

**DEPARTMENT OF MECHANICAL ENGINEERING, IUPUI  
FACULTY FEEDBACK FORM FOR COURSE OUTCOMES SURVEYS**

Note: This form must be completed and submitted to the department by instructors at the end of each semester based on the survey results of courses taught. It is designed to monitor student learning, keep track of progress and changes made in the program, and allow faculty reflect upon the results. The survey results may be viewed from the department's survey database at <http://www.engr.iupui.edu/me/assessment/fsurveys.shtml>. The completed form may be sent to the assessment database of the department via e-mail at: **hakay@iupui.edu**.

Course: ME 314 Lab	Year: 2005	Semester: Spring
Instructor: Michael Armbrester	Survey Average: 4.07 (Out of 5)	

1. List the outcomes that did not meet the Department's current threshold of 3.75 out of 5.0 and explain the reasons. If all or most outcomes in your course are equal to or above 3.75, please reflect upon on the lowest two or three. Please state the outcomes as fully as possible, as in the course outcomes list, with the numbers same as on the list.

All outcomes were above 3.75; three of the six were below 4.0.

3. Apply control volume analysis to two-dimensional heat conduction and heat convection in simple objects using a computer program. (3.82 out of 5)

We perform two experiments which pertain to this outcome -- a 2-D conduction experiment and a 2-D convection experiment. The conduction experiment is, in my opinion, more valuable, but I think the method prevents some students from gaining much from the experience. The numeric code used is written in an old version of FORTRAN; all the students are asked to do is execute it. In the future, I would like to transfer the code to a current version of MATLAB and have the students involved in some of the coding process, so that they understand what the code accomplishes and how it can best be structured for efficiency and accuracy. Dr. Krishnan and I are currently working with UITS to accomplish this.

I have the same goals for the convection experiment, although it suffers from a separate issue as well. The theoretical material covered in this experiment is not related to anything covered during the ME 314 lecture, and is frankly a bit more appropriate for a graduate-level heat transfer course. The explanation of the material given in the lab manual could certainly be simplified, and giving the students a basic understanding of numerical computing strategies would help them to better understand the strategy employed in this experiment.

4. Measure steady state heat transfer rates in free convection and boiling phenomenon, and in heat exchangers. (3.94 out of 5)

I think our free convection and heat exchanger experiments are definite strengths in this lab; the weakness here seems to be boiling. Again, the material covered in the boiling experiment is not

related to anything which is covered in the lecture. Dr. Krishnan and I have discussed how to best address this, and the solution we decided upon was to hold a special lecture outside of the normal class time to cover the basics of boiling heat transfer. This is something we are hoping to implement during the Fall 2005 semester to evaluate its effectiveness.

5. Verify the Stefan-Boltzmann Law of heat radiation, and measure radiant heat transfer between two plates. (3.88 out of 5)

Once again, the weakness here is the relationship between the material covered in lecture and lab. Radiation is a topic which is covered during the lecture, but it is definitely emphasized less than conduction and convection. For an undergraduate course, this seems appropriate. The best solution to this problem is probably a more pro-active teaching approach on my part.

## 2. Were there any changes made to the course during the semester? If so, explain.

The primary change was the renovation of the lab manuals for the course, which seemed to be a welcome change from the students' perspective. The theory and analysis methods were more clearly outlined for the students, resulting in far fewer cases of confusion. In addition, digital photos of the equipment were included to give the students a better opportunity to be familiar with the equipment and procedure before coming to class; the effort to do this was supplemented by pre-lab quizzes covering the theory and experimental methods to motivate the students to prepare before coming to class.

Aside from these changes, I put more effort into actively teaching the material rather than simply letting students come to me with questions or concerns. I think this has helped somewhat, as our survey results have improved from Fall 2004, and the quality of the lab reports improved as well.

## 3. Are there any recommendations for improvement?

The scheduling of experiments has been updated a bit to better match the lab schedule to the lecture schedule. We are also working on renovation and upgrading of some of the lab equipment, most notably the two numerical solution experiments.

We will try auxiliary lectures for boiling heat transfer and possibly radiation, and have decided to try a combination of individual and group lab reports to ease the burden on the students. We have instituted electronic submission of reports, which we hope will streamline the process of exchanging information between the students and myself.

Perhaps one of the most important improvements is a more active approach on my part. For Spring 2005, I resolved to be more active in teaching the material; for Fall 2005, I have found it necessary to add teaching Excel skills to that, so that our students get a clearer understanding of both the theory and the analysis tools that they will use in industry. I would like to see our students have stronger skills with Microsoft Excel and similar tools; perhaps this could be accomplished by modifying the Freshman Engineering curriculum.

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#### 4. Additional reflections/suggestions for assessment?

My only suggestion for assessment would be to have the course instructor included in the process. The surveys are a great tool for evaluating the students' perception of how effective the lab is; including my input in the survey results helps me to see where the students and I are not communicating. However, I may not be the most objective source of information since these surveys in some way reflect how well I do my job; it would be helpful to me to have the course instructor periodically come to lab and evaluate my performance.

Please e-mail to: [hakay@iupui.edu](mailto:hakay@iupui.edu). Thanks.