2.52 Modelling and Approximation of Thermal Processes

COURSE INFORMATION
Fall Term 2007

1 Credit and Content

During this academic year, 2.52 is being offered as a 6-unit H-level subject. The prerequisite for this course is an advanced undergraduate course in heat transfer, such as 2.51. (Course 2.006 is not a sufficient preparation.)

This course focuses on teaching students how to model thermal transport processes in typical engineering systems such as those found in manufacturing, machinery, and power production. Simplified modelling techniques and experimental interfacing are included. The course is divided into successive modules that cover basic modelling tactics for particular modes of transport, including steady and transient heat conduction. An innovative design project will incorporate many of the concepts.

2 Classes

Lectures: Mondays and Wednesdays from 11:00 am to 12:30 pm during September and October in Room 1-246

Instructors:

Lecturers: Professor L.R. Glicksman 5-418 x3-2233 glicks@mit.edu
Professor J.H. Lienhard 3-162 x3-3790 lienhard@mit.edu


3 Exams and Grading

The grade will be based on one exam (40%), a term project (35%), homework and class participation (25%). The exam will be open book. It will cover material from the lectures and the homeworks.
Homework assignments paralleling the lectures will be distributed. These problems will apply the material covered in lectures and are essential to learning that material. They will involve theory, modelling, and design exercises. It is very strongly recommended that you do all the homework yourself. Some of these problems will also be worked in class, prior to the final date for the remainder of the homework set; those problems will be identified in class.

4 Lecture Schedule

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Date†</th>
<th>Topic</th>
<th>Hmwk‡</th>
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<tbody>
<tr>
<td>1</td>
<td>Sept 5</td>
<td>Introduction to modelling</td>
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<tr>
<td>2</td>
<td>Sept 10</td>
<td>Resistances, order of magnitude</td>
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<tr>
<td>3</td>
<td>Sept 12</td>
<td>Analogies, bounding estimates</td>
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<tr>
<td>4</td>
<td>Sept 17</td>
<td>Fins</td>
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<td>5</td>
<td>Sept 19</td>
<td>Multidimensional conduction</td>
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<td>†</td>
<td>Sept 24</td>
<td><em>No class (Vacation day)</em></td>
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<tr>
<td>6</td>
<td>Sept 26</td>
<td>Thermal radiation</td>
<td>#1</td>
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<td>7</td>
<td>Oct 1</td>
<td>Transient conduction: Capacity &amp; resistance</td>
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<td>8</td>
<td>Oct 3</td>
<td>Series and chart adaptations</td>
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<td>Oct 8</td>
<td><em>No class (Holiday)</em></td>
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<td>9</td>
<td>Oct 10</td>
<td>Series and chart adaptations</td>
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<tr>
<td>10</td>
<td>Oct 15</td>
<td>Semi-infinite body models</td>
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<tr>
<td>11</td>
<td>Oct 17</td>
<td>Semi-infinite body models</td>
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<tr>
<td>12</td>
<td>Oct 22</td>
<td>Scaling analysis of transient conduction</td>
<td>#2</td>
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<td>‡</td>
<td>Oct 24</td>
<td>Exam</td>
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<tr>
<td>*</td>
<td>Oct 29</td>
<td><em>No class</em></td>
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<tr>
<td>13</td>
<td>Oct 31</td>
<td>Term project presentations</td>
<td>Project</td>
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</tbody>
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†Dates and coverage may vary.
‡Some individual homework problems will be due before the final due dates listed for the problem sets.