1. **Course number and name:** 055:072 – Electrical Engineering Materials and Devices

2. **Credits and contact hours:** 3

3. **Coordinator:** David Andersen


5. **Specific course information**
   a. Brief description. Fundamentals of semiconductor physics and devices; principles of the p-n junction diode, bipolar transistor and field effect transistor
   b. Prerequisites: 029:082 and 055:041
   c. Required for majors in the electrical track

6. **Specific goals for the course and mapping to outcomes**

<table>
<thead>
<tr>
<th>Course Goal</th>
<th>Basis For Goal Assessment</th>
<th>Supports ABET Outcomes</th>
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</thead>
<tbody>
<tr>
<td>a. Students should develop a working knowledge of the physics underlying all semiconductor devices</td>
<td>Homework, exam questions</td>
<td>a(●), e(●), k(●)</td>
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<tr>
<td>b. Students should develop an understanding of the physical principles behind the PN junction and the Schottky barrier diode</td>
<td>Homework, exam questions</td>
<td>a(●), e(●), k(●)</td>
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<tr>
<td>c. Students should develop an understanding of the operation of both junction and metal/insulator/semiconductor field effect transistors</td>
<td>Homework, exam questions</td>
<td>a(●), e(●), k(●)</td>
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<td>d. Students should be introduced to device design</td>
<td>Homework, exam questions</td>
<td>a(●), c(○), e(●), k(●)</td>
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</tbody>
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7. **Brief list of topics to be covered**
   a. Schrödinger equation & Boltzmann equation (3 classes)
   b. Crystal structure & silicon (6 classes)
   c. PN and Schottky junctions (5 classes)
   d. Bipolar Junction Transisstor (6 classes)
   e. MOS capacitor (3 classes)
   f. MOSFET (5 classes)
   g. Examinations (2 classes)