



Open Educational Resources

uses at LUMS

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Rice University, Houston, Texas USA

January 27, 2011

Disruptive Technologies

Disruptive technologies change the world in **two phases**:

1. The new technology **first** does what the old technology did, only better. Results are often “Intended Consequences”
2. The new technology **then** redefines the problem, asks new questions that were not possible in the first phase. Where **surprising innovation** is observed. Results often “Unintended Consequences”

Two Phases of the Web

- **Web 1.0:** HTML, **presentation** (looks and layout), hypertext links, searchable, two dimensional. Contains shared data and information. Readable by **educated** people (like a book).
- **Web 2.0:** XML, presentation **and content**, meta-data, smart hypertext links, smart searchable, three dimensional. Contains data, information, and *some* knowledge! Readable by literate people **and** by some machines.

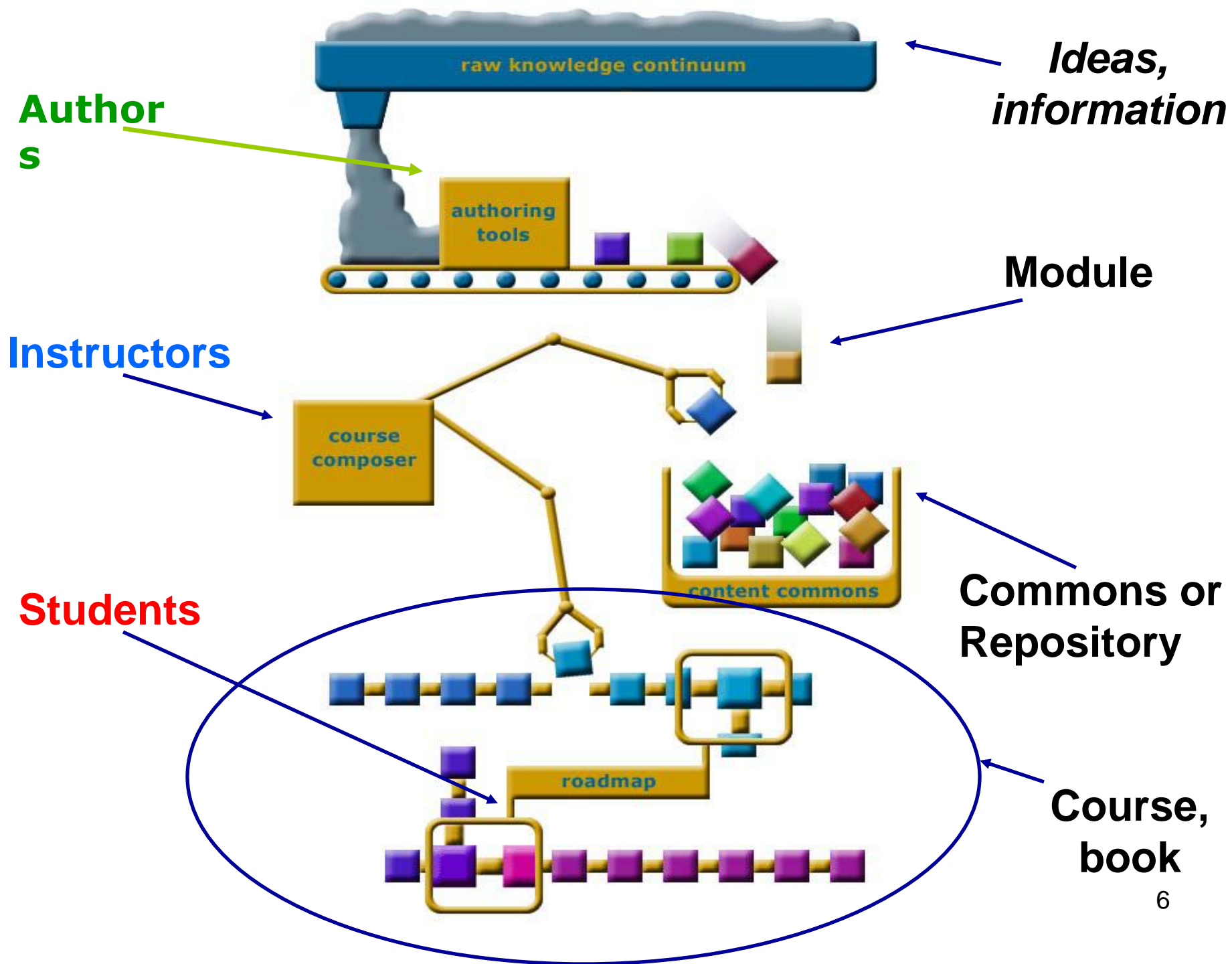
Open Educational Resources

The **Open Educational Resource** (OER) movement was inspired by the **Open Source** movement in software. Information is freely usable, re-usable, mixable, modifiable, etc.

- Open Course Ware “OCW” (MIT)
- Connexions “Cnx” (Rice)
- Wikipedia (Wikibooks, etc.)
- Siyavula project (Shuttleworth Foundation)
- Curriki, CK-12, Flat World Knowledge, etc.

What is Connexions?

1. A **repository** of modules of information available through the **web** on the Internet
 - **Modules** (and **collections**) encoded in **XML**, one concept, a few pages, a quantum of information
2. A set of **tools** for authoring, maintaining and using the content of the repository
 - Module **editor**, importer, course or book **composer**, repository organizer, **Creative Commons** license, tools for printing **books**, creating **pdf's**
3. A **community** of **people** who share educational interests and information
 - Interest groups (authors, instructors, students)



Books and On-Line Use with XML

Books from Connexions:

- Personalized, on-demand printing, up-to-date, inexpensive, collaboratively authored, allows pre and post publication review, never “out of print”, “Long tail” publications, content for eBooks, one button to buy printed book

On-Line use of Connexions:

- Allows modern pedagogy: concept-based, problem solving-based, discovery-based learning. Dynamic, interactive, linked, adapts to learning style, student and author driven, allows “assessment and evaluation”, Virtual Labs

Possible Ways to Use

- Bound and **printed paper books** that look like traditional books but are low cost and always up-to-date. This is **phase one**.
- Down Loadable **pdf files** which are free and can be used on a eBook reader or printed locally. This is also **phase one**.
- Free, interactive, dynamic **on-line use** on a screen such as a computer or hand-held device (iPhone). This is **phase two!**
- **New methods** that we cannot imagine now. This is the definition of **phase two**.

Create, Author

RELATED MATERIAL

Similar content

- [Complex Fourier Series and Their Properties](#)
- [Fourier Series: Eigenfunction Approach](#)
- [Orthonormal Basis Expansions](#)

MORE »

Courses using this content

- [Signals and Systems](#)

Fourier Analysis in Complex Spaces

[Print \(PDF\)](#)

By: [MICHAEL HAAG](#), [JUSTIN ROMBERG](#)

Summary: This module derives the Discrete-Time Fourier Series (DTFS), which is a fourier series type expansion for discrete-time, periodic functions. The module also takes some time to review complex sinusoids which will be used as our basis.

Introduction

By now you should be familiar with the derivation of the [FOURIER SERIES](#) for continuous-time, periodic functions. This derivation leads us to the following equations that you should be quite familiar with:

$$f(t) = \sum_n (c_n e^{j\omega_0 n t})$$
$$c_n = \frac{1}{T} \int f(t) e^{-j\omega_0 n t} dt$$
$$= \frac{1}{T} \langle f, e^{j\omega_0 n t} \rangle$$

frequency $\omega_0 n$ in $f(t)$.

In this module, we will derive a similar expansion for discrete-time, periodic functions. In doing so, we will derive the **Discrete Time Fourier Series** (DTFS), or the [DISCRETE FOURIER TRANSFORM](#) (DFT).



(login required)

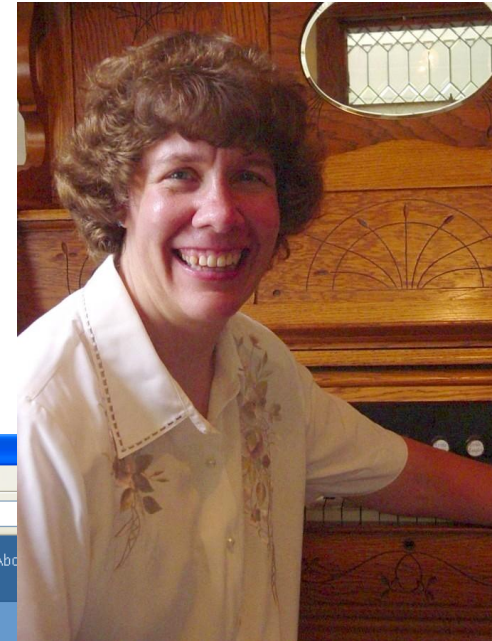
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wisconsin
berkeley
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utep
rice
cambridge
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Macedonia

Author of Music Content

Catherine Schmidt-Jones

well over **600,000** page views
per month

many by
US K-12
teachers



A screenshot of a web browser showing the 'Introduction to Music Theory' course page. The browser title is 'Introduction to Music Theory - Mozilla Firefox'. The address bar shows the URL 'http://cnx.rice.edu/content/col10208/latest/'. The page header features the 'connexions' logo with the tagline 'sharing knowledge and building communities'. The main heading is 'Introduction to Music Theory' by Catherine Schmidt-Jones.

Start Course

Instructor: Catherine Schmidt-Jones
Course Author: Catherine Schmidt-Jones

Course Description: This course introduces the basic concepts and terms needed to discuss melody and harmony. It is intended for teens or adults with no background in music theory but some familiarity with reading common notation and playing an instrument (or singing). Concepts covered include interval, major and minor keys and scales, triads and chords.

Contributing Authors: Catherine Schmidt-Jones, Russell Jones



[More about this content](#) | [Cite this content](#) | [Version history](#)

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Pitch and Interval

- [Octaves and the Major-Minor Tonal System](#)
- [Half Steps and Whole Steps](#)
- [Interval](#)
- [Ear Training](#)

Keys and Scales

- [Major Keys and Scales](#)
- [Minor Keys and Scales](#)
- [The Circle of Fifths](#)

Triads and Chords

- [Triads](#)
- [Naming Triads](#)
- [Beginning Harmonic Analysis](#)
- [Cadence in Music](#)
- [Consonance and Dissonance](#)
- [Beyond Triads: Naming Other Chords](#)

Fundamentals of Signal Processing



By: [Minh Do](#)

Start Course

Course Author: [Minh Do](#)

Course Description: Presents fundamental concepts and tools in signal processing including: linear and shift-invariant systems, vector spaces and signal expansions, Fourier transforms, sampling, spectral and time-frequency analyses, digital filtering, z-transform, random signals and processes, Wiener and adaptive filters.

Contributing Authors: [Anders Gjendemsjø](#), [Benjamin Fite](#), [Clayton Scott](#), [Don Johnson](#), [Douglas L. Jones](#), [Hyeokho Choi](#), [Ivan Selesnick](#), [Justin Romberg](#), [Melissa Selik](#), [Michael Haag](#), [Minh Do](#), [Ricardo Radaelli-Sanchez](#), [Richard Baraniuk](#), [Rob Nowak](#)

Course Content

» Introduction to Fundamentals of Signal Processing

FOUNDATIONS

- » Signals Represent Information
- » Introduction to Systems
- » Discrete-Time Signals and Systems
- » Linear Time-Invariant Systems



Fundamentals of Signal Processing

Minh Do

Connexions in Spanish

PERSONALIZE

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- [Summer Sky](#)
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- [Charcoal](#)
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Análisis de Fourier en Espacios Complejos

[Print \(PDF\)](#)

By: [MICHAEL HAAG](#), [JUSTIN ROMBERG](#), [ERIKA JACKSON](#), [FARA MEZA](#)

Based on: [FOURIER ANALYSIS IN COMPLEX SPACES](#) by [MICHAEL HAAG](#), [JUSTIN ROMBERG](#)

Summary: Este modulo deriva la series de Fourier discreto en el tiempo (DTFS), la cual es un tipo de expansión de fourier para funciones periodicas y discretas en el tiempo. El modulo tambien da un repaso a los senosoidales complejos que sirven como bases.



estar familiarizado con la derivación de la [SERIES DE FOURIER](#) par alas. Esta derivación nos lleva a las siguientes ecuaciones las cuales usted

$$f(t) = \sum_n (c_n e^{j \omega_0 n t}) \quad (1)$$

$$c_n = \frac{1}{T} \int f(t) e^{-j \omega_0 n t} dt$$
$$= \frac{1}{T} \langle f, e^{j \omega_0 n t} \rangle \quad (2)$$

DSPanish



donde c_n nos dice la cantidad de frecuencia en $\omega_0 n$ in $f(t)$.

RELATED MATERIAL

Similar content

Fundamentals of Digital Signal Processing Lab

Introduction to Digital Signal Processing

Control Systems Laboratory

MORE >>

Courses using this content

DSP

Preface for U of I DSP Laboratory (Thai Version)

Print (PDF)

By: DOUGLAS L. JONES, PATRICK FRANTZ, KAMOLCHANOK KRIENGCHAIPRUCK
Based on: PREFACE FOR U OF I DSP LABORATORY by DOUGLAS L. JONES

Summary: The DSP Laboratory textbook is well suited for a variety of course organizations, and Connexions provides the ideal venue for the textbook.

เอกสารฉบับนี้สร้าง
(Digital Signal Processing Laboratory) โดย
กว่าปีของการร่วมมือ
เนื้อหาของเอกสาร
การปฏิบัติการณ์ประ
ซึ่งเป็นวิชาเลือก ส
Urbana-Champaign
และเป็นส่วนที่แสดง

RELATED MATERIAL

Similar content

DSP Development Environment: Introductory Exercise for TI TMS320C54x

DSP Development

Preface for U of I DSP Laboratory (Japanese Version)

Print (PDF)

By: PATRICK FRANTZ, EMIKO YAMAI
Based on: PREFACE FOR U OF I DSP LABORATORY by DOUGLAS L. JONES

Summary: The DSP Laboratory textbook is well suited for a variety of course organizations, and Connexions provides the ideal venue for the textbook.

このテキストは
資料の共同開発

RELATED MATERIAL

Preface for U of I DSP Laboratory (Chinese Version)

Print (PDF)

By: PATRICK FRANTZ, KANGLIN WANG
Based on: PREFACE FOR U OF I DSP LABORATORY by DOUGLAS L. JONES

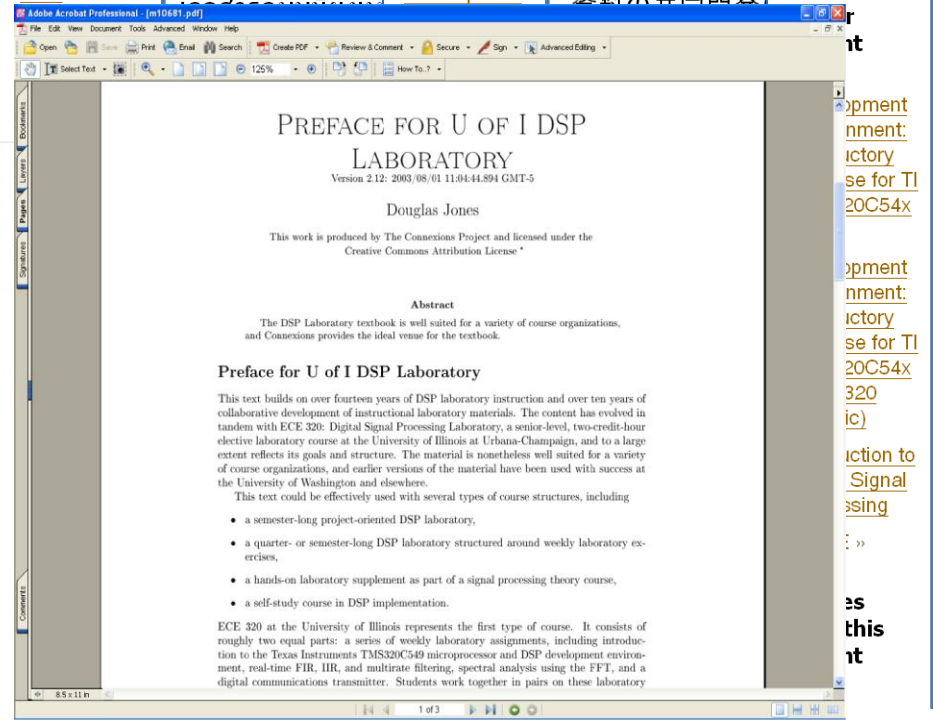
Summary: The DSP Laboratory textbook is well suited for a variety of course organizations, and Connexions provides the ideal venue for the textbook.

摘要：该DSP(数字信号处理)教程适合多种相关课程使用，而Connexions则为该教程提供了一个理想的演示平台。

该教程是建立在使用了14年以上的实验指导和历时10年经合作开发的实验讲义基础上的。内容主要来自ELEC320----伊利诺伊大学厄本那 - 香槟分校(the University of Illinois Urbana-Champaign)一门本科四年级两学分的实验选修课。本教程编排结构和教学目的都与其大致相同。本教程适合多种相关课程使用，其早期版本被华盛顿大学(the University of Washington)等成功地用于教学。

该教程可用于多种不同的教学安排，包括：

- 一学期制的以课程设计为主(project-oriented)的DSP实验课，
- 半学期制或一学期制的并在每周有实验安排的DSP实验课，



Interactive, Dynamic Virtual Lab

RELATED MATERIAL

Inverted Pendulum on a Translating Base

[Print \(PDF\)](#)

By: [ROBERT BISHOP](#)

Prerequisite links

- [LabVIEW Simulation Tutorial](#)
- [LabVIEW Control Design Tutorial \(TechTeach\)](#)

Similar content

- [Control Systems Laboratory](#)
- [Fundamentals of Digital Signal Processing Lab](#)
- [What is Priority Control ?](#)

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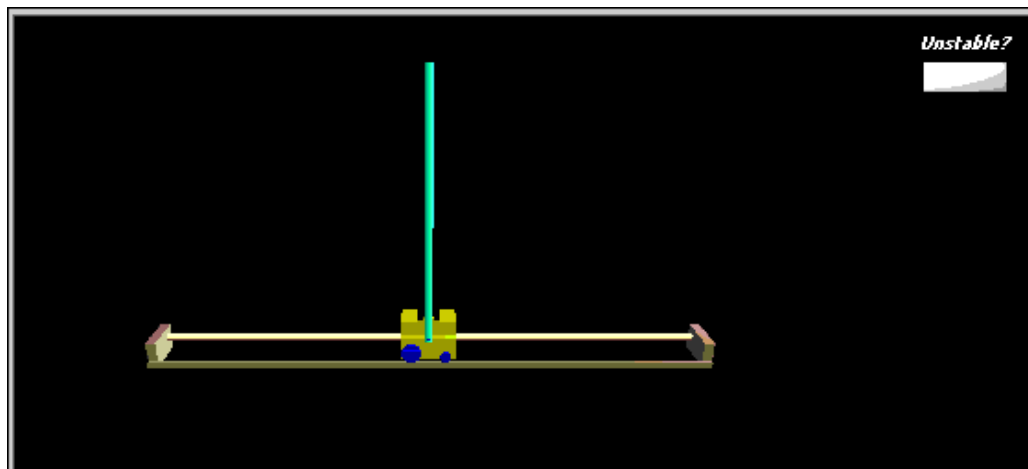
- [Control Systems Laboratory](#)

PERSONALIZE

Choose a style

- [Summer Sky](#)

Summary: The objective of this lab is to understand the dynamics of an inverted pendulum with a translating base. Students will use feedback to control an unstable system. The controller will be designed and implemented in LabVIEW using the Simulation Module and Control Design Toolkit.



Controller | Plant Model

Setpoint Gain
-70.7107

Set Point (Meters)
-0.3 -0.2 0 0.2 0.3
0

K
-70.7107
-37.8345
105.53
20.9238

Initial Conditions

X	X-dot	theta	theta-dot
0	0	0	0

Outputs

Distance (cm)

Simulation Time

X

Theta



Multimedia

RELATED MATERIAL

FIR Filter Example

By: [DON JOHNSON](#)



[Print \(PDF\)](#)

Similar content

- [Frequency Sampling Design Method for FIR filters](#)
- [Perfect Reconstruction FIR Filter Banks](#)
- [Window Design Method](#)

[MORE »](#)

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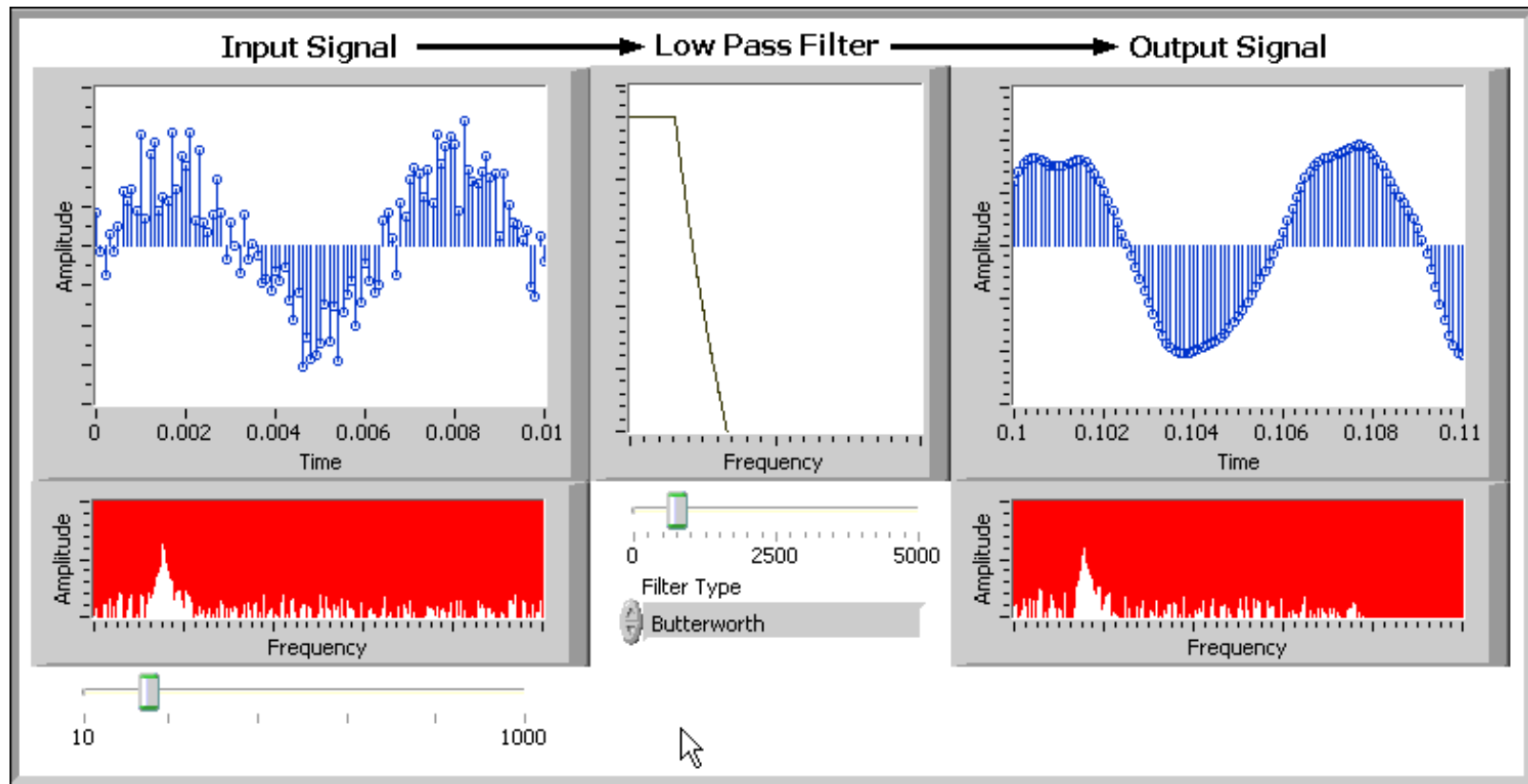
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EDIT-IN-PLACE

- [Edit this content](#) (login required)

Summary: An example of using a Finite Impulse Response filter.



The Traditional Book

The book is the central tool or technology in education at all levels and for all aspects.

The book is a mature technology that is not improving. It and the supporting infrastructure are the answer to the educational questions of the 19th century, maybe the first part of the 20th century. They are now the “bottle neck” or “barrier”. They are no longer the answer, they are the problem

eXtensible Markup Language

XML can also be thought of as “X” being an unknown that can be defined:

- **math**ML $x^3 + 7x^2 - 2x + 1 = 0$
- **chemistry**ML H_2O
- **music**ML (a music score)
- **“whatever you are teaching”**ML

where the rules of your subject define the markup language. The language “understands” your subject!!

The XMLs use semantic “tags” and meta-data

Selected Partners



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Foundation's
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in South Africa



TEACHERS
WITHOUT
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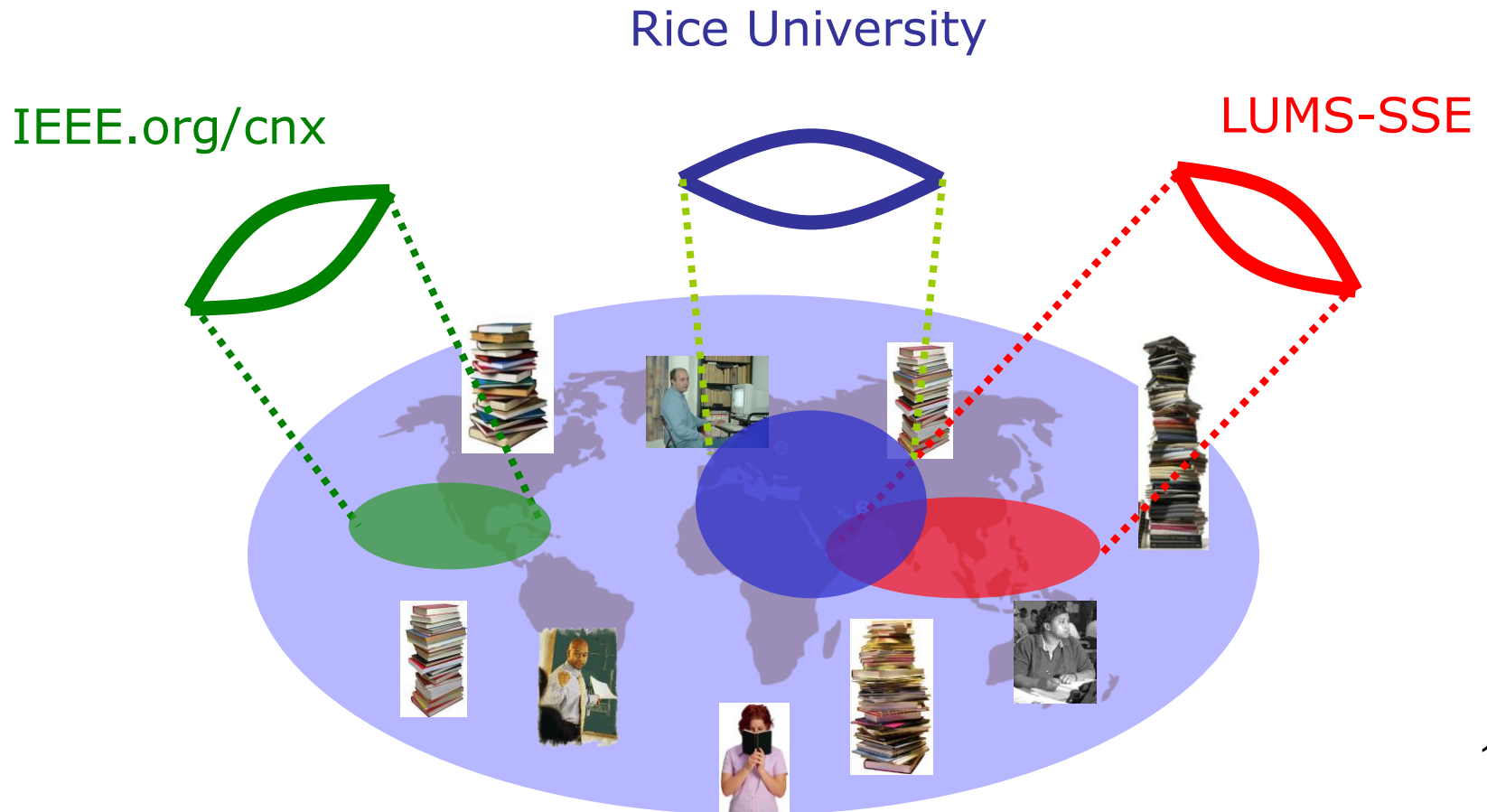
**Foothill-De Anza
Community College,
Lone Star CC system**



Lenses

social software for peer review

inspiration: Flickr, de.licio.us, ...

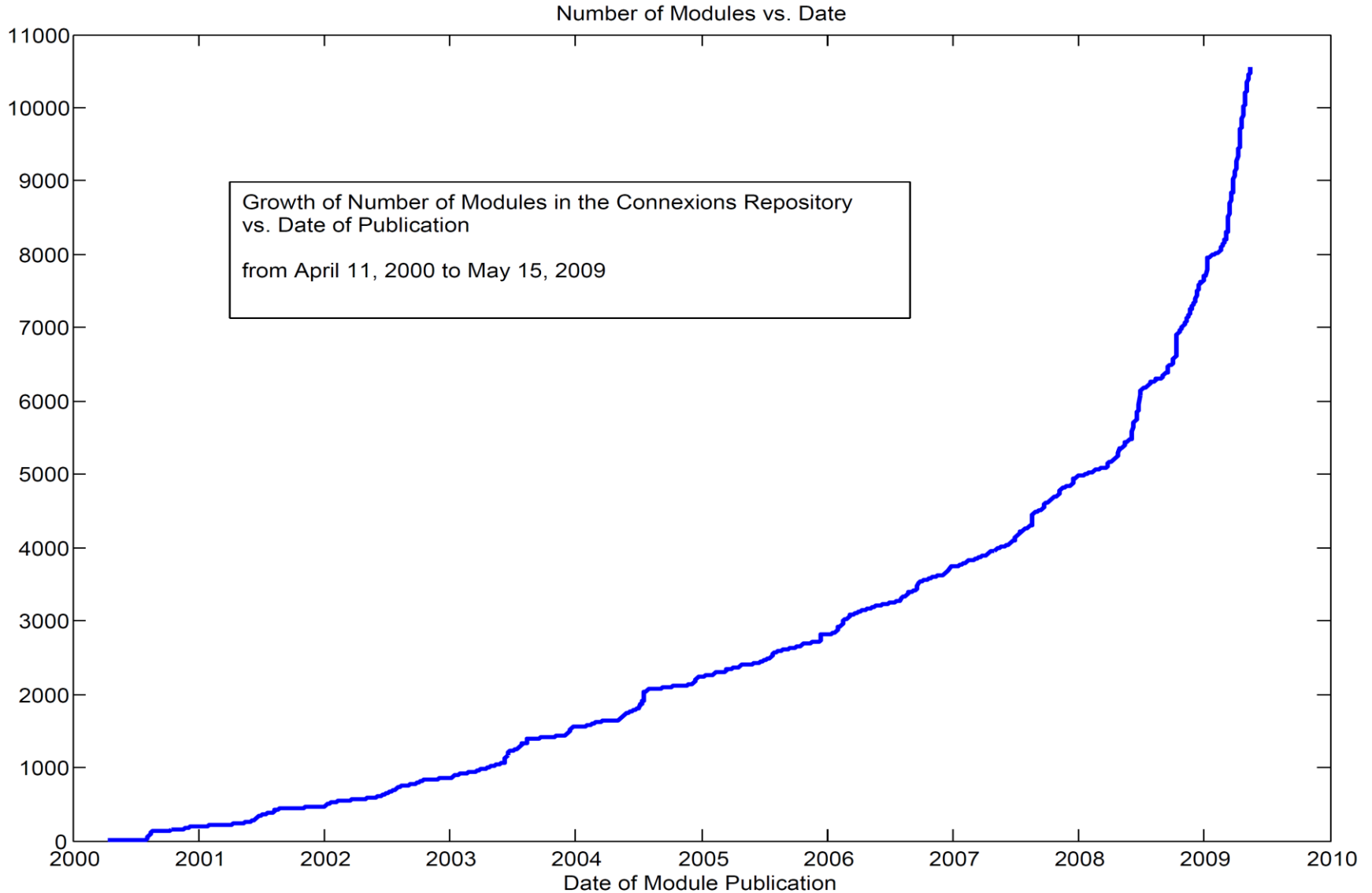


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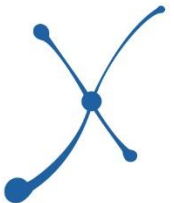
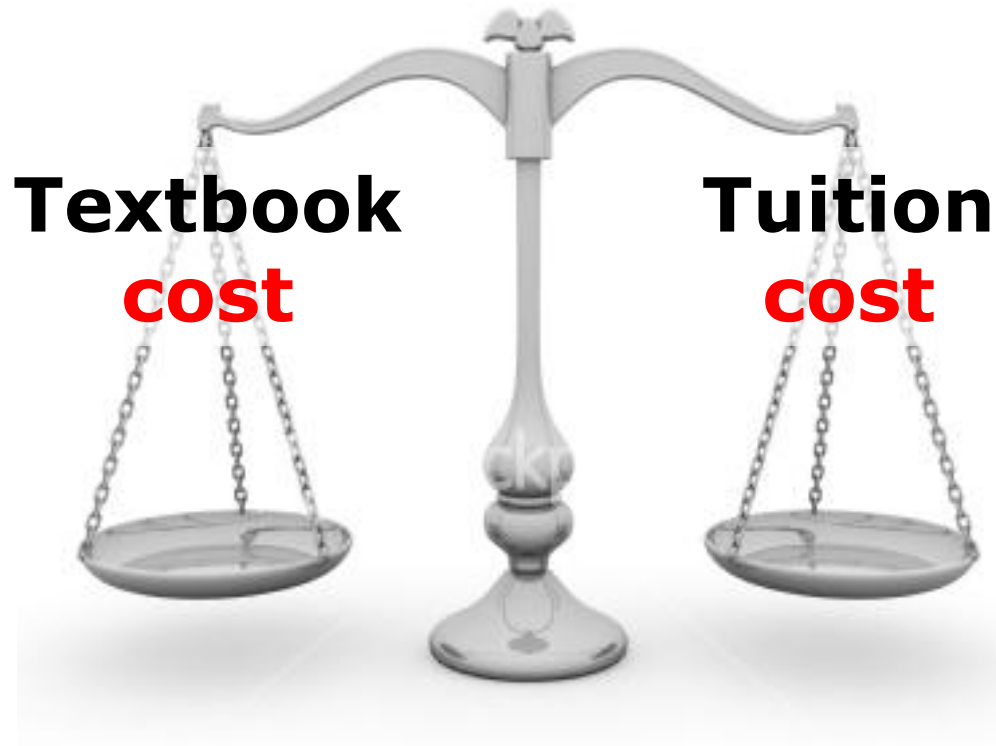
Traditional “All rights reserved” copyright inhibits collaboration and sometimes inhibits creativity and innovation. Putting content in the Public Domain is not easy.

- **Creative Commons** “Some rights reserved” copyright (Larry Lessig, James Boyle)
- **General Public License “GPL”** (Richard Stallman) and the GNU project
- Copyleft, Share alike, etc.

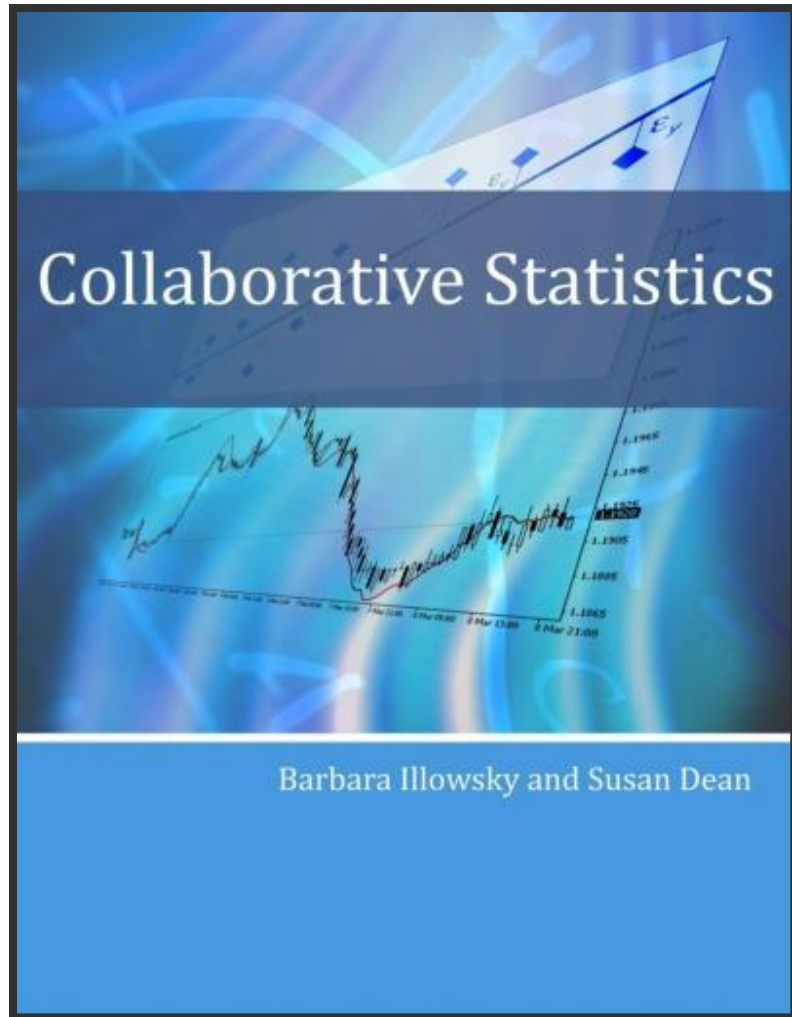
Growth of Numbers of Modules



Access to Education: Community Colleges

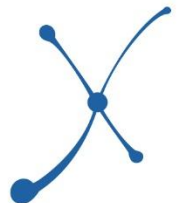


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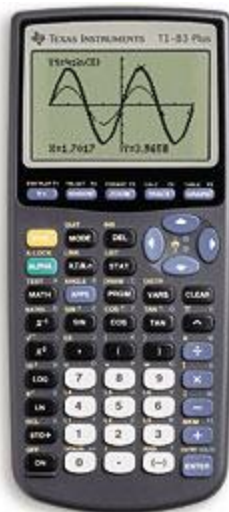


Collaborative Statistics

Barbara Illowsky & Susan Dean



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Sampling and Data: Data Collection Lab I (Edited: Teegarden)

Descriptive Statistics: Descriptive Statistics Lab (edited: Teegarden)

Probability Topics: Probability

Labs For Collaborative Statistics - Teegarden

Collection by: [Mary Teegarden](#)

[Start >>](#)

[Order printed copy](#)

Summary: This is a collection of labs from Collaborative Statistics by Illowski and Dean which have been edited to include Minitab activities. In addition the labs are to be done as individual activities.

This collection contains:

Modules by: [Mary Teegarden](#)

Comments, questions, feedback, criticisms?

Send feedback

- [E-mail the author of the collection, Labs For Collaborative Statistics - Teegarden](#)



Collaborative Statistics

- Estimated cost savings to students \sim \$200,000 in the first year
- Roughly 50% of students bought a hard copy of textbook





The **Connexions Project** was started at Rice University in 1999, but now is global and one of the most used OERs worldwide.

An invitation to you and your university

If you are interested in being involved in Connexions, see <http://cnx.org/> or contact: csb@rice.edu