported to the Committee on Discipline (COD). More information about what constitutes plagiarism can be found at

<http://web.mit.edu/academicintegrity/>

## 16 Evening Quizzes

Two evening examinations will be given: one on Wednesday, October 3, and one on Wednesday, November 7. These exams will be held in 32-124, 32-141, and 32-155 from 7:30-9:30 pm. Students will have two hours to complete each exam, which will each be designed as a one-hour exam.

These exams are closed-book: notes on both sides of one 8.5 × 11 sheet of paper may be used for reference in the first examination, and notes on both sides of two 8.5 × 11 sheets of paper may be used for reference in the second examination. Calculators, cell phones, music players, and other electronic communications devices are not allowed. Recitations are canceled on quiz days.

All students are expected to take the quizzes at the scheduled times and locations. If you have a legitimate reason for not being able to make the scheduled time (such as a conflict with another subject), please see the Head TA as soon as possible. No accommodations will be made unless the Head TA is contacted **more than one week** before the scheduled times.

## 17 Regrade Policy

If you find a grading error in a quiz, please submit your exam along with a cover sheet that describes the error that you found to your TA. We will review your concern and then regrade the **entire** exam to try to eliminate the error that you identified as well as any other grading errors.

Requests for regrades must be made **within one week** of the date when the graded exams are returned.

## 18 Final Examination

A three-hour final examination, given during the Final Examination Period, will cover all the material in the subject, but will be weighted more heavily on material not covered in the examinations given during the term. The final examination is closed-book; notes on both sides of three

8.5 × 11 sheets of paper may be used for reference. Calculators, cell phones, music players, and other electronic communications devices are not allowed.

The final examination is scheduled by MIT's Registrar's Office. Conflicts with the scheduled time must be resolved by scheduling a conflict examination with MIT's Registrar's Office.

## 19 Grade

The letter grade for the subject will be determined from a weighted sum of the letter grades for the homework assignments, class participation, quizzes, and final examination. First, a preliminary grade is determined using the following weights:

<b>Homework</b>	15%
<b>Class Participation</b>	05%
<b>Quiz 1</b>	15%
<b>Quiz 2</b>	25%
<b>Final Examination</b>	40%

The final grade will be based on the preliminary grade as well as other factors, such as poor performance on homework assignments. We consider the homework assignments to be an important part of this subject. Therefore, if you get a grade that is lower than C– on three or more weekly homework assignments, your final grade will be **lower** than your preliminary grade. For students near grade boundaries, other factors (such as effort, improvement, or professional behavior (or lack thereof)) may also be taken into account. Grades are determined by the entire staff.

## 20 Text

The text for this subject is A.V. Oppenheim and A.S. Willsky, with S.H. Nawab, *Signals and Systems*, Prentice-Hall, Second Edition, 1997. It is available at Quantum Books, 4 Cambridge Center (phone: 617-494-5042).