

**Viterbi School of  
Engineering  
Mork Family  
Department of  
Chemical  
Engineering and  
Materials Science**

**MASC 504 Diffusion and Phase Equilibria**  
Spring 2015—MW—2:00-3:15 pm  
Location: OHE 100B

**Instructor: Edward Goo**  
**Office: VHE 602**  
**Office Hours: W 12:30-1:30 pm always by appointment**  
**Contact Info: [ekgoo@usc.edu](mailto:ekgoo@usc.edu) 213 740-4426 e-mail is preferred**  
**Teaching Assistant: TBD**

**Topics Covered**

- 1) Phase Equilibria**
  - a) One-component System**
  - b) Binary System**
  - c) Ternary System**
  - d) Experimental Methods for Determining Phase Diagrams**
- 2) Diffusion**
  - a) Atomic Theory**
  - b) Fick's 1<sup>st</sup> Law**
  - c) Fick's 2<sup>nd</sup> Law**
  - d) Solutions to the Diffusion Equation**
  - e) Correlation Effects**
  - f) Moving Boundary Value Problem**
  - g) Diffusion in Concentrated Alloys – Darken's Analysis**
  - h) Phenomenological Equations**
  - i) Diffusion in Multiphase Systems**
  - j) Diffusion in Ionic Solids**
  - k) High Diffusivity Paths**
  - l) Thermal Diffusion**
- 3) Defects and Phase Transformation**
  - a) Nucleation and Growth**
  - b) Spinodal Decomposition**
  - c) Diffusionless Transformation**
  - d) Surfaces**
  - e) Grain Boundaries**

## **Texts Used**

**Diffusion in Solids – P. Shewmon**

**Phase Transformation in Metals and Alloys – D.A. Porter, K.E. Easterling and M. Sherif**

**These texts are optional and not required**

## **Exams**

**1<sup>st</sup> midterm February 11, 2015 Wednesday in class**

**2<sup>nd</sup> midterm March 25, 2015 Wednesday in class**

**Final May 11, 2015 Monday 2:00-4:00 pm**

## **Blackboard**

**Since this class is taught on DEN there will be two Blackboard websites for this class and it is important that you log on to the correct website depending on what information you are looking for.**

**The main Blackboard website which is the website where all USC classes reside is located at <https://blackboard.usc.edu> and the username and password is the same as your USC e-mail account. All course information(syllabus, problem sets, exams, grades) will be posted on this website.**

**The second Blackboard website exists because this is a DEN course and this website which also uses the same Blackboard software exists to post the video of the lectures and the pdf files of the SmartBoard notes. To access this Blackboard website go to <https://www.uscden.net/webapps/login/>. You have to create an account with a username and password.**

## **Problem Sets**

**There will be six problem sets. They will be posted on Blackboard on Monday and due in class one week later. The schedule for the problem sets are:**

**Problem Set #1 posted January 26**

**Problem Set #2 posted February 2**

**Problem Set #3 posted February 23**

**Problem Set #4 posted March 2**

**Problem Set #5 posted April 6**

**Problem Set #6 posted April 13**

## Grading

**Problem Sets 20%**

**Midterm I 25%**

**Midterm II 25%**

**Final 30%**

## Statement on Academic Conduct and Support Systems

### Academic Conduct

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Section 11, *Behavior Violating University Standards* <https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/>. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct/>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* <http://equity.usc.edu/> or to the *Department of Public Safety* <http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us>. This is important for the safety whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. *The Center for Women and Men* <http://www.usc.edu/student-affairs/cwm/> provides 24/7 confidential support, and the sexual assault resource center webpage [sarc@usc.edu](mailto:sarc@usc.edu) describes reporting options and other resources.

### Support Systems

A number of USC’s schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. *The Office of Disability Services and Programs* [http://sait.usc.edu/academicsupport/centerprograms/dsp/home\\_index.html](http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html) provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* <http://emergency.usc.edu/> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.