1. **Course number and name:** 316-2 - Microstructural Dynamics

2. **Credits:** 1  
   **Contact hours:** 3 hrs./week

3. **Instructor:** Derk Joester

4. **Text and other supplemental materials:**  
Online text available at msecore.northwestern.edu

5a. **Catalog Description:**  

5b. **Prerequisites**  
MSE 315 or equivalent and MatSci 316-1

5c. **Course type (required, elective, or selected elective):** required

6a. **Course outcomes:**  
A student completing this course will be able to:  
1) Predict nucleation rates from thermodynamic data  
2) Describe where precipitates are likely to form in a multicomponent material  
3) Design processing histories to obtain a desired microstructure  
4) Correctly use and interpret TTT diagrams

6b. **Supported Program Outcomes** (B=beginner, I=intermediate, A=Advanced):  

<table>
<thead>
<tr>
<th>Target Level</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>I</td>
<td>A</td>
<td>-</td>
<td>B</td>
<td>I</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>I</td>
</tr>
</tbody>
</table>

7. **List of topics to be covered**  
1. Homogeneous and heterogeneous nucleation in pure materials  
2. Heat flow and interface stability  
3. Nucleation in binary systems  
4. Nucleation in solids - strain energy effects  
5. Precipitate growth  
6. TTT diagrams, aging  
7. Coarsening  
8. Spinodal decomposition