



## **University of Puerto Rico Meetings**

***December 12-13, 2013***

**Link to all education presentation materials:**

<https://www.osc.edu/~sgordon/PuertoRico>

### **Curriculum Resources**

Competencies for an Undergraduate Curriculum

Minor Program in Computational Science Competency/Topic Overview

As part of the creation of an interdisciplinary undergraduate minor program in computational science put into place at a number of Ohio institutions, we formulated a set of competencies to serve as guidance in the creation of courses and course materials in computational science. The competency-based approach allows institutions to design their curriculum in a flexible way by integrating portions of the computational science materials into existing courses, by creating new courses focused on computational science, or doing a combination of the two.

The competencies were created by the participating faculty and then reviewed by a business advisory committee that offered some advice on topic emphasis and breadth. Since that time, a number of courses and instructional modules have been put into place and tested in a variety of instructional formats. In addition, there have been significant changes in computing technology with the advent of multi-core and many-core computational resources. The competencies below reflect the competencies based on these experiences.

Area 1: Simulation and Modeling [+]

Area 2: Programming and Algorithms [+]

Area 3: Differential Equations and Discrete Dynamical Systems [+]

Area 4: Numerical Methods [+]

Area 5: Optimization [+]

Area 6: Parallel Programming [+]

Area 7: Scientific Visualization [+]

Source: <http://hpcuniversity.org/educators/undergradCompetencies/>

### **Sources of Educational Materials**



See <https://www.osc.edu/~sgordon/workshop/materials> - facsimile attached

## XSEDE Resources

Getting started guide	<a href="https://www.xsede.org/using-xsede">https://www.xsede.org/using-xsede</a>
Gateway listing	<a href="https://www.xsede.org/gateways-listing">https://www.xsede.org/gateways-listing</a>
Course calendar	<a href="https://www.xsede.org/web/xup/course-calendar">https://www.xsede.org/web/xup/course-calendar</a>
Online training	<a href="https://www.xsede.org/web/xup/online-training">https://www.xsede.org/web/xup/online-training</a>
User forums	<a href="https://www.xsede.org/web/xup/forums">https://www.xsede.org/web/xup/forums</a>
Software search	<a href="https://www.xsede.org/web/xup/software">https://www.xsede.org/web/xup/software</a>

# Links to Workshop Materials

## Software Downloads

Vensim Software - Download Vensim PLE - Free for educational uses

<http://vensim.com/download.html>

AgentSheets Software - Download the Trial Version

<http://www.agentsheets.com/products/trial/index.html>

Presentation on formal programs in computational science

[http://www.osc.edu/~sgordon/workshops/Comp\\_science\\_overview.pdf](http://www.osc.edu/~sgordon/workshops/Comp_science_overview.pdf)

## Example Datasets

Description	Link
Package of datasets in zip file format	<a href="http://www.osc.edu/~sgordon/workshops/workshop_data.zip">http://www.osc.edu/~sgordon/workshops/workshop_data.zip</a>
Traffic Model Example	<a href="https://www.osc.edu/sites/osc.edu/files/staff_files/sgordon/trafficmodel.pdf">https://www.osc.edu/sites/osc.edu/files/staff_files/sgordon/trafficmodel.pdf</a>
MATLAB Models Online	<a href="https://compsci.osc.edu/">https://compsci.osc.edu/</a>

Algebraic Thinking with Excel	<a href="http://shodor.org/talks/ncsi/excel/SimplePopulation.xls">http://shodor.org/talks/ncsi/excel/SimplePopulation.xls</a>
Dynamic Variation with Excel	<a href="http://shodor.org/talks/ncsi/excel/Snake2.xls">http://shodor.org/talks/ncsi/excel/Snake2.xls</a>
Iteration and Diffusion with Excel	<a href="http://shodor.org/talks/ncsi/excel/SaltDiffusion.xls">http://shodor.org/talks/ncsi/excel/SaltDiffusion.xls</a>
Population dynamics with Vensim	<a href="http://shodor.org/talks/ncsi/vensim/BunnyComparison.mdl">http://shodor.org/talks/ncsi/vensim/BunnyComparison.mdl</a>
Disease SIR Model with Vensim	<a href="http://shodor.org/talks/ncsi/vensim/AdvancedSIR.mdl">http://shodor.org/talks/ncsi/vensim/AdvancedSIR.mdl</a>
Malaria Model with Vensim	<a href="http://shodor.org/talks/ncsi/vensim/MalariaEpidModel.mdl">http://shodor.org/talks/ncsi/vensim/MalariaEpidModel.mdl</a>
Falling objects with Vensim	<a href="http://shodor.org/talks/ncsi/vensim/FallingRockWithDrag.mdl">http://shodor.org/talks/ncsi/vensim/FallingRockWithDrag.mdl</a>
Pharmokinetics with Vensim	<a href="http://shodor.org/talks/ncsi/vensim/Pharma.mdl">http://shodor.org/talks/ncsi/vensim/Pharma.mdl</a>
Simple Sick Model with AgentSheets	<a href="http://shodor.org/talks/ncsi/agentsheets/SimpleSick.zip">http://shodor.org/talks/ncsi/agentsheets/SimpleSick.zip</a>
Forest Fire with AgentSheets	<a href="http://shodor.org/talks/ncsi/agentsheets/AccessFire.zip">http://shodor.org/talks/ncsi/agentsheets/AccessFire.zip</a>
Precipitates from Solution with AgentSheets	<a href="http://shodor.org/talks/ncsi/agentsheets/precipitate.zip">http://shodor.org/talks/ncsi/agentsheets/precipitate.zip</a>

## Java Applets

Description	Link
Function Flyer for math education	<a href="http://www.shodor.org/interactivate/activities/MultiFunctionDataFly/">http://www.shodor.org/interactivate/activities/MultiFunctionDataFly/</a>
Histogram	<a href="http://www.shodor.org/interactivate/activities/Histogram/">http://www.shodor.org/interactivate/activities/Histogram/</a>
Molecular model of ideal gas	<a href="http://www.phy.ntnu.edu.tw/ntnujava/index.php?topic=25">http://www.phy.ntnu.edu.tw/ntnujava/index.php?topic=25</a>
Predator prey	<a href="http://www.shodor.org/interactivate/activities/RabbitsAndWolves/">http://www.shodor.org/interactivate/activities/RabbitsAndWolves/</a>
Spread of disease	<a href="http://shodor.org/talks/ncsi/agentsheets/SimplesickApplet/index.html">http://shodor.org/talks/ncsi/agentsheets/SimplesickApplet/index.html</a>
Forest fire	<a href="http://shodor.org/talks/ncsi/agentsheets/AccessFireApplet/index.html">http://shodor.org/talks/ncsi/agentsheets/AccessFireApplet/index.html</a>
Precipitation from solution	<a href="http://shodor.org/talks/ncsi/agentsheets/PrecipitateApplet/index.html">http://shodor.org/talks/ncsi/agentsheets/PrecipitateApplet/index.html</a>

## Links to XSEDE Resources

Description	Link
XSEDE User Portal	<a href="https://www.xsede.org/">https://www.xsede.org/</a>
Science Gateways	<a href="https://www.xsede.org/gateways-listing">https://www.xsede.org/gateways-listing</a>
Campus Champions	<a href="https://www.xsede.org/web/guest/campus-champions">https://www.xsede.org/web/guest/campus-champions</a>
Course training calendar	<a href="https://www.xsede.org/web/xup/course-calendar">https://www.xsede.org/web/xup/course-calendar</a>
Online courses	<a href="https://www.xsede.org/web/xup/online-training">https://www.xsede.org/web/xup/online-training</a>
Getting started (accounts and services)	<a href="https://www.xsede.org/using-xsede">https://www.xsede.org/using-xsede</a>

## Resources for Computational Modeling

Description	Link
National Science Digital Library (NSDL)	<a href="http://www.nsdlib.org">http://www.nsdlib.org</a>
Biology Workbench	<a href="http://mycyberbench.ncsa.illinois.edu/">http://mycyberbench.ncsa.illinois.edu/</a>
GridChem	<a href="http://www.gridchem.org">http://www.gridchem.org</a>
Computational Science Education Reference Desk – National Science Digital Library – models with exercises and reviews	<a href="http://www.shodor.org/refdesk">http://www.shodor.org/refdesk</a>
HPC University – workshops and pointers to materials	<a href="http://hpcuniversity.org/">http://hpcuniversity.org/</a>
Computational modules on a variety of topics	<a href="http://www.capital.edu/cs-computational-science/">http://www.capital.edu/cs-computational-science/</a>
Shared science instructional modules and models	<a href="http://phet.colorado.edu/">http://phet.colorado.edu/</a>
Computational physics materials	<a href="http://www.ucomp.org/">http://www.ucomp.org/</a>
Computational Science and Engineering Online – various chemistry, combustion, and nano-science java tools	<a href="http://cse-online.net/">http://cse-online.net/</a>
Computational biology for biology educators	<a href="http://www.computationalscience.org/cbbe">http://www.computationalscience.org/cbbe</a>
Computational chemistry for chemistry educators	<a href="http://www.computationalscience.org/ccce">http://www.computationalscience.org/ccce</a>
Agent based models for economics	<a href="http://www2.econ.iastate.edu/tesfatsi/ace.htm">http://www2.econ.iastate.edu/tesfatsi/ace.htm</a>
MATLAB demos in engineering design	<a href="http://gershwin.ens.fr/vdaniel/Doc-Locale/Cours-Mirrored/Methodes-Maths/white/cappl/s0/mlabcappl/mlabcappl.html">http://gershwin.ens.fr/vdaniel/Doc-Locale/Cours-Mirrored/Methodes-Maths/white/cappl/s0/mlabcappl/mlabcappl.html</a>
Tools, lesson plans, and datasets relating to biological modeling	<a href="http://bioquest.org">http://bioquest.org</a>
NASA Aeronautics Models	<a href="http://www.grc.nasa.gov/WWW/k-12/aerores.htm">http://www.grc.nasa.gov/WWW/k-12/aerores.htm</a>
Engineering applets from Virginia Tech	<a href="http://www.engapplets.vt.edu/">http://www.engapplets.vt.edu/</a>

Large number of physics and mathematics applets	<a href="http://www.falstad.com/mathphysics.html">http://www.falstad.com/mathphysics.html</a>
Earthquake engineering resources	<a href="http://nees.org/education/for-teachers/collegiate-teachers">http://nees.org/education/for-teachers/collegiate-teachers</a>

## Digital Humanities and Social Science Resources

Description	Link
ICHASS - University of Illinois	<a href="http://www.ichass.illinois.edu/Home/Home.html">http://www.ichass.illinois.edu/Home/Home.html</a>
Digital Humanities Now	<a href="http://digitalhumanitiesnow.org/tag/resource/">http://digitalhumanitiesnow.org/tag/resource/</a>
Journal of Digital Humanities	<a href="http://journalofdigitalhumanities.org/">http://journalofdigitalhumanities.org/</a>
Alliance of Digital Humanities Organizations	<a href="http://adho.org/">http://adho.org/</a>
dH Commons	<a href="http://dhcommons.org/">http://dhcommons.org/</a>
Association for Computers and the Humanities	<a href="http://ach.org/">http://ach.org/</a>
Digital Social Research	<a href="http://www.digitalsocialresearch.net/wordpress/">http://www.digitalsocialresearch.net/wordpress/</a>
Humanities and Social Sciences Collaboratory	<a href="http://www.hastac.org/">http://www.hastac.org/</a>