The integrated Thermal Fluids curriculum

Course Description
- Integrate traditional subjects of Thermodynamics, Heat Transfer and Fluid Mechanics into one coherent two-semester course sequence
- Place emphasis on the connection between different interdisciplinary subjects (see table A)
- Conduct three one-hour lectures plus one three-hour workshop session
- Use real-world case studies throughout the class (see table B)

Thermal and Fluids Curriculum Laboratory Integration

Web-Based Delivery/Supplements
- Comprehensive course web pages were developed to provide step-by-step on-line guidance
  - Daily lecture notes, weekly workshop assignments and other class supplementary materials ([www.eng.fsu.edu/~shih/eml3015](http://www.eng.fsu.edu/~shih/eml3015) & [www.eng.fsu.edu/~shih/eml3016](http://www.eng.fsu.edu/~shih/eml3016))
- A ROAD MAP section (see sample road map page)
  - Guides students through different topics
  - Provides a smooth transition
  - Includes extensive hyperlinks to relevant subjects for beyond-textbook experience (see A Road Map for the Teaching of an Integrated Thermal Fluids Course in the SUCCEED's Greatest Bits, Vol. 3 CD, 2000)
- Weekly three-hour on-line workshop:
  - Active examples (see example to the left) and hands-on demonstrations: students model and solve thermal problems following on-line presentations of experiments/examples

Textbooks:
Thermodynamics & Heat Transfer: "Introduction to Thermodynamics and Heat Transfer", by Yunus Cengel, McGraw-Hill
Fluid Mechanics: "Introduction to Fluid Mechanics", by Fox & McDonald, Wiley

Sample Road Map

A Road Map for the Teaching of an Integrated Thermal and Fluids Course

Thermal Fluids Laboratory Integration

Laboratory Course Description
- Provide “Just-In-Time” hands-on laboratory experience in Thermal/Fluids related subjects
- Provide on-line web lab manuals and interactive experiments (currently under development) for a “Virtual Laboratory” environment
- Emphasize the “Seeing is Believing” concept.
  - Develop visualization-enhanced projects: For example, see Qualitative Flow Visualization included in the SUCCEED’s Greatest Bits, Vol. 2 CD, 1999
- Implement “Learning through Teaching” strategy.
  - Students present laboratory demonstrations to fellow students to gain valuable higher-level learning experience (currently under development)

Laboratory Organization
- Reinforce and enhance students’ understanding of the fundamentals of fluid mechanics and heat transfer learned in Thermal Fluids I & II through hands-on laboratory experience
- Weekly schedule includes two one-hour lectures and one three-hour laboratory. Students are divided in groups of four students/group and each group performs one experiment/week.
- Students conduct a total of ten experiments (eight hands-on laboratories and two demonstrations)
  - [www.eng.fsu.edu/~alvi/eml4304L/webpage](http://www.eng.fsu.edu/~alvi/eml4304L/webpage)

Program Assessment
So far, no systematic assessment has been done on the effectiveness of our new teaching format. However, we can use the students’ evaluation surveys to make a qualitative comparison. Only Professor Shih’s surveys were used since he was responsible for teaching the integrated courses. The evaluation is based on a scale from excellent (being 1), very good, good, fair, to poor (being 5). It can be clearly seen that there is a significant improvement in the first two categories seems to suggest that the integrated thermal fluids curriculum is promising.