

March 28, 2019

Stanford | VPTL

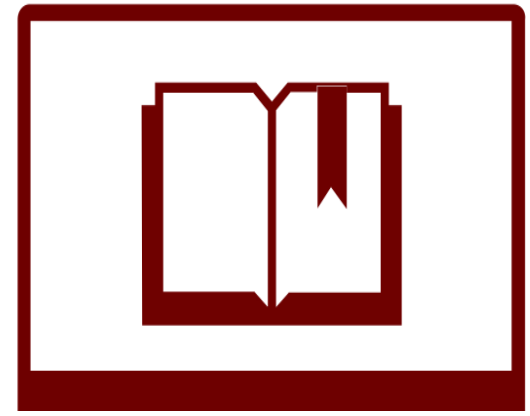
The best of both worlds in fully online master's: Integrating Open edX and Canvas

Jea Choi | Alison Brauneis | Greg Brubns | Grace Lyo

Outline

- Course Context & Background Information
- Instructors' Needs & Platform Decision
- Deep Dive into Platform Features
 - Canvas structure with content integration
 - Open edX
 - Canvas
- Reflection & Future Implications

Course Background



Materials Science 204: Thermodynamics & Phase Equilibria

Materials Science 156/256: Solar Cells, Fuel Cells, and Batteries



Reduce the amount of time to be on campus

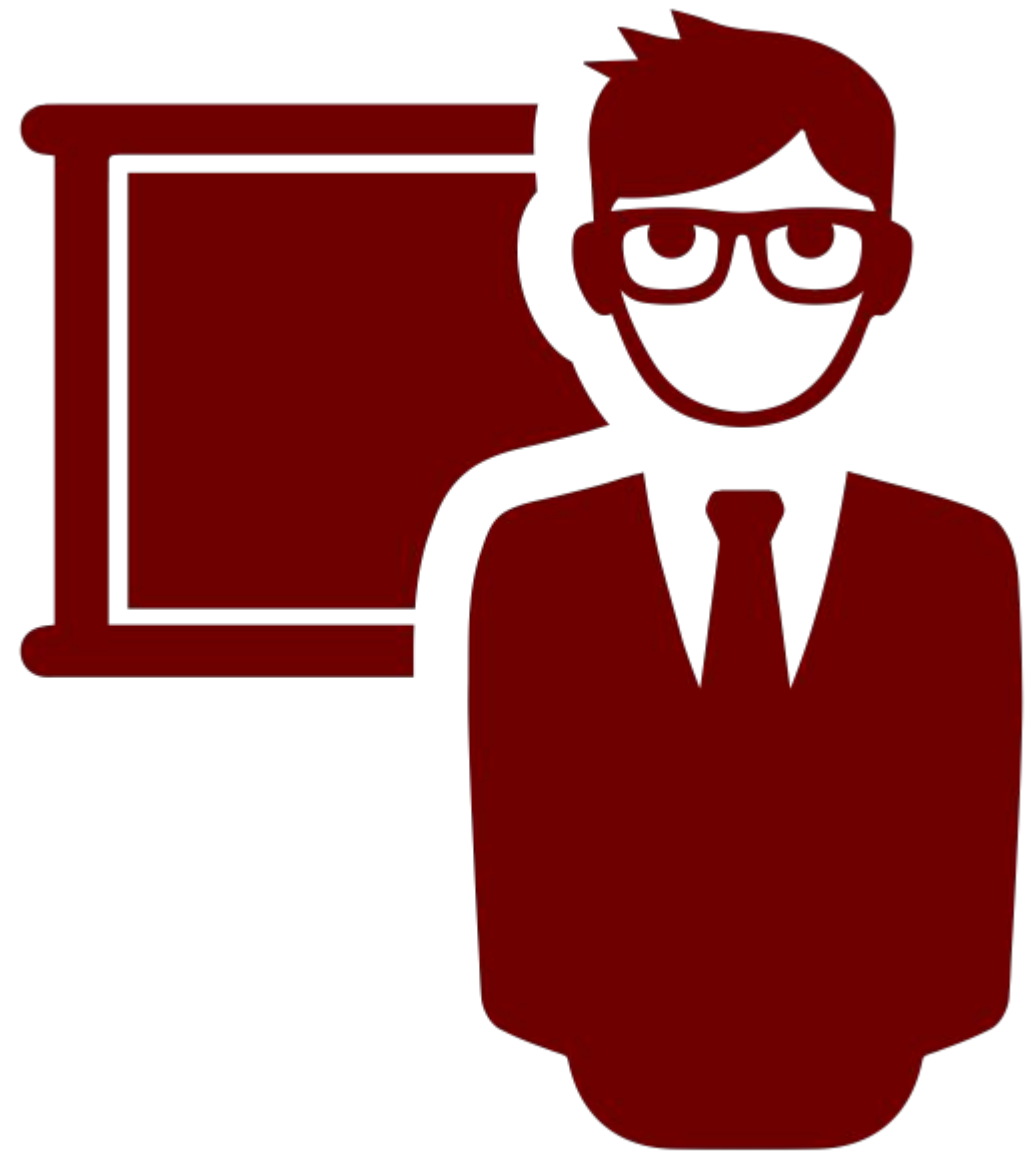
Expand the courses to a broader audience



Offered in Summer 2018 as a pilot

Planning started in December 2017

Instructors' Needs



- ❖ Offer interactive student experience
- ❖ Integrate constructive response opportunities
- ❖ Assign problem sets & exams with manual grading
- ❖ Implement prerequisites
- ❖ Provide the space to ask questions
- ❖ Provide seamless user experience

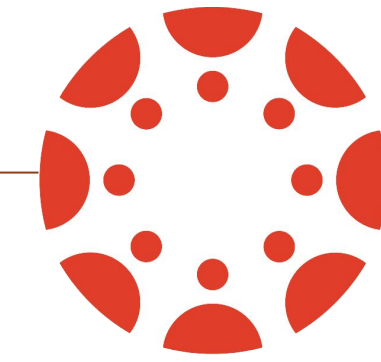
Platform Features

Why Pick One When You Can Have Both?



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OPENedX

- ❖ Student interaction and engagement features
- ❖ Interactive video player
- ❖ Robust assessment (e.g. peer instruction, drag and drop, submit and compare)
- ❖ Supports LTI integration to the other platform



canvas

- ❖ Registration system linked
- ❖ Assignment/exam feedback using SpeedGrader
- ❖ Discussion forum
- ❖ More flexible use of prerequisites



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Canvas Platform Navigation

- ❖ Canvas features and tools are listed in the left hand column
- ❖ Instructor decides which features to use and show learners

☰ Su18-MATSCI-204-01/194-01

Summer 2018

Home

Announcements

Modules

Discussions

Grades

People

Syllabus

Roster Photos

Assignments

Files

Pages

Outcomes

Quizzes

Conferences

Collaborations

Settings

Thermodynamics and Phase Equilibria

MATSCI 204: Thermodynamics & Phase Equilibria Summer 2018 Online Course Syllabus

Course Staff

Professor: ██████████

Email: ██████████@stanford.edu

Teaching Assistant: ██████████

Email: ██████████@stanford.edu

Course Site

This class is delivered entirely online. Course information, including the syllabus, announcements, all lecture materials, and all assignments will be delivered entirely via the Canvas course platform at:

<https://canvas.stanford.edu/courses/85702>. To get started, click on Modules in the left navigation menu.

Course Overview

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Canvas Structure & Content Integration

- ❖ Canvas Modules organize content and create a flow/progression through material
- ❖ Various types of content can be displayed in Modules, including external content through LTI
- ❖ Integration is seamless and all Open edX functionality is available

A screenshot of a Canvas LMS module page. The breadcrumb trail at the top reads: 'Sci18-MATSCI-204-01/194-01 - Modules - Chapter 1: Foundations - First Law of Thermodynamics'. The left sidebar contains navigation links: 'Home', 'Announcements', 'Modules' (highlighted), 'Discussions', 'Grades', 'People', 'Syllabus', 'Recent Pages', 'Progress', 'Help', 'Flags', 'Calendar', 'Groups', 'Courses', 'Collaboration', and 'Settings'. The main content area is titled 'First Law of Thermodynamics' and features a video player. The video has a red header with 'First Law' and the Stanford logo. The video frame shows a diagram of a thermally isolated system with a battery, a coil, a thermometer, and a piston. The text 'THERMALLY ISOLATED' is displayed below the diagram. The video player interface includes a progress bar, a timestamp of 0:28 / 0:29, and playback controls. At the bottom of the page, there are 'Previous' and 'Next' navigation buttons.

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EdX Robust Assessment - Peer Instruction

- ❖ Multiple-choice question where learner provides explanation for choice
- ❖ After submitting, learner sees peers' explanations for different choices and can change answer and explanation
- ❖ Provides a sense of engagement and interaction with peers in online environment

The screenshot shows a web interface for a '1.5 Knowledge Check (3 Questions)'. The interface is split into three main sections: 'Answer', 'Reflection', and 'Results'.
1. **Answer Section:** Contains a question and three radio button options: 'Positive', 'No Change', and 'Negative'. The 'No Change' option is selected.
2. **Reflection Section:** Titled 'Step 2) Read Other Students Answers', it displays three example student answers with their explanations:

- Student Answer: Positive:** "The entropy of the surroundings must increase because if there is an irreversible process, the entropy of the universe must increase. That of the system stays constant, as a result that of the surroundings must increase."
- Student Answer: No Change:** "Same question as before"
- Student Answer: Negative:** "The surroundings provided heat for the system to produce work during the cycle, as a result, the entropy of the surroundings decreases."

- Results Section:** Titled 'Step 3) Your Final Answer', it shows the selected 'No Change' option and a text input field for an explanation. The text entered is 'None I think it's because...'. Below this are 'Previous' and 'Next' navigation buttons.

POWERED BY
OPENedX

EdX Robust Assessment - Submit & Compare

- ❖ Free text response submission
- ❖ Learner receives expert or model answer from instructor to compare their own response
- ❖ Xblock developed by Open Learning Initiative (OLI)

The screenshot displays a web interface for a knowledge check. At the top, it shows the course ID 'SUB-MATSCI-204-01/194-01' and the assignment title '1.1 Knowledge Check (4 Questions)'. A 'Speed Grader' button is visible in the top right. The main content area is titled '1.1 Knowledge Check (4 Questions)'. Below this, the question is presented: 'Question 1 (2/3 points)'. The question text is: 'State whether the following is true or false, and provide a brief explanation for why. The internal energy of all materials is 0 at T=0K'. Below the question is a large text input field for the student's answer. A 'Peer Answer' section follows, showing a 'Peer Answer' label and a response: 'False. Energy is not on an absolute scale and systems can have potential energy at 0K'. There are 'Answer' and 'Next' buttons below the peer answer. The interface also shows a 'Question 2' section with a multiple-choice question: 'If a system completes a cycle, ΔU_{system} and $\Delta U_{\text{surroundings}}$ is no matter what.' with radio buttons for 'True' and 'False'. Navigation buttons for 'Previous' and 'Next' are at the bottom.

POWERED BY
OPENedX

EdX Robust Assessment - Drag & Drop

- ❖ Constructed-response question (not selecting from a set of options)
- ❖ Feedback can be provided in various ways

The screenshot displays a question titled "2.3 Knowledge Check (1 Question)" within a course interface. The main content is a graph with a vertical axis labeled 'y' and a horizontal axis labeled 'P'. Three curves are shown: a solid blue curve labeled V_1 , a dashed green curve labeled V_2 , and a dotted orange curve labeled V_3 . A small box labeled $-y$ is positioned near the top right of the graph. Below the graph, there is a "FEEDBACK" section with three radio button options:

- The derivative of y with respect to P is the volume (describes the curve that varies least with pressure) corresponds to the piece of the graph (orange) and the curve that varies least with pressure corresponds to the piece with the smallest volume.
- The derivative of y with respect to P is the volume (describes the curve that varies most with pressure) corresponds to the piece of the graph (orange) and the curve that varies most with pressure corresponds to the piece with the smallest volume.
- The derivative of y with respect to P is the volume (describes the curve that varies most with pressure) corresponds to the piece of the graph (blue) and the curve that varies most with pressure corresponds to the piece with the smallest volume.

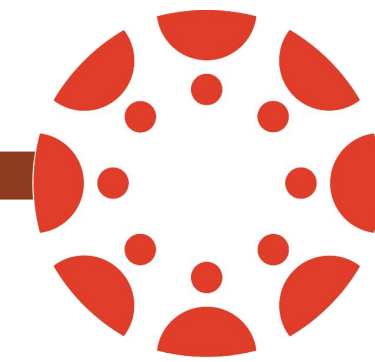
At the bottom of the interface, there are buttons for "Previous" and "Next".

Platform Features



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OPENedX

- ❖ Great students interaction and engagement features
- ❖ Interactive video player
- ❖ Robust assessment (e.g. Peer instruction, drag and drop, submit and compare)
- ❖ Supports LTI integration to the other platform



canvas

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Canvas - Pen and Paper Assignment

Homework 1

Submit Assignment

Due Jul 8 by 11:59pm Points 25 Submitting a file upload File Types doc, docx, pdf, and txt

To submit this assignment, complete the following Homework Problems on your own paper. Once complete, scan the completed document and upload as a PDF, Word doc, or .txt file. All submissions must be uploaded by Sunday, July 8 @ 11:59 pm PDT.

Note: If you need additional resources to solve these problems, please refer to Unit 2 videos.

Complete problems 1, 3, 4, 5, and 9 from the Unit 1 Homework Problems.

[View or download the complete set of Homework Problems.](#)

Tip: Midterm and Final exam will be in the same format with limited time given. You might want to use this homework assignment to estimate the time you take to upload and submit the answers so that you can finish the future exam in a given time.

◀ Previous

Next ▶

The screenshot shows the Canvas interface for Homework 2. A dropdown menu is open, displaying options: Assignment Details, SpeedGrader, Message Students Who..., Set Default Grade, Curve Grades, Download Submissions, and Mute Assignment. The background image shows handwritten solutions for Homework #2 with red checkmarks and grades. The solutions include:

- 2.1(a) See attached for plot + code. ✓
- (b) $f(u) = \frac{1}{1+e^u} = \frac{1}{2}$
- (c) $f(\epsilon) = \frac{3}{4} \Rightarrow \exp(\epsilon/k_B T) = \frac{4}{3} - 1 = \frac{1}{3} \Rightarrow E_{3/4} = \ln(\frac{1}{3})k_B T$
- $f(\epsilon) = \frac{1}{4} \Rightarrow \exp(\epsilon/k_B T) = 4 - 1 = 3 \Rightarrow E_{1/4} = \ln(3)k_B T$
- $E_{3/4} - E_{1/4} = k_B T (\ln(\frac{1}{3}) - \ln(3)) = [k_B T \cdot (\ln(\frac{1}{9}))]$
- regardless of ϵ , i.e. electrons states. ✓
- Ge has a higher carrier concentration since it has a higher n_i . ✓
- mostly doping with an acceptor (B). ✓
- $n_i = 1 \times 10^{10} \text{ cm}^{-3}$
- $p = \frac{-(N_D - N_A) + [(N_D - N_A)^2 + n_i^2]^{1/2}}{2}$
- $\ln(\frac{3.22 \times 10^{19}}{3.22 \times 10^{10}}) = 0.0134 \text{ eV below } E_C$
- $N_V = \frac{-E_g}{2k_B \ln(\frac{N_D}{N_V N_C})}$
- $k_B = 1.38 \times 10^{-23} \text{ J/K}, N_C = 3.22 \times 10^{19}$
- $T = 847.4 \text{ K}$



Canvas - Grade Assignments Using SpeedGrader

Homework 3
Due: Jul 22 at 11:59pm - Su18-MATSCI-156-01...
9/12 Graded 25.49 / 30 (85%) Average 9/12

Page 1 of 10
ZOOM

5.3 6/12

Wrong formulas, check solution.

6.3: 6/6

7.2: 12/14

Submitted: Jul 22 at 11:51pm

Submitted Files: (click to load)

.hw3.pdf

Assessment

Grade out of 30

21.73

Assignment Comments

Add a Comment

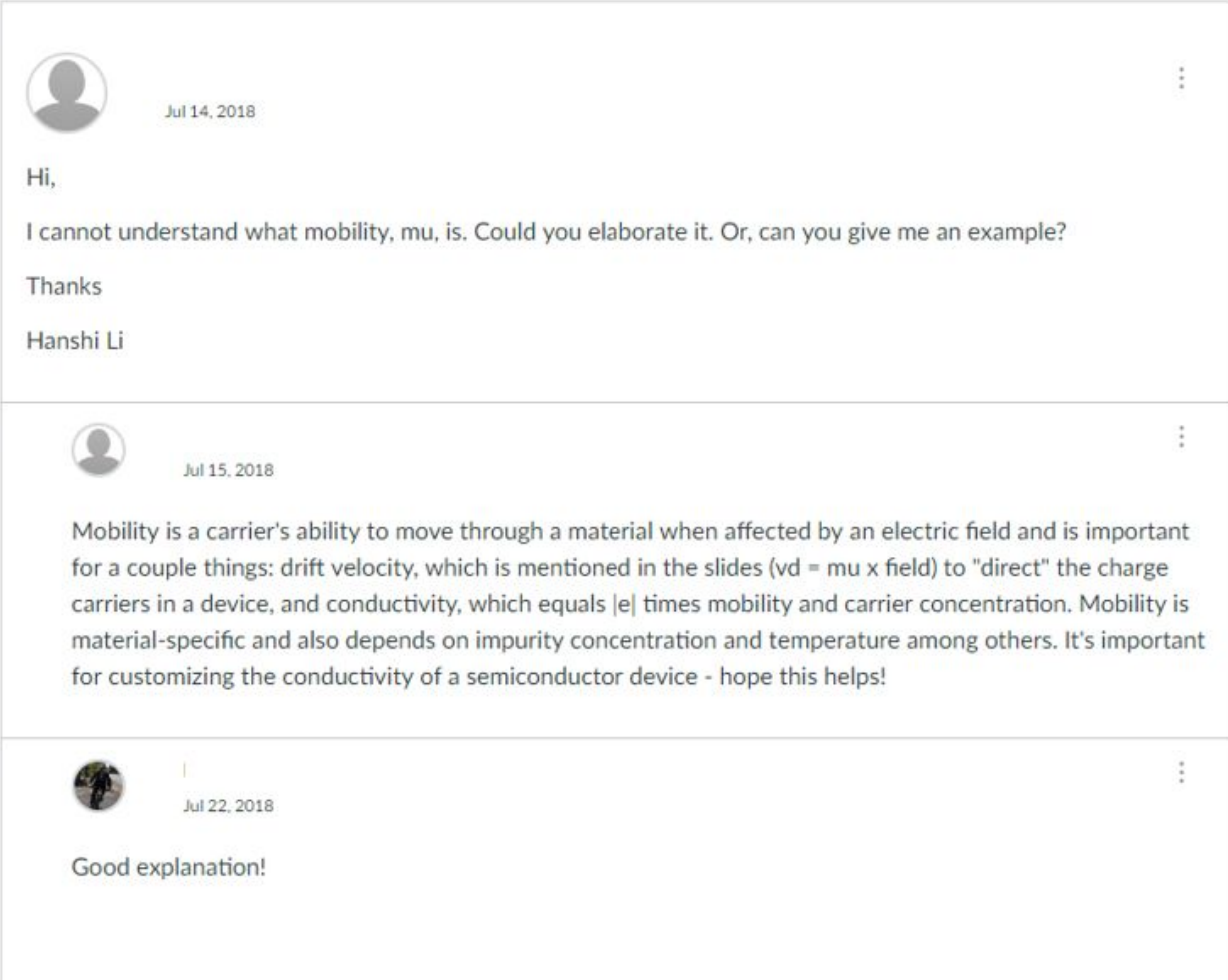
📎 📺 🔊
Submit



Canvas - Discussion Forum

canvas

- ❖ Canvas forum for Q&A
- ❖ Open edX inline discussion cannot be used



The screenshot shows a discussion forum thread with three posts. Each post is enclosed in a rounded rectangle with a small circle on the left and a vertical ellipsis on the right. The first post is from Hanshi Li on Jul 14, 2018, asking for clarification on mobility. The second post is an answer from an unnamed user on Jul 15, 2018, explaining the concept of mobility. The third post is a reply on Jul 22, 2018, stating "Good explanation!".

Jul 14, 2018

Hi,

I cannot understand what mobility, μ , is. Could you elaborate it. Or, can you give me an example?

Thanks

Hanshi Li

Jul 15, 2018

Mobility is a carrier's ability to move through a material when affected by an electric field and is important for a couple things: drift velocity, which is mentioned in the slides ($v_d = \mu \times \text{field}$) to "direct" the charge carriers in a device, and conductivity, which equals $|e|$ times mobility and carrier concentration. Mobility is material-specific and also depends on impurity concentration and temperature among others. It's important for customizing the conductivity of a semiconductor device - hope this helps!

Jul 22, 2018

Good explanation!



Canvas - Prerequisite Feature

Worked Example Problem

Homework 1
Jul 8, 2018 | 25 pts

Unit 1 Q&A
1 pts

▶ Unit 2: Semiconductors (Optional Material)

▼ Unit 3: Transport and Carrier Concentration in Semicon... Prerequisites: Unit 1: Solar Resource [Complete All Items](#)

Introduction

Unit 3 Slides.pdf

Electrons and Holes how they Conduct Electricity

Charge Transport in Semiconductors

3.1 Knowledge Check (1 Question)



Challenges - Server Delay

Worked Example Problem

Homework 1
Jul 8, 2018 | 25 pts

Unit 1 Q&A
1 pts

Note: There is a 15-minute delay to update your knowledge check completion data, so you may not see the next unit immediately.

▶ **Unit 2: Semiconductors (Optional Material)**

▼ **Unit 3: Transport and Carrier Concentration in Semicon...** Prerequisites: Unit 1: Solar Resource **Complete All Items**

Introduction

Unit 3 Slides.pdf

Electrons and Holes how they Conduct Electricity

Charge Transport in Semiconductors

3.1 Knowledge Check (1 Question)

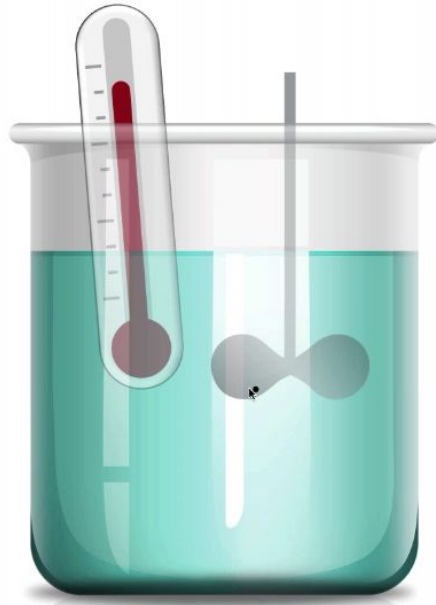
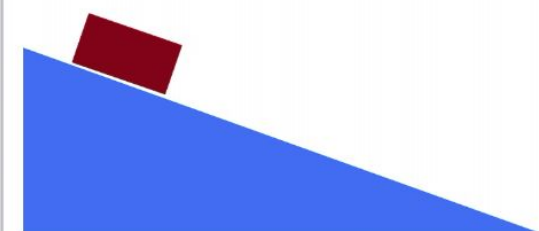
Challenges - Level of Content Integration

Canvas "Module" Layout

Energy and First Law	✓
Read and Annotate Chapter 1 of The Phoenix Corps 0 pts	✓
Graphic Novel Chapter 1 Assessment	✓
Heat and Work	✓
Famous People: James Joule	✓
Definition and Sign Convention for Work	✓
First Law of Thermodynamics	✓
1.1 Knowledge Check (4 Questions) 4 pts	✓
Caloric Equation of State	✓
Generalized Form of the First Law	✓
Internal Energy of an Ideal Gas	✓
1.2 Knowledge Check (1 Question) 1 pts	✓
Entropy	✓
Read and Annotate Chapter 2 of The Phoenix Corps 0 pts	✓
Graphic Novel Chapter 2 Assessment	✓
Need for Entropy	✓
Inaccessibility and Empirical Entropy	✓
1.3 Knowledge Check (1 Question) 1 pts	✓

Navigation: < Previous | [Icons] | Next >

Heat and Work Stanford

even though there are both modalities with which the system exchanges energy with the surroundings, they're fundamentally different. So, in the case of heat, for example imagine that I have a paddle wheel, and I turn the paddle wheel. Now you would see eventually the temperature of your liquid increase once the paddle wheel has turned enough.

Now what happens here is that the paddle wheel is slapping molecules around, and then as these molecules are being slapped around by the paddle wheel, they encounter other molecules and then they bounce off of the other molecules, and eventually, the directed motion of the paddle wheel gets changed into the random. So in this case when the paddle wheel slaps this molecule it's going in this direction.

Video player: 0:47 / 6:02 | 1.0x | [Controls]

Navigation: < Previous | Next >

Navigation: < Previous | Next >

Reflection

MET INSTRUCTORS' NEEDS BY USING BOTH PLATFORMS

Included robust assessments and streamlined the user experience

NEED MORE USE CASES WITH HIGHER ENROLLMENT

Encountered low enrollment due to summer, optional quartering course offering with late promotion

Future Implications

DEVELOP PUBLIC-FACING OFFERINGS

Make it public and allow other faculty to use the assets

DEVELOP FULLY ONLINE INTRODUCTORY COURSES

Expand the offerings to include introductory courses

INTEGRATE CUSTOM PROBLEMS

Take advantage of Open edX's custom-graded problems

Q & A



Stanford | VPTL
Transforming Learning Together

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Overview of how to set up the LTI integration

In Open edX:

- LTI provider option needs to be enabled in Django Admin interface
- set up LTI consumer to generate key and secret used in external LMS

In external LMS (in our case, Canvas)

- add App using above LTI key and secret
- within a Canvas Module, add “external tool” and select the App you created
- add the LTI specific URL of the content you want to embed

LTI specific URL construction to use in the above “external tool”:

https://{host}/lti_provider/courses/{course_id}/{usage_id}

https://edx-lti.org/lti_provider/courses/course-v1:edX+DemoX+Demo_Course/block-v1:edX+DemoX+Demo_Course+type@vertical+block@vertical_3888db0bc286