Please consider the following changes to MATS 582 Rate Processes in Materials:

The most recent course description in the curriculum proposal system, from October 25, 2017 when the ME 582 cross listing was dropped, is below and is followed by the proposed changes and their justifications:

**Course Information**
Designator/Course #: MATS 582  
CIP Code: 401001  
Title: RATE PROCESSES IN MATERIALS  
Original Course: MATS 582 RATE PROCESSES IN MATERIALS  
College/Department or College/School: College of Engineering / School of Mechanical, Industrial, and Manufacturing Engineering  
Credits: 0 or 4  
Max Credits to Graduation: 4  
Grading Mode: A-F (includes I, W, R, S/U)  
Courses Taught Schedule: Every Term  
Schedule Types: Lecture; Laboratory; Final Exam  
Campus Location: Corvallis Campus  
Programs Requiring this Course: None  
Description: Diffusion in solids, including vacancy and interstitial and short-circuit diffusion. Phase transformations including classic nucleation and growth theory. Applications to materials development. Laboratory will emphasize microstructural evaluation and quantitative metallography. Lec/lab.

**Course Relationships**

<table>
<thead>
<tr>
<th>Designator</th>
<th>Title</th>
<th>Minimum Grade/Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATS 581</td>
<td>THERMODYNAMICS OF SOLIDS</td>
<td>C</td>
</tr>
<tr>
<td>ME 581</td>
<td>THERMODYNAMICS OF SOLIDS</td>
<td>C</td>
</tr>
</tbody>
</table>

**Enforced Prerequisites**

**Corequisites**

None

**Equivalent Courses**

ME 582 RATE PROCESSES IN MATERIALS

**Slash Courses**

None

**Crosslisted Courses**

None

**Proposed changes**

It is proposed to make substantive changes to the Course Information, including:

- changing the Course Types from “lecture; laboratory” to “lecture” only
- updating the course description to read: “Diffusion in solids, including vacancy and interstitial and short-circuit diffusion. Phase transformations including classic nucleation
and growth theory. Applications to materials development. Lecture only” to reflect the elimination of the laboratory.

- changing Credits from a 0 to 4 variable credit to 3 lecture credits and changing the hours scheduled for the course to three per week to reflect this change.

**Justification**

In the past, this course has been taught with two hours of lecture plus a metallography laboratory. The topics that are covered in the lectures (diffusion, phase transformations, nucleation, and growth) are relevant to all materials systems (metals, ceramics, polymers, semiconductors) and practically all material science and engineering applications. As such, these topics are relevant to the education and the research of a broad cross section of the graduate materials science students. For adequate coverage of the theory, more than two hours of lectures per week should be devoted to these topics. In contrast, the metallography laboratory, while valuable, is narrowly focused in its scope.

It would be impractical to improve this the course by adding both additional lecture and laboratory time to adequately cover the theory and create a matching laboratory curriculum. Changing MATS 582 to a three credit lecture-only course would give adequate time for thorough coverage of the theory and would improve it as a core course for the Materials Science graduate curriculum. It is suggested that the metallography laboratory topics could be taught as a separate, more focused, course or could be incorporated into another materials science laboratory course.

**Additional changes – updates to course description**

In addition to the substantive changes described above, it is proposed to update the Courses Taught Description description to reflect the reality that this course is only taught once per year.

It may also be noted that although the Course Information states that a minimum grade of a C in MATS 581 is an enforced prerequisite, in recent years this prerequisite has not been enforced during registration and students that have not passed or taken MATS 581 have been able to register for the course. No update to the Course Information is proposed, it is however requested that this prerequisite be enforced.

With regard to scheduling: this course should not conflict with MATS 509, MATS 555, MATS 570, MATS 571, MATS 578, MATS 581, MATS 584, MATS 587, MATS 588, and MATS 671.

A syllabus with detailed list of topics for the proposed 3 credit lecture-only course is below.
### MATS 582  Rate Processes in Materials  (4 lecture credits)

<table>
<thead>
<tr>
<th>Description</th>
<th>This course covers diffusion in solids, including vacancy, interstitial, and short-circuit diffusion paths. Phase transformations including classic nucleation and growth theory.</th>
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<tbody>
<tr>
<td>Prerequisites</td>
<td>MATS 581 with a C or better</td>
</tr>
</tbody>
</table>
| Course Objectives    | By the completion of this course, students are expected to:  
1. Describe the principles of diffusion in crystalline solids as they apply to metal, metal oxide, and organic systems  
2. Explain the principles of nucleation theory and growth kinetics to solid-state phenomena.                                                                                                      |
| Instructor           | Melissa K. Santala                                                                                                                                                                               |
| Course Content       | Force-flux couples  
Diffusion:  
  - Fick’s 1st and 2nd Laws  
  - Solutions to Fick’s 2nd Law  
  - Diffusion paths including interstitial, substitutional, & high-diffusivity paths  
  - Diffusion measurements  
Kirkendall Effect  
Classical nucleation theory  
  - Barriers to nucleation  
  - Nucleation rates  
Phase transformations  
  - Solidification  
  - Precipitation (diffusional transformation)  
  - Diffusionless transformations  
Interface migration  
Grain growth and coarsening |
| Textbooks            | Required texts:  
Both texts are available online through the Valley library. |
| Evaluation           | Course grades will be derived from performance on exams and homework assignments. Credit will be assigned as follows:  
Homework: 30%, Mid-term: 30%, Final: 40% |
<p>| Regarding Student with Disabilities | Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at <a href="http://ds.oregonstate.edu">http://ds.oregonstate.edu</a>. DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations. |</p>
<table>
<thead>
<tr>
<th>Brief Basic Needs Syllabus Statement</th>
<th>Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to contact the Human Services Resource Center (HSRC) for support (<a href="mailto:hsrc@oregonstate.edu">hsrc@oregonstate.edu</a>, 541-737-3747). The HSRC has a food pantry, a textbook lending program and other resources to help. Furthermore, please notify the professor if you are comfortable in doing so. This will enable them to provide any resources that they may possess.</th>
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<tbody>
<tr>
<td>Student Conduct</td>
<td>Academic dishonesty (including – but not limited to - plagiarism, fabrication of data, cheating on exams, or assisting cheating) will not be tolerated and will be handled according to Oregon State University policies: <a href="http://studentlife.oregonstate.edu/studentconduct/offenses-0">http://studentlife.oregonstate.edu/studentconduct/offenses-0</a></td>
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</tbody>
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