



# Satuan Acara Pengajaran

MMS8110802 - Kinetik & Transformasi Fasa

Pengajar

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## Tujuan Perkuliahan

Mata kuliah ini ditujukan agar mahasiswa mampu memahami mekanisme terjadinya proses transformasi fasa baik melalui proses difusi atau melalui proses non-difusi dan penerapannya dalam proses pemilihan dan desain bahan sesuai dengan sifat yang diinginkan.

## Minggu 1

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<b>Materi</b>	Introduction (Rules, Grading, Marking) 1. Review on Thermodynamics and Phase Equilibrium: a. Single Component System b. Binary Component System c. The Phase Rule d. Binary Phase Diagrams: - Two phase equilibrium - Three phase equilibrium - Exercise on two phase and three phase equilibrium - Reactions in the solid state
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<b>Media</b>	LCD Projector
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- Referensi**
1. Porter, D. A and Easterling, K.E, Phase Transformation in Metals and Alloys, 2nd. ed., CRC Press, 2003.
  2. Prince, A, Multicomponent Alloy Constitutional Bibliography, The Metals Society, London, 1978
  3. West, DRF, Ternary Equilibrium Diagrams, Chapman and Hall, 1982

Support materials:

1. Chapter 5, 9 and 10 of: Callister, W.D, Materials Science and Engineering: An Introduction, 6th ed., Wiley., 2004
2. Lennart Backerud, Guocai Chai, and Jarmo Tamminen, Solidification Characteristics of Aluminum Alloys-Volume 2: Foundry Alloy
3. Lars Arnberg, Lennart Backerud, and Guocai Cahi, Solidification Characteristics of Aluminum Alloys-Volume 3: Dendrite Coherency

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## Aktivitas

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## Minggu 2

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- Materi**
- e. Fe-Fe<sub>3</sub>C Phase Diagram
  - f. Ternary System Representation
  - g. Ternary System containing 2 phase
  - h. Exercise

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## Referensi

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## Aktivitas

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## Minggu 3

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- Materi**
- Diffusion in Materials:
- a. Atomic mechanism of diffusion
  - b. Fick's first law for steady state diffusion
  - c. Interstitial diffusion
  - d. Substitutional diffusion

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## Referensi

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## Minggu 4

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**Materi** Diffusion in Materials (cont.):  
d. Tracer diffusion in binary alloys  
e. Diffusion in multiphase binary system  
f. Journal review

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## Minggu 5

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**Materi** Solution for Fick's 2nd law:  
- Homogenization  
- Thin film solution  
- Carburization and decarburization  
- Diffusion from a Finite Source into Semi Infinite Media  
- Case studies

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## Minggu 6

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**Materi** Crystal Interface and Microstructure (2)  
a. Interfacial free energy  
b. Grain boundary  
c. Case study in Crystal Interface

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## Minggu 7

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**Materi** Crystal Interface and Microstructure (2)  
d. Interphase interfaces in solids  
e. Interface migration

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## Minggu 8

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**Materi** Midterm

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## Minggu 9

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**Materi** Solidification (1)  
a. Nucleation in pure metals  
b. Growth of pure solid  
c. Solidification of alloy

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## Minggu 10

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**Materi** Solidification (2)  
d. Application of solidification theory in casting and welding  
e. Solidification during quenching from the melts  
f. Case study

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## Aktivitas

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### Minggu 11

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**Materi** Diffusional Transformation in Solids (1)  
a. Homogeneous and heterogeneous nucleation in solids  
b. Precipitate growth  
c. Transformation kinetics

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### Minggu 12

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**Materi** Diffusional Transformation in Solids (2)  
d. Eutectoid transformation  
e. Ordering transformation  
f. Case study

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### Minggu 13

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**Materi** Diffusionless Transformation in Solids:  
a. Theories of martensite nucleation  
b. Martensite growth  
c. Tempering of ferrous martensite  
d. Martensite transformation in nonferrous metals

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### Minggu 14

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**Materi** Diffusionless Transformation in Solids (2)  
e. Exercise  
f. Case study in Diffusionless transformation

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## Minggu 15

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**Materi** - Class review  
- Question and answer session

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**Referensi**

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**Aktivitas**

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## Minggu 16

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**Materi** Final examination

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**Media**

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**Referensi**

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**Aktivitas**

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