# ME 336 COURSE PROFILE

**DEGREE PROGRAM:** Mechanical Engineering

<table>
<thead>
<tr>
<th>COURSE NUMBER:</th>
<th>ME 336</th>
<th>COURSE TITLE:</th>
<th>Thermodynamics II</th>
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</thead>
<tbody>
<tr>
<td>REQUIRED COURSE OR ELECTIVE COURSE:</td>
<td>Elective</td>
<td>TERMS OFFERED:</td>
<td>Fall, Winter</td>
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<td>COGNIZANT FACULTY:</td>
<td>C. Borgnakke</td>
<td>COURSE TOPICS:</td>
<td></td>
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<tr>
<td>COURSE STRUCTURE/SCHEDULE:</td>
<td>Lecture: 2 days per week at 1.5 hours</td>
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| COURSE OBJECTIVES: | 1. To make students familiar with advanced concepts and devices used in thermal science [1, 2]  
2. To teach the behavior of simple pure substances and ideal mixtures [1, 7]  
3. To teach the general formulation of conservation laws for mass, energy and entropy for various physical systems [1, 2, 7]  
4. To teach application of process knowledge to the analysis of complete systems [1, 4, 7]  
5. To teach evaluation of processes involving phase change of water in air [4, 7]  
6. To show students some real devices and cycles used in industry [1, 4, 7]  
7. To introduce students to combustion of hydrocarbon fuels and emissions [4]  
8. To familiarize students with chemical equilibrium concepts and processes [1, 2, 4, 6]  
9. To introduce students to the workings of fuel cells [2, 4] |
| for each course objective, links to the Program Outcomes are identified in brackets. |

| COURSE OUTCOMES: | 1. Analyze different subsystems, indicate where there is work, heat transfer and give the best approximating process [1, 3, 4]  
2. Given a set of properties, find the correct phase and remaining properties for a substance [2]  
3. Given a physical setup, find process and compute associated work/heat transfer that is the most reasonable approximation [1, 3]  
4. Given a physical device and process, compute the work and heat transfer [3, 4, 6]  
5. Given a physical setup, formulate the ideal approximation to the behavior and compute the corresponding work and heat transfer [3, 4]  
6. Given an actual device, formulate the corresponding ideal device [3, 4, 6]  
7. Formulate performance and compute power for simple heat engines/refrigerators [3, 4]  
8. Evaluate processes in moist air, evaporation and condensation of water [5]  
9. Ability to analyze processes that includes mixtures of gases and trace components [2, 7]  
10. Given a fuel type, compute the energy release and combustion temperature [7]  
11. Analyse the energy and entropy for a combustion process and evaluate the electrical potential for a fuel cell [7, 8]  
12. Energy levels and component composition should be found for equilibrium situations involving simple chemical reactions and/or combustion [7, 8] |
| for each course outcome, links to the Course Objectives are identified in brackets. |

| ASSESSMENT TOOLS: | 1. Regular homework assignments [2-12]  
2. Exams [6-12] |
| for each assessment tool, links to the course outcomes are identified |

PREPARED BY: C. Borgnakke  
LAST UPDATED: 06/02/2017