Nanotechnology Educational Landscape

Nanotechnology: A Call to Action for Community Colleges

Wing Tsao
CCSF Dean of Math and Science
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Nanotechnology Educational Landscape

- National trend and Development
  - Wing Tsao, Dean, School of Science & Mathematics
- Blue Ribbon Task Force on Nanotechnology
  - Dhaval Brahmbhatt, Chairman, IEEE SF Bay Area Nanotechnology Council
- A Local Response
  - Robert Cormia, Professor, Foothill College
Overview

- Penn State Program
  - Center for Nanotech Education and Utilization
- Minnesota Program
  - Dakota County Technical College, Rosemount, MN
  - Deb Newberry
- New Mexico Program
  - Technical and Vocational Institute, Albuquerque, NM
  - Al West, Matt Pleil and Fabian Lopez
- Oregon Program
  - Chemeketa College, Salem, OR
  - Carmen R Watkins
Penn State Model

- Funded by NSF-ATE grant
- Taught at the Penn State Nanofabrication Facility
- $2+2+2$ pathway articulated
- Capstone semester: 6 hands on courses, 18 Units
  - Material, Safety and Equipment for Nanofabrication
  - Basic Nanofabrication Process
  - Thin Films in Nanofabrication
  - Advanced Lithography and Patterning Technique
  - Material Modification in Nanofabrication
  - Characterization, Packaging and Testing of Nano Structures
## Minnesota Curriculum

### 72-CREDIT NANO SCIENCE CURRICULUM

<table>
<thead>
<tr>
<th>Semester 1 at DCTC</th>
<th>Semester 2 at DCTC</th>
<th>Semester 3 at DCTC</th>
<th>Capstone at the U of M</th>
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<tbody>
<tr>
<td>Course #</td>
<td>Course Name</td>
<td>Credits</td>
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<td>General Biology</td>
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<td>CHEM</td>
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<td>MATH 1300</td>
<td>Algebra</td>
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<td>PHYS 1520</td>
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<td>MATH 1550</td>
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<td>Writing &amp; Research</td>
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<td>NANO 1100</td>
<td>Fundamentals of Nanoscience I</td>
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**TOTAL CREDITS**

17 19 18

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<tr>
<th>General Education – Minnesota Transfer Curriculum</th>
<th>Junior-Level Nanoscale courses</th>
<th>Advanced Nanoscale courses at University of Minnesota</th>
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<tbody>
<tr>
<td>29</td>
<td>25</td>
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</table>
Minnesota Program

Nanoscience Curriculum:
A career path approach
New Mexico Program

- Introduction MEMS
- Design – 2 courses
  - Uses Sandia’s SUMMiT V and Conventor software
- Fabrication – 3 courses
  - Lithography, wet and dry etch
  - Thin film deposition
- Support
  - Packaging, testing, characterization
Oregon Curriculum (quarter system)

- Careers in Nanotechnology
- Introduction to MEMS (1 unit, online)
- MEMS Design I (1 unit, online)
  - Uses Sandia’s SUMMiT V software
- MEMS Design 2 (2 units, online)
  - Uses Sandia’s SUMMiT V software