In Friend of OCW's August 2015 newsletter   <u>View this email in your browser</u>

MITOPEN**COURSEWARE**
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Under Siege in Cyberspace

This class deals with topics related to computer security. (Image courtesy of <u>UK Ministry of Defence</u> on Flickr. CC BY-NC 2.0.)

Given the way the world has become dependent on computer systems, few subjects can have more urgency than cybersecurity. Every week, it seems, large computer systems are attacked, and vast amounts of information get stolen—social security numbers, credit card and bank accounts, droves of email messages, confidential business data, state secrets. Hackers work feverishly around the clock to break-in, shut down, tie up, hijack, and make off with the goods.

Luckily, MIT is on the job educating students how to design computer systems that can stymie these attacks. OCW has just published *6.858 Computer Systems Security,* a graduate-level course taught by <u>Professor Nickolai Zeldovich</u>. The course site has full lecture videos, notes for most lectures, labs with

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Friend of OCW, we hope you learned something new or refreshed your memory on a topic you've previously studied.

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supporting files, exams with solutions, and an extensive array of links to resources on cryptography, OS security, and more. There is no textbook; rather, students read a sequence of papers and submit questions before each lecture.

As Professor Zeldovich explains, computer system security has three high-level components. First, programmers must develop a policy, a set of goals they want to achieve. Second, they must construct a threat model, a set of assumptions that profile the adversary behind potential attacks. And they must create mechanisms that execute the policy and thwart the threat model.

All three areas are prone to error and must be questioned and tested in an iterative process to achieve a high level of security. The assumptions about the behavior of users (as in the kind of passwords they create or the answers they provide for security questions) can be flawed. Even if accurately predicted at first, the capability of the bad guys can change as technology changes over time. The mechanisms providing security can have bugs, and even small bugs can lead to catastrophic consequences.

It's all quite scary, but that's to the good. Computer security is one area where paranoia can be not just beneficial, but essential.

OCW users who would like a more extensive introduction to how secrets can be shared safely will want to explore *6.857 Network and Computer Security,* taught by Professor Ron Rivest, which emphasizes cryptography.

New Courses

Ab InITIO
**Ab Initio and OpenCourseWare:
Built on fundamentals**

[STS.089 Technology and Innovation in Africa](#)

[18.325 Topics in Applied Mathematics: Waves and Imaging](#)

- [7.341 Of Mice and Men: Humanized Mice in Cancer Research](#)
- [21M.S53 Chinese Popular Musics in Dialogue](#)
- [21A.150 Teaching and Learning: Cross-Cultural Perspectives](#)
- [17.263 U.S. National Elections](#)
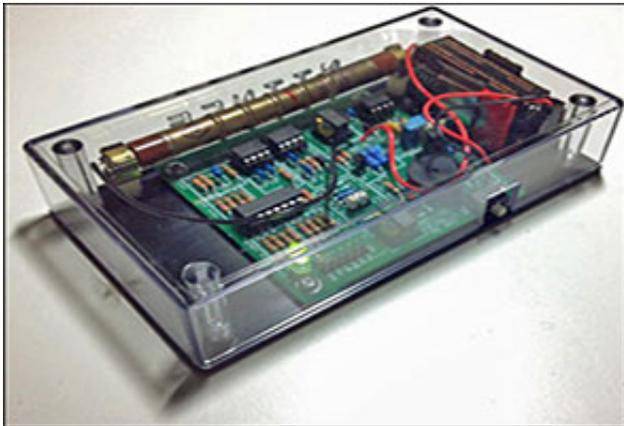
Updated Courses

[WGS.301J Feminist Thought](#)

[21H.991 Theories and Methods in the Study of History](#)

- 6.828 Operating System Engineering
- 18.303 Linear Partial Differential Equations: Analysis and Numerics

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OCW Educator

Each student in this class builds and tests their own Geiger counter. (Photo courtesy of Mark Chilenski.)

Active Learning Clicks in This Class

You have four highly radioactive cookies, each emitting a different kind of radiation. You must

a. Put one in your pocket
b. Hold one in your hand
c. Eat one
d. Give one to a "friend"

What do you do?

Such is the challenge that begins *22.S902 Do-It-Yourself Geiger Counters,* a course taught in MIT's

January 2015 IAP period by <u>Professor Mike Short</u> and Teaching Assistants Mark Chilenski and Matthew D'Asaro. (You can read about them <u>here</u>.)

The goal of the course is just as the title states: building a functioning Geiger counter. And en route: learning about radioactivity, how to identify its different kinds, how to shield against them, how to calculate uncertainty, how to solder, assemble, test, and debug circuits, and lots more! All in five days!

Professor Short is a champion of active learning, and he explains why in <u>Developing and Teaching Hands-on Courses</u>, one of the Instructor Insights on his <u>This Course at MIT page</u>. As he sees it, the initial time investment is considerable, but the payoff is exponential:

> Whenever I put in the extra effort to make a hands-on course, the work I get back from students is better. It's quicker to grade. It's also more fun to teach hands-on courses because the students get what's going on instead of just sitting silently through class. If you can teach the same content in a better way, then why wouldn't you put in the extra work to do it?

One of the challenges of active learning is getting students to overcome their fear of failure, and doing that, Professor Short insists, requires that the instructor earn students' trust. Cheerleading also helps. He says repeatedly to the students:

> "This is the class in which I want to see things exploding. This is where I want to see you do the high-voltage dance. This is where I want everything to go wrong,

because you can't get it to go right unless
you see what goes wrong. This is a safe
place where you can screw up."

The course site includes instructions on how to build a
Geiger counter (written by Mark Chilenski) along with
tips on how to obtain the necessary parts.

Students in the class used their Geiger counters in
many different ways—determining how much
radiation people are exposed to in a flight from Boston
to Hong Kong, seeing just how radioactive are those
famous graves in Salem, Massachusetts, identifying
chunks of uranium lying around near old mine sites . .
. The uses are endless!

Highlights for High School

Image courtesy of emily.bluestar on Flickr. License:
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Have no fear, OCW is here!

Though it's technically still summer, many schools
have already started, and teachers are furiously
planning the beginning weeks of their classes.

Teachers, OCW's Highlights for High School has a

ton of material ready to help you, whether you want to beef up on a particular subject, plan an activity, or find extra credit projects for your students.

Check out our special **For Teachers** section and learn:

- How Highlights for High School is organized
- Ways to use Highlights for High School
- Examples of how the site has been used by other educators
- Advice from teachers
- FAQs

Also, take a look at our new project called **This Course at MIT** .

Structured like fact sheets, "This Course at MIT" pages provide context for how the course materials published on OCW were originally used at MIT. We hope that such information will help you better understand and use the course materials. The pages may include sections such as:

- Course Outcomes
- Curriculum Information
- Student Information
- How Student Time Was Spent
- Instructor Insights
- Course Team Roles

MITx News
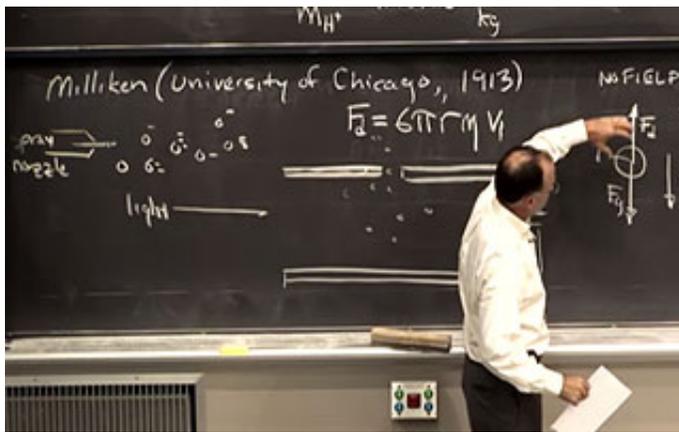
Professor Cima teaching 3.091x

Experience Back to School like an MIT Student with MITx MOOCs

This September, as MIT students arrive back on campus for the fall semester, learners all over the globe can join them virtually via MITx on edX. MITx has 9 courses launching through late August and September, covering a variety of subjects representing some of the best that MIT has to offer. The menu of courses even includes some of the first-year or introductory-level courses that MIT students will embark upon as they arrive on campus.

Looking to learn computer science and programming skills that are in high demand from employers? 6.001x Introduction to Computer Science and Programming Using Python, starting August 26, is one of the most popular courses. You'll learn how to use computer science to solve real-world analytical problems, and you don't need any background in programming. Electrical Engineering and Computer Science, otherwise known as Course 6 or EECS in MIT-speak, is the largest academic department at MIT, so you're in good company if you join any of the online Course 6 MOOCs!

3.091 Introduction to Solid State Chemistry, starting September 8, has been taught at MIT for over forty years and is one of the largest classes on campus. It

teaches students how to tap into their "chemical intuition," exploring the basic principles of chemical bonding by studying the properties of solids. Even if you've studied chemistry before, this course's engineering focus will give you a different viewpoint of the field.

As students arrive back on campus, they will also utilize digital learning in their residential coursework via the MITx platform – a version of the edX platform specifically for MIT students. Students might access video tutorials or practice concepts with online, interactive problem sets. This fall it's anticipated that close to 50 on-campus courses will utilize some aspect of digital learning during the semester. Already, more than 85% of MIT students have used it in some way.

Join us this fall as we go back to school worldwide! There are many more courses open for registration now at https://www.edx.org/school/mitx.

Views From Our Supporters
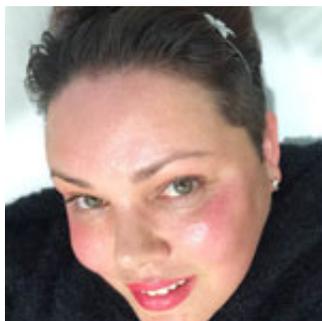
"OCW is allowing me to pursue my love of astrophysics in a learning capacity with freedom from fees while still giving me the opportunity to undertake an undergraduate later should I qualify.

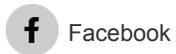The teachers are outstanding and I feel only grateful for their

help along the way -
that has to count
towards something.

Hence, I am only too
pleased to part with a
few $."

- Veronika, Independent
Learner, Australia

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