"Advanced Physical Metallurgy"

- Non-equilibrium Solidification -

Fall 2019_445.655A

Professor Eun Soo Park

Syllabus

Location: **33-327**
Meeting time: **Tuesday & Thursday 09:30-10:45**
Class web page: http://eng.snu.ac.kr/lecture/index.php

Teaching staff

Instructor: **Eun Soo Park**
Office: **33-313**
Telephone: **02-880-7221**
Email: espark@snu.ac.kr
Office hours: **by appointment**

***Text*:** S.R. ELLIOTT, **"Physics of Amorphous Materials"**
Longman Scientific & Technical (1990)

***References*:** 1) F.E. Luborsky **"Amorphous Metallic Alloys"**
Butterworths & Co. (Publishers) Ltd. (1983)

2) P. Duwez et al. "**Metallic Glasses**",
American Society for Metals, Metals Park, Ohio (1976)

3) C. Suryanarayana, A. Inoue, "**Bulk Metallic Glasses**",
CRC Press, Taylor & Francis Group (2011)

Additional reading materials will be provided.

***Course Description*:**

This course will cover the rapidly evolving field of amorphous materials, with a particular emphasis on the connection among thermodynamic, kinetic, and structural aspects of amorphous materials. This course intends to illustrate the major materials issues for amorphous metals, from processing to properties and from the fundamental science of glasses to viable industrial applications. I hope that this course shows why amorphous materials are attracting such an intensive interest and serve to highlight some challenging issues awaiting resolution. After completing this course, students performing experimental research using amorphous materials should be reasonably informed about materials preparation, processing, and stability. Students performing research outside this field should be able to consider amorphous materials as a new form of material suitable for selection in their innovations.

Schedule

week 1 *Introduction to Amorphous materials*
week 2 *Classification of Solids*
week 3 *Definition of Amorphous Materials*
week 4 *Preparation of Amorphous Materials : Non-equilibrium Solidification*
week 5 *Phase Transition: glass transition*
week 6 *Measurement of Glass Transition Temperature*
week 7 *Theories for the Glass Transition I: thermodynamic / entropy*
week 8 *Theories for the Glass Transition II: relaxation behavior / viscosity*
week 9 *Structural Approach to Glass Formation*
week 10 *Kinetic Approach to Glass Formation*
week 11 *Ease of Glass Transition: glass-forming ability*
week 12 *Glass Forming Ability Parameters*
week 13 *Formation of Bulk Metallic Glasses*
week 14 *Mechanical Properties of Bulk Metallic Glasses and Their Composites*
week 15 *Unique Properties of Bulk Metallic Glasses*
week 16 *Potential Applications of Bulk Metallic Glasses*

***Components of Your Grade*:**

1) **Exams (midterm: 35% + final: 40%)**
There will be two exams, each of which takes place in class for 3 hours. The exams will be conceptual and simple.

2) **Reports and Presentation (15%) (+Incentive Homework 5%)**
There will be one presentation on the topics of amorphous materials in the last part of course, which takes place in class for half an hour. The presentation will include mainly topics of amorphous materials from the fundamental science to viable industrial applications.

3) **Attendance (10%)**
Please don't be late to class.

Remarks: The grade components might change up to 5% depending on the student's achievement.

Course Policies, Questions and Answers

Q: Is it possible to adjust class time?

A: None is planned, but if you really want one, speak up. We can negotiate.

Q: What is the course style?

A: Although most classes will be lecture-based, I am hoping that the weekly class meetings will proceed in a discussion format, so please do ask questions.

Q: What is the policy for attendance?

A: Please be on time. Being late disrupts the instructor and other students. If you cannot attend a class, please let me know in advance by email.

Prof. Eun Soo Park
Department of Materials Science and Engineering/Seoul National University