Individualized Assignments and Assessment through Automated Grading  
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Computation Lab – CS 121, 122, 123  
Course Goal and Themes  
- For science, mathematics and engineering students to become proficient with an industrial grade tool including symbolic, numeric, visualization and scripting that they can use for engineering computation  
- Design, Exploration, and Simulation  
- Required of all freshmen engineering students (~950/ year)

Motivation for Learning Approach  
- Recent literature* re-iterates the value of our key strategies:  
  - Value of a quiz based learning experience  
  - "Interleaving of worked example solutions and problem-solving exercises"  
  - "Use quizzing to promote learning, re-submitting exercises to information"  
  - "Use pre-questions to introduce a new topic"  
  - Value of an extended learning experience (3 semesters instead of a single term)  
  - "Space learning over time"  
  

Course Organization  
- 1 credit hour per term, 3 terms (30 weeks)  
- Separate from calculus (math content lags behind one term)  
- Meet 2 hours in weeks 2,4,6,8 in lab  
- Automated quizzes (Maple TA, web based) in weeks 3,5,7,9 (on-line, any time)  
- Proficiency exam in week 10 (Maple TA, automated quizzes in weeks 3,5,7,9)  
- 15+ undergrad assistants  
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Course Objectives  
- Technical  
  - Using an interactive CAS for mathematical computations  
  - Setting up and using mathematical models  
- Programming  
  - Assignment, looping, conditional, functions  
  - Simple Data Structures – lists, tables, sequences, expressions  
- Software engineering  
  - Developing scripts  
  - Testing  
  - Troubleshooting  
  - Learning from documentation  
  - Communicating technical material

MapleTA Overview  
- Web-based quiz system with Maple backend  
- Class and roster management with provisions to create, conduct and report/show results for individual quizzes  
- Allows for the following types of question creation:  
  - Multiple choice, matching, true-false  
  - Computed solutions to word problems  
  - Free form answers checked against patterns and via Maple computation  
- Can "individualize" tests at the student level  
- Different parameter values for the same problem  
- Different questions for the same concept

MapleTA Question Parameterization  
- Question Parameterization  
  - Scripted question input, output and grading  
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Software engineering  
- Communicating technical material  
- Learning from documentation  
- Technical

Computation Lab Learning Approach  
- Current Computation Lab teaching model  
  - Introduce the concept  
  - Formally teach / master the key principles  
  - Re-enable the imparted knowledge  
  - Note that all phases of this approach employ quizzes to facilitate the learning process  

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Course Website: https://www.cs.drexel.edu/complab/cs123/spring2011

MapleTA Question Selection  
- Dynamic question selection  
- Random question selection  
- Question selection based on student performance  
- Different questions for the same concept  
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