EEO 304: Electronic Instrumentation and Operational Amplifiers

2013-2014 Catalog Description:
Design of electronic instrumentation: structure of basic sensors and measurement systems, transducers, analysis and characteristics of operational amplifiers, analog signal conditioning with operational amplifiers, sampling, multiplexing, A/D and D/A conversion; digital signal conditioning, data input and display, and automated measurement systems.

Goals:
Teach students how to use Op.Amp. based circuits as basic elements for creation electronic systems for measurement, analog processing and conversion into different analog and digital formats.

Student Learning Objectives:
To increase understanding of connections between science and engineering, provide a basic training in the area of solving engineering problems and teach how to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Topics Covered:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Week 1</td>
<td>Technology of Electrical Measurements</td>
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<tr>
<td>Week 2</td>
<td>Electrical Sensors and Operational Amplifier Fundamentals</td>
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<td>Week 3</td>
<td>Circuits with Resistive Feedback</td>
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<td>Week 4</td>
<td>Static Op Amp Limitations</td>
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<td>Week 5</td>
<td>Dynamic Op Amp Limitations</td>
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<td>Week 6</td>
<td>Application of Operational Amplifier</td>
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<td>Week 7</td>
<td>Active Filters. Part I – First Order Filters</td>
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<td>Week 8</td>
<td>Active Filters. Part II – Second Order Filters</td>
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<td>Week 9</td>
<td>Nonlinear Circuits Part I – Comparators.</td>
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<td>Week 10</td>
<td>Nonlinear Circuits Part II – Signal Converters</td>
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<td>Week 11</td>
<td>Signal Generators. Part I - Sinusoidal</td>
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<tr>
<td>Week 12</td>
<td>Signal Generators. Part II – Non-sinusoidal</td>
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<td>Week 13</td>
<td>Voltage References and Voltage Regulators</td>
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<td>Week 14</td>
<td>D-A and A-D Converters</td>
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<tr>
<td>Program Outcomes</td>
<td>% contribution</td>
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<td>---------------------------------------------------------------------------------</td>
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<tr>
<td>❑ (a) an ability to apply knowledge of mathematics, science and engineering</td>
<td>25</td>
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<td>❑ (b1) an ability to design and conduct experiments</td>
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<td>❑ (b2) an ability to analyze and interpret data</td>
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<td>❑ (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability</td>
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<td>❑ (d) an ability to function on multi-disciplinary teams</td>
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<td>❑ (e) an ability to identify, formulate, and solve engineering problems</td>
<td>20</td>
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<td>❑ (f) an understanding of professional and ethical responsibility</td>
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<td>❑ (g) an ability to communicate effectively</td>
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<td>❑ (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context</td>
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<td>❑ (i) a recognition of the need for, and an ability to engage in life-long learning</td>
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<td>❑ (j) a knowledge of contemporary issues</td>
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<td>❑ (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice</td>
<td>20</td>
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<td>❑ (l) an ability to communicate and/or collaborate effectively online</td>
<td>10</td>
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