

The Core of Materials Engineering

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What do Students Need?

- Where are the jobs for our students?
- Varies widely between universities
- Changes from one year to the next
- Drexel – wide mixture, many in plastics, increasing pharmaceutical
- RPI – mostly electronics
- Penn, Michigan – broadly distributed fields
- UMC Survey – traditional metallurgy & ceramics important
- Significant fraction leave Materials Engineering for Biomed, Law, Medicine, etc (they are our students, too)

What do Students Need?

- Consensus: If we educate for a broad range of careers, education must be broad and focused on fundamentals

Is MSE Unique?

- We agree that our discipline differs from the others, because we are the only one that *design the materials for function*.
- We do it by looking at the scale of materials- molecule to macro.
- We do it by looking at classes of materials -- soft/hard/composites.
- We do it by *integrating the processing, structure, properties, to optimize the function*.

MSE Slogans

- We are enablers of advanced technology
- We are the engineers of engineers, nobody can do anything without us

New MSE Core

- The same Structure-Properties-Processing,
 - But cover a wider range of structures (gels, colloids, LC, soft materials...as well as close-packed crystals)
 - But consider properties for a wider range of applications beyond structural– increase emphasis on functional and biological
- Add Biological Science to supplement Physics, Math, and Chemistry (organic)

New MSE Core

- Sciences: Biologic, Physics, Math, and Chemistry
- Thermo, Kinetics, Structure, Properties, Transport
- Engineering: Process Operations, Economics, Environmental
- Design.... Not discussed by us

Concerns of Expanded MSE Core

- Concern that we are not teaching the basics for our traditional employers
- Concern that we get breadth at the cost of depth of knowledge
- Who will teach the new content in near future when most of faculty are hard materials folks?
- Who will teach the hard material structural content in distant future when most of faculty are soft-material bio-types?

Points about Expanded MSE Core

- Attract more students ... more talented students
 - This is what our “customers” want
- Larger enrollments keep MSE Departments healthy and alive
- Peter Davies described the new all-Nano curriculum at Penn

Job opportunities for students where do MSE undergraduates find jobs?

Airforce
AK Steel
Alliant Tech Systems
American Steel Treating
Arvin Meritor
ASiMI
AW of North Carolina
Barrick
Boeing (3)
Bristol Myers
Bryte Technologies
Hydrogen Power Inc.
Caterpillar
CC Technologies
Cincinnati Lamb
Eastman Chemical
Edison Welding Inst.
Engineer Machine Prod.
Etrema Electronics
Excera Materials Group
Federal Mogul
FM&T
Ford Motor Company
Ft. Wayne Metals
General Dynamics
General Motors (3)
Georgia Iron Works

Global Storage
GM-Defiance
Hannifan
Hitachi
Honeywell
Innovations
Intel (2)
Kennedy Space Center
Knolls Atomic Power L.
Lockhead Martin (2)
Lucent Technology
Martin Marietta
Matco Assoc. Inc
Meloon Foundry
Mercury Marine
Metlab
Micron Tech. (2)
MITRE Corp
Naval Surface Warfare
Navy Nuclear Officers
Newmont
NextelCommunications
Northrup Grumman (2)
Nuclear Regulatory (2)
Nucor-Yamato Steel (2)
Olin Brass

Ortho
Owens Corning
Pacific Clay
Pacific Nrthwst Ntl. Lbs
Potero
Raytheon
RJ Lead Group
Rocketdyne
Rockwell
Rolls Royce
RTP Co.
Schlumberger (4)
Spectrum Glass
Steel Dynamics, Inc
Steel Technologies
Supreme Corp.
TXRockwell Collins
U.S. Navy
Unitive Inc.
US Army
US Pipe
US Steel
W. L. Gore & Assc.
Waupaca Foundry (2)
WSU IT Dept.
Zimmer