446.631A

소성재료역학
(Metal Plasticity)

Syllabus

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Course description

The objective of this course is

- to introduce students to the concept of mechanics of materials, in particular focusing on plasticity theory.
- The introductory part of the course includes the review of macro- and micro- aspects of plasticity theory
- In the beginning of the course, the plasticity theory will be illustrated in terms of 1D tension, bending, and torsion problems,
- while, these will be extended to 3D theory such as general yield function and hardening laws
- In addition, advanced topics on modern plasticity constitutive theory for the applications to formability and springback will be discussed

Text and references

Main textbook

- Chung and Lee, Basics of Continuum Plasticity, Springer, 2018

References

- Introduction to the mechanics of a continuous medium by Malvern, Prentice-Hall (1969)
- Continuum theory of plasticity by Khan and Huang (1995)
- Computational inelasticity by Simo and Hughes, Springer (1997)

Evaluation

- Evaluation
  - Midterm exam 40%
  - Final term exam 40%
  - Participation 20%

  - Students who are absent for over 1/3 of the class will receive a grade of 'F' or 'U' for the course. (Exceptions can be made when the cause of absence is deemed unavoidable by the course instructor.)
- Instructor
  - Prof. Myoung-Gyu Lee
  - Eng. Building 33-309
  - Tel: 02-880-1711
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  - Office hour: Tuesday, Thursday (Contact is required in advance)

Content of courses

- Plasticity characteristics – simple tension/compression
- Instability in simple tension
- Physical plasticity
- Deformation of heterogeneous structures
- Plasticity in pure bending, beam theory, and torsion
- 3D plasticity: yield function
- Flow rule
- Plane stress state for sheets
- Hardening laws
- Stress update formulations
- Formability and springback

Content of courses – detailed schedule

1. 1D plasticity
- (Week 1)Plasticity characteristics
- (Week2) Simple tension/compression
- (Week 3-4) Instability in simple tension test
- (Week 5) Pysical plasticity
- (Week 6) Deformation of heterogeneous structures
- (Week 7-8) Pure bending and beam theroy based on elastic-plasticity
  (Mid-term. exam)

2. (Week 9) Overview of basics of continuum mechanics

3. 3D plasticity
- (Week 10) Yield functions
- (Week 11) Normality rule for plastic deformation
- (Week 12) Plane stress state
- (Week 13-14) Evolution of yield surfaces: hardening law
- (Optional) Stress update formulations
- (Week 15) Formability and springback
- (optional) Basics of crystal plasticity
  (Final term. exam)