



TECHNOLOGY & LEARNING

Governing Council Presentation

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WHAT IS IT?

MOOC

MASSIVE

Classes may consist of up to 100,000+ students.

OPEN

Registration is open to anyone around the world.

ONLINE

The course is taken completely online.

COURSE

They're similar to college courses, but don't offer credit.

MOOCS

GARTNER HYPE CYCLE



Importance of
good
underlying
pedagogy

Big data
analytics
opens up new
frontier for
research

**WHAT HAVE
WE LEARNED**

Interaction
still matters

**FROM
MOOCS?**

Global
promotion of
U of T brand

Learning at
scale is
achievable



MOOCS AT THE UNIVERSITY

U of T MOOCS BY THE NUMBERS:

14

Unique courses in total since 2012

13

Have been repeated or in open archive (or both)

Total registrations to date:

~800 K

MOOC Directions

- This year we are renewing our contracts with edX and Coursera

FUTURE DIRECTIONS

- On-demand courses that do not have a start and end date
- Verified certificate option





*Introduction to Computer
Programming* **MECHANICS**

Calculus for Engineers I & II

Molecular Biology, Biotechnology & You

Ontario Shared Online Course Fund

*Geographic Information and
Mapping I*

ENGLISH GRAMMAR

**Introductory Chemistry
from a Materials Perspective**

Introduction to Neuroscience



**An Introduction to
Programming Language
in Structures C**

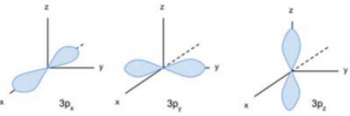
**Ontario Shared
Online Course Fund
LEARNING
MODULE SETS**

REUSABLE LEARNING OBJECTS (RLOs)

the four quantum numbers can completely describe the energy of an electron.

Quantum Numbers

- n : principal (size)
- l : angular momentum (shape)
 - example: $l = 0$ is spherical, $l = 1$ is dumbbell
- m_l : magnetic quantum number (spatial orientation)



- m_s : spin ($+\frac{1}{2}$, $-\frac{1}{2}$)

Allowed values of quantum numbers

- $n = 1, 2, 3, 4, \dots$
- $l = 0, 1, 2, 3, \dots, n-1$
- $-l \leq m_l \leq l$
- $m_s = \pm \frac{1}{2}$

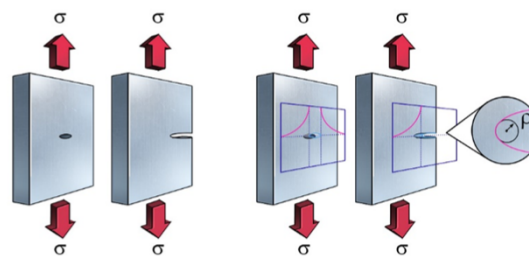
Electron Configuration

- Electrons in the outermost are termed as "valence electrons"
- Valence electrons are important to the behaviour of the element
- Stable Octet: $ns^2 + np^6$

Exceptions

- half-filled sd or completely filled sd are special low energy configurations ($3d^5, 3d^{10}$)
 - Cr: $[Ar]3d^5 4s^1$ goes to $[Ar]3d^6 4s^1$
 - Cu: $[Ar]3d^9 4s^1$ goes to $[Ar]3d^{10} 4s^1$

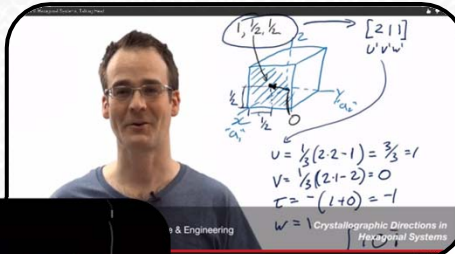
The stress concentration factor – approximating the stress at the crack tip



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Instructor RLOs

- Lecture slides & teaching guides
- Lecture demonstrations



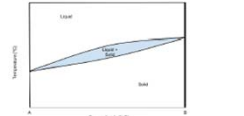
Crystallographic Directions in Hexagonal Systems

atomic planes (hkl)

Constructive

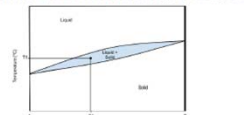
The two-phase region

Figure P-4: A schematic binary isomorphous phase diagram for the hypothetical two-component A-B system, showing the liquid and solid. The two-phase region has been shaded in blue.



The compositions of each phase

Figure P-5: A hypothetical alloy of composition C₁, heated to a temperature T₁ is shown to exist as two phases on this schematic binary isomorphous phase diagram for the two-component A-B system.



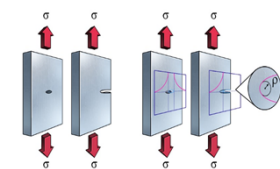
Student RLOs

- Online videos: lectures, examples, demos
- Assignments: traditional or online
- Assessment instruments

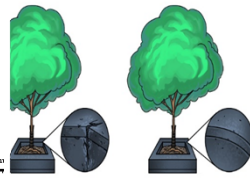
Objects can be used to research student preferences:

Do students prefer PowerPoint slides with voice over or handwritten explanation?

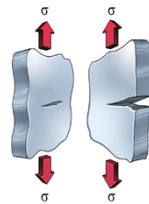
The stress concentration factor – approximating the stress at the crack tip



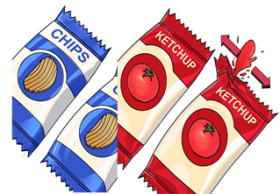
important in mechanical design – the fillet radius



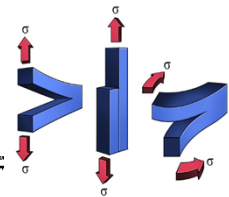
fracture toughness



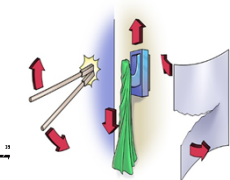
The stress concentration factor in everyday life



lots of fracture displacement



less of fracture displacement



“Stress is to strength as stress intensity factor is to fracture toughness”¹

1. Hertzberg, *Deformation and Fracture Mechanics of Engineering Materials*, 4th Ed. Wiley and Sons, 1996.

Materials Science & Engineering

3

**ONLINE PROJECTS
OFTEN BUILD FROM
ONE TYPE TO ANOTHER**

Example 1
Statistics (Alison Gibbs):



MOOC

**INVERTED
CLASSROOM**

**LEARNING
MODULES**

**ONLINE
COURSE**

Example 2

Psychology (Steve Joordens):

ONLINE COURSE

MOOC

**ALOR (MTCU
Funding)**

**LEARNING
MODULES**



Example 3
Materials Science (Scott Ramsay):

**ALOR (MTCU
Funding)**

**LEARNING
MODULES**

**ONLINE COURSE &
MOOC (in
development)**



Online Courses



ONLINE COURSES

AT THE UNIVERSITY OF TORONTO

umber of Courses			
	UNDERGRAD	GRAD	TOTAL
Asynchronous	26	54	80
Synchronous	3	11	14
Grand Total	29	65	94

Number of Registrations			
	UNDERGRAD	GRAD	TOTAL
Asynchronous	4425	1641	6066
Synchronous	128	114	242
Grand Total	4553	1755	6308

THE USE OF EDUCATIONAL TECHNOLOGY (*ED TECH*)

LEARNING MANAGEMENT SYSTEM (LMS) USE:

- Every course is supported with an LMS website
- Substantial **mobile** use: **98,436** unique LMS mobile users
- Substantial **library** use: **~270,000** student views of library resources page through the LMS



Data is over the last 3 years

THE USE OF EDUCATIONAL TECHNOLOGY (*ED TECH*)

LECTURE CAPTURE IS GROWING.

- We use **three systems**: Echo360, Techsmith Relay and MyMedia (hosting)
- 652 Echo video uploaders
 - 19,404 active students on Echo360
- 434 TechSmith Relay Users
 - 1708 recordings this year
- 1,240 faculty/staff MyMedia video accounts
 - 3,416 Student Accounts

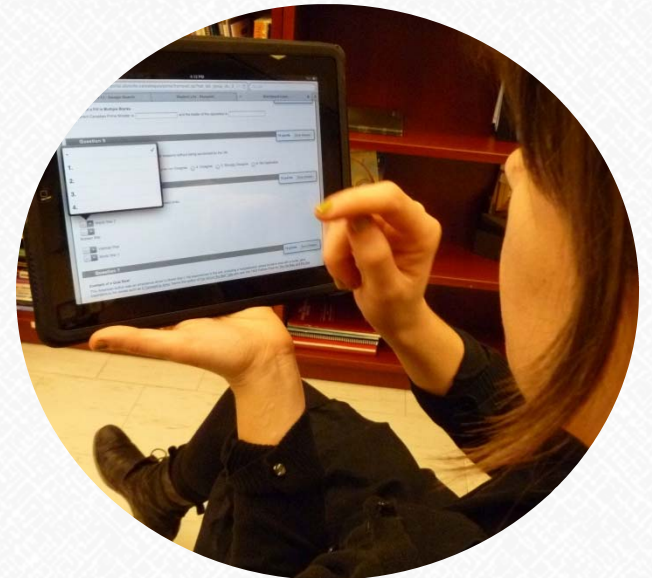


Data is over the last 3 years

THE USE OF EDUCATIONAL TECHNOLOGY (*ED TECH*)

GROWING USE OF ONLINE COLLABORATION TOOLS FOR TEACHING

- **28,981** Unique Collaborate Webinar attendees
- **7,221** Collaborate Virtual Rooms Used



Data is over the last 3 years

WHAT'S HAPPENING IN ED TECH

AT THE UNIVERSITY OF TORONTO

Review of the
current
**educational
technology suite**

Review of the
current **learning
management
system**

Development of
**protocol for
quickly adopting
important new
technologies** as
they emerge

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