

Syllabus  
METE 327  
Physical Metallurgy  
Fall, 2008  
Three credits  
Prerequisites: MATE 202  
Instructor: Loren Jacobson, Adjunct Prof.  
Office: 343 Workman Center  
Phone: 505-670-5728 (cell)  
E-Mail: [jacobsonla@att.net](mailto:jacobsonla@att.net)

Course Designation: This course is required for undergraduate students majoring in Metallurgical Engineering.

Course Description: Mechanisms of deformation and fracture in metals. Binary phase diagrams. Phase transformations, age hardening, heat treatment of steels, TTT diagrams, CT diagrams, martensitic transformation, shape-memory effects. Common ferrous and non-ferrous alloys.

Readings, Materials, and Resources: Text for this course will be "Physical Metallurgy Principles" Third Edition, by Robert E. Reed-Hill and Reza Abbaschian. Other readings from published literature may be assigned.

Course Content: See listing below.

Course Goals: The purpose of this course will be to give students a detailed set of principles that are necessary for understanding physical metallurgy.

Attendance: Students are expected to attend all class periods, as class participation is an important part of one's course grade. Acceptable reasons for missing class will include illness, personal and family emergencies.

Grading: Grades will be based on the following factors:

|                     |     |
|---------------------|-----|
| Class participation | 30% |
| Homework            | 20% |
| Quizzes             | 20% |
| Final Exam          | 30% |

This distribution of percentages may be modified later, if circumstances warrant, and with full disclosure to students.

The standard for letter grades will be as follows:

A - 90% or above  
B - 89% to 80%  
C - 79% to 70%  
D - 69% to 60%  
F - 59% or below.

Assessment: Interviews with students will constitute the class assessment.

Pace of the Class: The pace of this class will be such as to cover most of the material considered to be essential for a good understanding of physical metallurgy, its application and its history of development

Getting Help: Students are strongly encouraged to work together. I will be available for help during specified office hours, after class meetings, and at other times by appointment. I strongly encourage informal drop-in visits to my office, and contact by e-mail.

Detailed calendar and reading and homework assignments will be found in separate documents available on the web site for the course. The URL for this web site is:

[http://infohost.nmt.edu/~ljacobso/mete327\\_08.html/](http://infohost.nmt.edu/~ljacobso/mete327_08.html/)

Course Content, METE 327, Physical Metallurgy Fall Semester, 2008

1. Crystal Structure, Diffraction, Binding Energy

sub topics: Stereographic Projection, Crystal Symmetry, Reciprocal Lattice

2. Dislocations

History, geometrical arguments for, types of dislocations, how they move in crystals

3. Grain Boundaries, Vacancies and Annealing

4. Solid Solutions, Phases and Phase Diagrams

Thermodynamics, Solution theory, Phase Rule, Types of Binary Diagrams, Ternary Diagrams

5. Diffusion

6. Solidification, nucleation and growth

7. Precipitation Strengthening

Aluminum Alloys

8. Displacive Transformations

Martensite, twinning

9. The Iron-Carbon system

Steel

10. Other Alloy Systems

Titanium alloys, Nickel-base Superalloys, Ordered Alloys

11. Other possible topics:

Fracture mechanics, thermally activated deformation