

## MSE 323: Materials Characterization Laboratory

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| <i>Course description:</i>                                 | Laboratory exercises on materials characterization: X-ray, TEM, SEM.  |
| <i>Number of credits:</i>                                  | 2 (1-3). This course is required.   |
| <i>Course Coordinator:</i>                                 | David Field and Collin Merriman   |
| <i>Prerequisites by course:</i>                            | MSE 321 or c//  |
| <i>Prerequisites by topic:</i>                             | Atomic structure, bonding, introduction to crystal structures, optics, interference, diffraction.   |
| <i>Postrequisites:</i>                                     | MSE 425: <i>Senior Thesis I</i><br>MSE 426: <i>Senior Thesis II</i>   |
| <i>Textbooks/other required materials:</i>                 | None  |
| <i>Course objectives:</i>                                  | <ol style="list-style-type: none"><li>1. To provide hands-on experience with SEM</li><li>2. To provide experience on examining the fracture surfaces of materials and identifying the fracture mechanism</li><li>3. To enable students to use EDS to determine chemical composition</li><li>4. To provide experience in using EBSD in the SEM</li><li>5. To provide hands-on experience with TEM</li><li>6. To allow students to obtain, record, and index diffraction patterns from a variety of materials</li><li>7. To allow students to obtain bright field and dark field images</li></ol> |
| <i>Topics covered:</i>                                     | Materials characterization using scanning electron microscopy and transmission electron microscopy.   |
| <i>Expected learning outcomes:</i>                         | <ol style="list-style-type: none"><li>1. To be able to operate a SEM in SEI mode and obtain images of fracture surfaces</li><li>2. To use these images to identify fracture mechanisms</li><li>3. To be able to use EDS for chemical identification and to use this information to identify the materials used in semiconductor device fabrication</li><li>4. To be able to obtain, record, and correctly index electron diffraction patterns</li><li>5. To be able to obtain a range of images and correctly interpret them</li></ol>  |
| <i>Class schedule:</i>                                     | None  |
| <i>Laboratory schedule:</i>                                | One 3-hour laboratory session per week, for one semester.   |
| <i>Contribution to meeting the professional component:</i> | Engineering Topics  |

*Relationship of course to student outcomes:*

3 strongly supported; 2 supported; 1 minimally supported

Student Outcomes Pre-Fall 2018  
(ABET EC2000)

Student Outcomes Fall 2018 forward  
(ABET EC2019)

| <b>a</b> | <b>b</b> | <b>c</b> | <b>d</b> | <b>e</b> | <b>f</b> | <b>g</b> | <b>h</b> | <b>i</b> | <b>j</b> | <b>k</b> | <b>l</b> | <b>m</b> | <b>n</b> | <b>o</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> | <b>6</b> | <b>7</b> | <b>8</b> | <b>9</b> | <b>10</b> | <b>11</b> |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|
| 2        | 2        |          |          |          |          |          |          |          |          | 2        |          |          |          |          | 2        |          | 3        |          | 3        | 2        | 2        | 2        | 2        | 2         | 3         |

*Prepared by:* Andrea Butcherite and Dr. David Field    *Date:* May 30, 2018