DOCTOR OF PHILOSOPHY IN ELECTRICAL ENGINEERING WITH SPECIALIZATION IN ENERGY/ENVIRONMENT/ECONOMICS (E3)

Curriculum

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Minimum Credits Required</td>
<td>72</td>
</tr>
<tr>
<td>Minimum 500-level+ ECE Course Credits</td>
<td>15</td>
</tr>
<tr>
<td>Maximum Transfer Credit</td>
<td>32</td>
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<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>CHE 543</td>
<td>Energy, Environment, and Economics</td>
<td>3</td>
</tr>
<tr>
<td>ECE 550</td>
<td>Power Electronic Dynamics and Control</td>
<td>3</td>
</tr>
<tr>
<td>ECE 551</td>
<td>Advanced Power Electronics</td>
<td>3</td>
</tr>
<tr>
<td>ECE 552</td>
<td>Adjustable Speed Drives</td>
<td>3</td>
</tr>
<tr>
<td>ECE 553</td>
<td>Power System Planning</td>
<td>3</td>
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<tr>
<td>ECE 554</td>
<td>Power System Relaying</td>
<td>3</td>
</tr>
<tr>
<td>ECE 555</td>
<td>Power Market Operations</td>
<td>3</td>
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<tr>
<td>ECE 556</td>
<td>Fault-Tolerant Power Systems</td>
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</tr>
<tr>
<td>ECE 557</td>
<td>Power System Reliability</td>
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<tr>
<td>MMAE 517</td>
<td>Computational Fluid Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 520</td>
<td>Advanced Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 522</td>
<td>Nuclear, Fossil-Fuel, and Sustainable Energy Systems</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 523</td>
<td>Fundamentals of Power Generation</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 524</td>
<td>Fundamentals of Combustion</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 525</td>
<td>Fundamentals of Heat Transfer</td>
<td>3</td>
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Candidates must pass written qualifying and comprehensive examinations and must defend their thesis in an oral examination. The Ph.D. committee for E3 students must include at least one professor with specialization in an energy and sustainability area from outside the student’s department.

E3 Courses

See descriptions under the respective department’s course listings.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>MMAE 526</td>
<td>Conduction and Diffusion</td>
<td>3</td>
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<tr>
<td>MMAE 527</td>
<td>Heat Transfer: Convection and Radiation</td>
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<td><strong>Group B</strong></td>
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<tr>
<td>CHE 541</td>
<td>Renewable Energy Technologies</td>
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<tr>
<td>CHE 560</td>
<td>Statistical Quality and Process Control</td>
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<tr>
<td>ENVE 501</td>
<td>Environmental Chemistry</td>
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<tr>
<td>ENVE 506</td>
<td>Chemodynamics</td>
<td>3</td>
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<tr>
<td>ENVE 542</td>
<td>Physicochemical Processes in Environmental Engineering</td>
<td>3</td>
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<tr>
<td>ENVE 551</td>
<td>Industrial Waste Treatment</td>
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<tr>
<td>ENVE 561</td>
<td>Design of Environmental Engineering Processes</td>
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<tr>
<td>ENVE 570</td>
<td>Air Pollution Meteorology</td>
<td>3</td>
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<tr>
<td>ENVE 577</td>
<td>Design of Air Pollution Control Devices</td>
<td>3</td>
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<tr>
<td>ENVE 578</td>
<td>Physical and Chemical Processes for Industrial Gas Cleaning</td>
<td>3</td>
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<tr>
<td>ENVE 580</td>
<td>Hazardous Waste Engineering</td>
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