<table>
<thead>
<tr>
<th>Course</th>
<th>ME 32200 – Heat Transfer Laboratory</th>
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<tbody>
<tr>
<td>Type of Course</td>
<td>Required for ME program</td>
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<tr>
<td>Catalog Description</td>
<td>Introduction to heat transfer laboratory and design of experiments. Experiments on measurements of temperature and thermal conductivity, transient heat conduction, convection, radiation, boiling, and heat exchangers.</td>
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<tr>
<td>Credits</td>
<td>1</td>
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<tr>
<td>Contact Hours</td>
<td>3</td>
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<tr>
<td>Prerequisite Courses</td>
<td>ME 29300 and ME 32100</td>
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<tr>
<td>Corequisite Courses</td>
<td>ME 31900</td>
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<tr>
<td>Prerequisites by Topics</td>
<td>Measurement &amp; Instrumentation Lab and Heat Transfer Course</td>
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**Course Objectives**

To introduce the students to heat transfer concepts in a laboratory, to provide students the opportunity to utilize data acquisition systems and computers, and to improve students’ written communication, teamwork, and experimental skills.

**Course Outcomes**

Students who successfully complete this course will have demonstrated an ability to:

1. Utilize data-acquisition software. \((a, b)\)
2. Determine the thermal conductivity of a liquid or a gas and compare that value to published data. \((a, b, k)\)
3. Model the transient temperature response of a lumped system and determine whether or not the model is valid. \((a, b, k)\)
4. Predict the transient temperature response in a cylinder. \((a, b, k)\)
5. Apply separation of variables to two-dimensional, steady-state heat conduction and to compare the analytical solution to finite difference and finite element solutions. \((a, e, k)\)
6. Design and model a heat transfer device or system to meet a specific objective; then test and report results. (a, b, k)
7. Analyze heat exchanger performance. (a, b, k)
8. Solve a gray-surface enclosure problem. (a, k)
9. Communicate experimental results in written reports and oral presentation. (g)

Laboratory Topics
1. Introduction, report format, and uncertainty analysis
2. Oral reports on a heat transfer measurement device
3. Thermal conductivity lab
4. Lumped capacitance lab
5. Two-dimensional cylindrical, transient lab
6. Numerical experiment—two-dimensional heat conduction
7. Heat exchanger experiment
8. Design of heat transfer device and/or experiment including group presentations
9. Numerical experiment—radiant exchange between surfaces
10. Lecture over labs and introduction to data acquisition system

Computer Usage
Medium

Laboratory Experience
High

Design Experience
Medium

Coordinator
Donald Mueller, Ph.D., P.E.

Date
30 September 2015