

Implementing the 5xME Recommendations

Lake Buena Vista, FL November 13-14, 2009

- The National Science Foundation (NSF) has sponsored this workshop to focus on *implementing the recommendations* of the previously held (Arlington, VA, May 2007) “5xME” Workshop.
- For example, to develop *curricular templates* for a variety of ME programs, then to publicize those broadly to ME department heads at the March 2010 ASME IMEEC and via the ASME Vision 2030 education efforts.
- The goal of today’s meeting is to develop such curricular templates in our breakout sessions.
- **Planning Committee:**
 - Adnan Akay, Carnegie Mellon and Bilkent
 - Norman Fortenberry, NAE
 - John Lienhard, MIT
 - Sheri Sheppard, Stanford
 - Gretar Tryggvason, WPI
 - Galip Ulsoy, University of Michigan (Chair)
 - Kon-well Wang, University of Michigan (Co-chair)



A. Galip Ulsoy, William Clay Ford Professor of Manufacturing
Mechanical Engineering, University of Michigan, Ann Arbor, MI 48109-2125 USA

1/28/05

1

Original 5xME Participants



1. Adnan Akay, NSF
3. Allen L. Soyster, NSF
5. Arden Bement, NSF
7. Bill Wepfer, GaTech
9. Deba Dutta, U. Mich.
11. Eduardo Misawa, NSF
13. Galip Ulsoy, U. Mich.
15. Jim Duderstadt, U. Mich.
17. Mario Rotea, U Mass
19. Nariman Farvardin, UMD
21. Pam Eibeck, Texas Tech
23. Richard Buckius, NSF
25. Rohan Abeyaratne, MIT
27. Tom Perry, ASME
2. Al Pisano, UCB
4. Andrew Alleyne, UIUC
6. Bill Miller, ETAS
8. Bob Warrington, MTU
10. Earl Dowell, Duke
12. Fritz Prinz, Stanford
14. Gretar Tryggvasson. WPI
16. Judy Vance, NSF
18. Marshall Jones, GE
20. Norman Fortenberry, NAE
22. Pat Moran, US Naval Academy
24. Robert L. Clark, Duke
26. Sheri Sheppard, Stanford
28. Ward Winer, Ga. Tech.

Planning Committee:

Mary Good, Marshall Jones, Lee Matsch, Dan Mote and Galip Ulsoy (Chair)



A. Galip Ulsoy, William Clay Ford Professor of Manufacturing
Mechanical Engineering, University of Michigan, Ann Arbor, MI 48109-2125 USA

1/28/05

2

Original Workshop Goal

- The goal of the May 2007 “5xME” workshop was to lay the foundation for *transformative* change in mechanical engineering education and research in the USA.
- This was motivated by the fact that the science-based engineering education taught at our engineering schools has become a commodity, available to students all over the world, including low-wage markets.
- Global companies employ such world-class engineering talent, often at 20% of the cost in the USA, and are moving manufacturing, design and even research activities to such locations.
- *The challenge for engineering schools in the USA is how to educate a mechanical engineer that provides five times the value added when compared to the global competition, i.e., the “5xME.”*



Workshop Recommendations

- 1) In today's global knowledge economy, mechanical engineers educated in the USA must be able to add significantly more value than their counterparts abroad, through the breadth of their intellectual capacity, their ability to innovate, and their leadership in addressing major societal challenges.
 - 2) Transformative changes are needed at each of the five major stages of the education of an engineer. These stages include: (1) primary and secondary education, (2) bachelors, (3) masters, (4) doctoral, and (5) lifelong learning. Discussions during the workshop focused only on stages (2) through (5).
 - 3) The bachelors degree should introduce engineering as a *discipline*, and should be viewed as an extension of the traditional liberal arts degree where education in natural sciences, social sciences and humanities is supplemented by education in the discipline of engineering for an increasingly technological world.
 - 4) This bachelors degree in the *discipline* of engineering can be viewed as the foundational stem upon which several extensions can be grafted: (1) continued professional depth through a professional masters degree in engineering, and (2) transition to non-engineering career paths such as medicine, law, and business administration.
 - 5) The masters degree should introduce engineering as a *profession*, and become the requirement for professional practice. This is where educational institutions and professional societies can build an awareness of the profession, as opposed to producing graduates who view themselves merely as employees.
 - 6) Doctoral education in engineering is essential to national prosperity, and global competition is rapidly increasing. The doctoral degree in engineering, while indisputably the best in the world, needs to be enhanced and strengthened with an emphasis on breadth as well as depth, linking discovery and innovation, and improved leadership and teaching skills.
 - 7) Lifelong learning programs in engineering, including executive education, need to be developed and delivered to engineers at all stages in their professional development.
-



Workshop Outcomes

- 1. See the 5xME Workshop web site**
<http://umich.edu/~ulsoy/5XME.htm>
 - Report and Appendices
 - Brochure
 - Photos, participants, agenda, etc.
 - 2. Symposium organized at the ASME International Mechanical Engineering Education Conference (IMEEC), April 4-8, 2008, Galveston, Texas.**
 - <http://www.asmeconferences.org/meed2008/>
 - 3. Follow up workshop on Implementing 5xME Recommendations proposed for November 2009 in conjunction with the ASME IMECE, and a session at the March 2010 ASME IMEEC**
-



Agenda: November 13

- 7:30-8:00 am *Continental Breakfast*
 - 8:00-8:15 am **Welcome and Introductions**
 - 8:15-10:00 am **Plenary Lectures:**
 - J. Duderstadt
 - W. Seering
 - 10:30am *Break*
 - 11:00am **Plenary Lectures:**
 - A. Akay
 - G. Ulsoy
 - noon to 12:30 pm **Breakouts to answer questions**
 - 12:30pm *Lunch*
 - 2:00-3:00 pm **Breakouts to outline curricula**
 - 3:00pm *Break*
 - 3:30-4:30pm **Resume breakout sessions**
 - 4:30pm **Report back from breakouts**
 - 5:00 pm *Adjourn*
-



Breakout Sessions

- **Four Groups: A, B, C and D**
- **Each group has a designated Facilitator and Recorder/Reporter**
 - Recommend that Reporter use laptop and Word or Powerpoint
- **Morning breakout: answer the 7 questions on the handout**
- **Afternoon breakout:**
 - Pick any one (or more) of the 3 tasks described in the handout
 - Blank slate vs transitional curriculum
 - Four year BS degree only vs BS and MS combined curriculum
 - Outline a curriculum that can help achieve the recommendations from the 5xME Workshop
 - Reporters present summary to group at 4:30pm (5 min each)
 - Send your materials via e-mail to ulsoy@umich.edu



Agenda: November 14

- **7:30-8:00 am** ***Continental Breakfast***
- **8:00-11:30am** **Prepare**
 - Detailed outline of the workshop report
 - Detailed outlines of sample curricula
- **11:30am** **Wrap-up Discussion and Next Steps**
- **Noon** ***Adjourn***

