

An Integrated Thermal and Fluids Curriculum

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The Integrated Mechanical Engineering Curriculum

- Basic structure of our curriculum follows closely the guidelines proposed during the 1996 workshop for U.S. Mechanical Engineering Departments, organized by the MIT ME Dept.
- Our program has completed two full years of implementation
- 12 traditional, discipline-specific 3 credit courses (12 by 3) have been consolidated into a set of four, 4 credit, two-semester course sequences (4 by 2 by 4)
- Mechanics & Materials I&II: integrate *Statics, Mechanics of Materials* and *Materials Engineering*
- Mechanical Systems I & II: replace *Mechanism Design, Design of Machine Elements* and *Elements of CAD*
- Dynamic Systems I & II: combine *Dynamics, Mechanical Vibrations* and *Linear Control Theory*
- Thermal and Fluids I & II: integrate the traditional thermal and fluid related subjects of *Thermodynamics, Heat Transfer* and *Fluid Mechanics*

SUMMARY

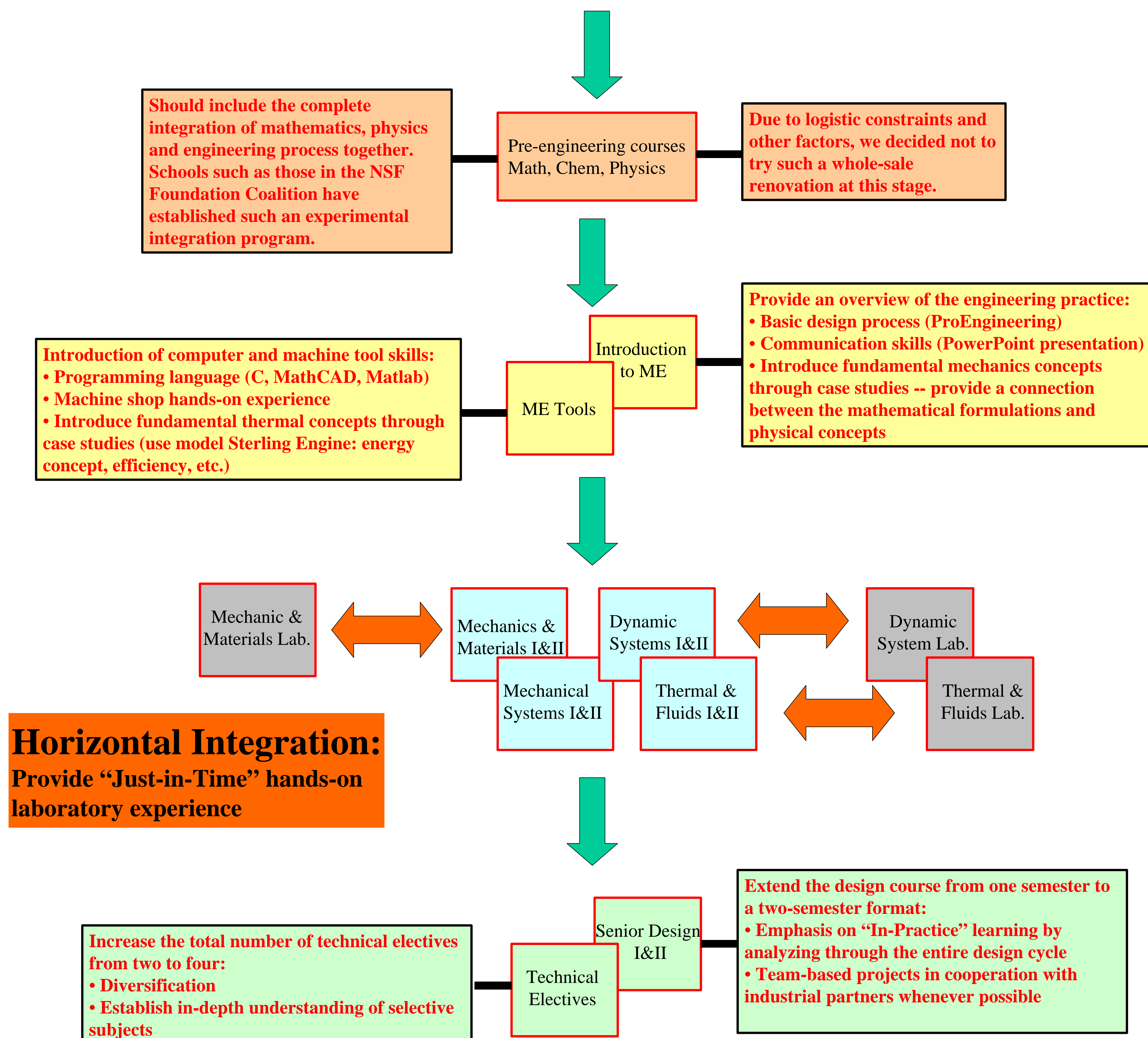
A new Thermal and Fluids curriculum is developed as a part of our recent efforts to implement an Integrated ME curriculum. The new format integrates the three traditional thermal subjects of thermodynamics, heat transfer and fluid mechanics into a single two-semester course sequence. One of the main objectives is to provide students with a better understanding of the thermal engineering disciplines and how they can be applied to the design of complete thermal systems by presenting these subjects in a more coherent manner. In addition, to facilitate the “just-in-time” hands-on experience, the thermal and fluid laboratory, traditionally being taught separately, is also integrated with the new course sequence. In here, we discuss difficulties encountered during our initial implementation phase and provide recommendations for possible future improvements.

The College and the Department

A unique institution jointly administered by Florida A&M University, a Historically Black University, and Florida State University. Its mission is to provide greater minority and women participation in engineering education while achieving national and international recognition through outstanding teaching, research, and professional development. The department has an enrollment of more than 300 undergraduate students of which 60% are underrepresented minorities and 20% are female. The diverse population in our school makes the transition to the new curriculum both challenging and necessary since it can provide better motivation to our students and, hopefully, can significantly improve the retention rate. In addition, the tightly-structured program encourages the establishment of positive relationship among students thus promoting the development of a true learning community.

The integrated Mechanical Engineering curriculum

Vertical Integration



Difficulties/Obstacles

- Obtain a consensus among the faculty members
 - Why? How? Who?
 - “Enthusiastic” participation from all faculty is a must
 - Coordination between classes is critical but difficult, if possible
- Lack of experience in teaching integrated disciplines
 - Unrealistic expectations from the instructors
 - Time-consuming/ Material selection
 - Smooth transition between subjects
- Students’ resistance/indifference
 - Why us? Why now?
- No suitable textbooks/references

Suggestions/Solutions

- Avoid team teaching if possible. Preferably, one faculty be assigned to develop one complete course-sequence
- Be patient and plan early. Selective omission is not a disaster
- Establish frequent and effective communication with the students
 - The development of a new class is an iterative process that requires many modifications
- Adopt teamwork and cooperative learning concepts
 - Students comprehension of various subjects is usually complementary
- Taking advantage of web-based technology
 - Provide on-line guidance throughout the learning period
 - Introduce real-world applications and the state-of-the-art technology