INTRODUCTION:

Caltech's partnership with Coursera provides a new resource in support of faculty efforts to enhance our students' learning here on campus and offer Caltech-quality learning opportunities to potential students, scientists, and engineers beyond.

The Coursera platform allows for a great deal of flexibility in terms of the structure and implementation of courses. Large-scale courses (100,000+ students), as well as the platform itself, come with some unique opportunities, challenges, decisions, and resource needs. The most striking is the need for a more detailed course timeline, planned further in advance, and covering many aspects of instruction. This quick-start planning guide outlines early decisions and resources needed for several of the most common "models" for Coursera course structures.

Caltech staff—Directors of Teaching and Learning Programs and Academic Media Technologies, Cassandra Horii and Leslie Maxfield—can also consult individually on designing, building, implementing, and adapting Caltech Coursera courses—whether following these 'typical' patterns or devising new ways to use Coursera effectively.

DESCRIPTION:

Coursera is a platform for building and distributing on-line courses to a local and/or global population of students. It supports content delivery and interaction, and gives faculty data about student access and learning. Here are some specifics:

- Coursera requires a browser and internet access; it is not device specific.
- A course "landing page" provides preview information including overview, requirements, course start and end dates, promo video, and instructor bio.
- To access full content, students must register for each specific course.
- Instructors can restrict courses to only Caltech students or open them to anyone.
- Content is usually delivered as video, audio with slides (or digital whiteboard videos, like the Khan Academy), PDF, text, glossary, and links.
- In-video (embedded) "quizzes" frequently assess students' understanding.
- On-line students may interact via a Discussion Forum, Course Wiki, and in-person Meetups, depending on instructor choices.
- TAs typically monitor discussion forums, manage grading, and update on-line content.
- Built-in metrics give instructors information about student learning.

EXPLORATION:

How an instructor uses the Coursera platform is based on several decisions, outlined below. You may want to explore Coursera first. If you haven't already, please use your Caltech e-mail to create an account at https://www.coursera.org/account/signup, which will allow you to visit the example course previews included below.

OVERALL CHOICES:

It may be helpful to consider these questions and notes in the early phases of planning.

A. Participants:

? Who do you hope your Coursera students will be, in terms of prior education, occupation (current or future), aspirations, motivations, etc.?

✓ *Note that while we can't predict who will ultimately enroll, your vision will inform aspects of your course design and help participants decide whether the course will be a good fit.*

B. Goals:

? What do you want your Coursera students to learn, in terms of content and abilities?

? Are your goals for your Coursera students the same as for your Caltech students?

? If the goals are similar, how is the experience enriched for Caltech students?

✓ *Note that it is possible to offer a rigorous Caltech quality class, while making choices about scope, prerequisite knowledge, or time period that may be different from a traditional Caltech course.*

C. Student work:

? What kind of work do you want your Coursera students to do for the course (e.g., problems, conceptual answers, quizzes, writing, discussion forum participation)?

? How do you want to determine and distribute feedback and scores on student work?

✓ *Note that Coursera has options for automatic feedback and scoring of short written answers (text, formulas, numerical), programming code, and multiple choice. It also includes a suggested process for guided peer grading of extended written work.*

D. Interaction:

? Do you envision your Coursera and Caltech students interacting with each other?

? How do you want Coursera students to interact with each other?

? How do you want to interact with your Courera students? Your TAs?

✓ *Note that Coursera-Caltech interactions may be shaped by concurrency of offerings and that TAs and/or faculty typically monitor Coursera discussion forums.*

MODEL 1: The "Flipped" Coursera Class

Description:

A "flipped" class reverses what traditionally happens during and outside the lecture time. Videos of lectures are viewed before the class meets, and the in-class time is spent solving problems, working on complex cases, or conducting experiments, often collaboratively.

In Coursera, students complete assigned video/multimedia modules, each one typically 8-12 minutes of "lecture" (optimal for on-line attention) followed by embedded questions that test their understanding. Up to two hours of such modules are assigned per typical "week" of class and take the place of a traditional lecture hall. For on-campus students, the multimedia modules may serve as preparation for in-class discussions, case studies, extended problem solving, team work, or other interactive experiences, as well as for assigned work such as problem sets, quizzes, projects, and exams. For Coursera students, the multimedia modules serve as preparation for assigned work that will be completed and/or turned in on-line, as well as for assigned discussion forum participation. Modules are typically recorded in a studio setting, or in the faculty's own office, using a camera, microphone, and/or capture of digital "whiteboard" notations or work synchronized with audio commentary. They can also be recorded in a lecture hall if the lecturer is more comfortable teaching in that setting.

Advantages:

- 8-12 minute modules give students "chunks" of content and make them test their understanding frequently. This helps keep student understanding on track.
- Students can review modules to learn more deeply, improve mastery of challenging material.
- "Flipped" classes can facilitate interaction with faculty, complex cases, or other novel in-class work for on-campus Caltech students.
- Once created, modules can be reused, as is or with revisions, for future classes.
- Carefully crafted quizzes can guide instructor on what concepts need further attention.

Challenges:

- Advance planning: "Flipped" classes run more smoothly when all/most modules are recorded and edited before class begins.
- Writing effective embedded quiz questions (conceptually based, not too easy or hard, giving helpful feedback).
- Planning for non-lecture in-class work; communicating the nature of this work to students (Caltech and Coursera, if different).
- TAs will need to be active in online forum discussions, grading, and posting content. They will face different challenges with on-line students.

Implications:

- Overall time commitment is different than traditional courses: more planning and creating materials in advance (especially first run of course).
- May want to try out different video, audio, interactive "whiteboard" & other formats for modules.
- Obtain recording equipment and plan timeline for recording/editing modules, writing/embedding questions.
- Helpful to work with TA(s) before class begins on uploading modules, embedding questions, trouble-shooting in Coursera.
- Clearly set expectations and plan what will happen during Caltech lecture time.

Links: Machine Learning, Stanford (Coursera) > https://www.coursera.org/course/ml
        Peer Instruction, Harvard (non-Coursera) > http://mazur.harvard.edu/education/educationmenu.php

Caltech

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- 3 -

MODEL 2: The Delayed Lecture Coursera Class

Description:

The recording of teaching material for Coursera happens in a live Caltech classroom—via video, audio, and/or capture of digital "whiteboard" notations—and is then edited and assigned to Coursera students some time later. Assignments and other student work for Caltech and Coursera students may be similar or different. Due to turn-around time between recording in class, editing, and reliably posting material in Coursera, it is more difficult to run entirely concurrent Coursera and Caltech versions of a class.

Advantages:

- Recording is done in class; some Coursera content is created during regularly scheduled teaching.
- Conceptual questions can be tested with live Caltech students in class before going out to larger numbers of Coursera students.
- Once recorded and edited, video material can be reused, as is or with revisions, for future classes.

Challenges:

- In order to edit video for optimal on-line attention, it's helpful to plan lectures for 8-12 minute "chunks."
- Incorporating conceptual, embedded questions in lecture also requires planning and communicating to the new structure to Caltech students.
- Although the Caltech class typically precedes Coursera by several days to weeks, it's helpful to use Coursera for Caltech students, so that assignments and other material can be staged and tested "in-situ."

Implications:

- In-class A/V setup needs to be planned carefully so that live recordings are high quality and can be edited for on-line.
- A/V recording setup needs to be active for every class period (may train TAs or obtain resources for Academic Media Tech support).
- Helpful to work with TA(s) before class begins on uploading modules, embedding questions, trouble-shooting and determining a workflow in Coursera.
- TAs are normally assigned by the quarter; on-line course prep and instruction may not match our academic calendar.

Links:

Health Policy and the Affordable Care Act (Coursera) > https://class.coursera.org/healthpolicy-2012-001
Professor Yaser Abu-Mostafa's recordings (non-Coursera) >
                           http://www.youtube.com/playlist?list=PLD63A284B7615313A&feature=plcp

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- 4 -

Blend of Models 1 and 2

Description:

Is it possible to stray from the models above? Absolutely—there are many adaptations, combinations, and possibilities we have yet to explore. For example, one could combine some in-class video with studio or office recordings and build a complete online course from multiple sources, over time. In such an arrangement, Caltech students could be engaged in helping to develop course materials, quizzes, exam questions, etc. for later on-line offering.

Advantages:	Challenges:	Implications:
▪ Many of the above, plus: ▪ Development of Coursera course can happen after the Caltech course is over which is less demanding on the instructor. ▪ Engaging students in development can be an excellent learning opportunity.	▪ Many of the above, but the pressure of simultaneous Caltech and Coursera course deployment is lifted. ▪ Planning what learning needs to be recorded in the studio/office environment vs. in class could be complex.	▪ TAs are normally assigned by the quarter; on-line course prep and instruction may not match our academic calendar, but perhaps this could be a work-study or other opportunity for an undergrad.

Example: Probabilistic Graphical Models (Coursera) > https://class.coursera.org/pgm/lecture/preview/index

GLOSSARY
Translation of common Caltech terms to Coursera, and vice versa; a work in progress.

Caltech	Coursera
Blue book	N/A (exams use one of the other available formats, such as quizzes, but weigh the results more heavily as for an exam)
Cheating	See Honor Code. Also, Coursera has a system security team, and as of 9/12/12, the system has not been hacked.
Classroom polling ("Clickers")	In-video quizzes
Classroom time	Internet 24/7
Collaboration	Course Wiki
Course Management System (e.g., Moodle)	Coursera, which can also be used as the CMS for a Caltech-only course; it does not have to be open to the world.
Course webpage	Landing Page with basic course info
Coursera alumni	Open question: does Cousera keep a list of students who have taken the course?
Extensions	Open question: how do faculty handle "extensions" in massive online courses? Peer assessed assignments may have issues. We are

working on finding out!

Final grade	Caltech does not issue a certificate or final grade. Students do not know how they rank among other students. Instructors usually send out a farewell message via email or video to give students closure to their Coursera experience.
Grading	Automated or peer assessment
Honor code	Coursera has its own Honor Code; students agree to conditions before they can sign up for a course. https://www.coursera.org/maestro/auth/normal/tos.php#honorcode
Lab work	Open questions: how do massive open online courses assign "lab work"? Do they? Should they? Peer assessments could be the correct grading mechanism.
Lectures	Online videos
Office hours	24/7 text-based discussion forum
Open-book exam	Open question: how are massive open online courses handling the idea of an open book exam? Are they?
Pranks	N/A (Coursera does have a system security team and their system has not been hacked, as of 9/12/12.)
Pre-requisites	Recommended Background defined by the instructor
Problem Set	Quiz (can be in various formats: multiple choice, fill in the blank, peer assessment long answers/essays/proofs/etc.)
Solution set	In-video quiz explanations, or could be offered as a PDF in Coursera.
Student	A Coursera account user (non-admin or teaching) who has registered for a course. An account could just be a Bot. Coursera is looking into tracking this kind of activity.
Study group	Coursera MeetUp – self organized by city.
Student TA training	Peer assessment training: must use rubric to grade sample assignments and qualify to do peer assessments
TAs	Caltech student TAs- labeled as "Course staff" in discussion forums.
Term	Start and end dates – "Started on: date (# weeks long)" on Course landing page
Textbooks	Recommended reading via links. Open question: assigning textbooks/ebooks if it's a free course? It is up to the faculty; if a cost is involved, or books are not obtainable, many remote students may not have access to such materials. Some publishers do offer chapters of textbooks as free PDFs when instructors acknowledge their support and provide a link to purchase the textbook.
Units	Workload (range of hours per week)