



Satuan Acara Pengajaran

ENMT801016 - Rekayasa Permukaan Material Lanjut

Pengajar

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Tujuan Perkuliahan

1. Menjelaskan hal-hal yang berkaitan dengan perubahan sifat bahan akibat perlakuan rekayasa permukaan 2. Memilih dan mendesain berbagai perlakuan permukaan sesuai dengan bahan yang dipilih dan aplikasinya di dunia industri 3. Mendapatkan mikrosutruktur yang tepat sesuai dengan yang diinginkan sesuai dengan jenis perlakuan permukaan yang dipilih

Minggu 1

Materi	Class Introduction General Rules Grading Class Outline Teamwork Learning Simulation
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Media	LCD Projector
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Referensi	Karl-Erik Thelning, 'Steel and its heat treatment,' Butterworths, 1984. ASM Handbook Vol. 4; Heat Treating, ASM International, Ohio, USA, 1991. ASM Handbook Vol. 5; Surface Engineering, ASM International, Ohio, USA, 1994. Rointan F. Bunshah: Handbook of Hard Coatings, Deposition Technologies, Properties and Applications, Noyes Publications, Park Ridge, New Jersey, 2001. Hugh O. Pierson: Handbook of Chemical Vapor Deposition (CVD) Principles, Technology, and Applications, Noyes Publications, Park Ridge, New Jersey, 1999. Arthur A. Tracton: Coatings Technology Handbook, CRC Press Taylor & Francis Group, Boca Raton, 2006.
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Aktivitas Lecture
 Group discussion

Minggu 2

Materi Fundamental of Surface Engineering:
 - Part Surface Requirements
 - Selecting surface technologies
 - Processes for surface treatment
 - Classification of surface engineering

Quiz

Media LCD Projector

Referensi ASM Handbook Vol 4: Heat Treating, ASM International, Ohio, USA, 1991.
 ASM Handbook Vol 5: Surface Engineering, ASM International, Ohio, USA,
 1994.

Aktivitas Lecture
 Quiz

Minggu 3

Materi Surface Cleaning:
 - Factors in selection
 - Cleaning options: Mechanical, Chemical, Biological
 - Inhibitors

Media LCD Projector

Referensi Rointan F. Bunshah: Handbook of Hard Coatings, Deposition Technologies,
 Properties and Applications, Noyes Publications, Park Ridge, New Jersey, 2001.
 Hugh O. Pierson: Handbook of Chemical Vapor Deposition (CVD) Principles,
 Technology, and Applications, Noyes Publications, Park Ridge, New Jersey,
 1999.
 Arthur A. Tracton: Coatings Technology Handbook, CRC Press Taylor &
 Francis Group, Boca Raton, 2006.

Aktivitas Lecture
 Problem-based learning

Minggu 4

Materi Team Work Problem-Based Learning
- Material Failure
- Failure Analysis
- Self assessment
- Group Assessment

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Referensi Rointan F. Bunshah: Handbook of Hard Coatings, Deposition Technologies, Properties and Applications, Noyes Publications, Park Ridge, New Jersey, 2001.
Hugh O. Pierson: Handbook of Chemical Vapor Deposition (CVD) Principles, Technology, and Applications, Noyes Publications, Park Ridge, New Jersey, 1999.
Arthur A. Tracton: Coatings Technology Handbook, CRC Press Taylor & Francis Group, Boca Raton, 2006.

Aktivitas Group Discussion
Class Discussion

Minggu 5

Materi Surface Finishing:
- Tolerance, consistency
- Surface quality
- Surface texture
- Surface integrity
- Surface alterations
- Cutting edges finishing
- Non-abrasive finishing

Media LCD Projector

Referensi ASM Handbook Vol 5: Surface Engineering, ASM International, Ohio, USA, 1994.
Helmi A. Youssef and Hassan El-Hofy: Machining technology: machine tools and operations, CRC Press Taylor & Francis Group, Boca Raton 2008
J.T. Black and Ronald A. Kohser: DeGarmo's Materials and Process in Manufacturing, 10th Ed., John Wiley & Sons, Inc., Hoboken NJ, 2008

Aktivitas Lecture

Minggu 6

Materi Selected Traditional Surface Engineering:
- Painting
- Electroplating
- Anodizing
- Thermal and plasma spraying
- Diffusion: Nitriding, carburizing, boriding
- Selective: Flame and induction

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Referensi ASM Handbook Vol 4: Heat Treating, ASM International, Ohio, USA, 1991.
ASM Handbook Vol 5: Surface Engineering, ASM International, Ohio, USA, 1994.

Aktivitas Lecture

Minggu 7

Materi Midterm

Media

Referensi

Aktivitas

Minggu 8

Materi Enhanced Surface Engineering:
- Laser treatment
- Physical vapor deposition
- Chemical vapor deposition

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Referensi ASM Handbook Vol 4: Heat Treating, ASM International, Ohio, USA, 1991.
ASM Handbook Vol 5: Surface Engineering, ASM International, Ohio, USA, 1994.

Aktivitas Lecture

Minggu 9

Materi Case Study:
Surface Engineering and Their Characterization

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Journal

Referensi Hitoshi Habuka and Masaki Tsuji: Surface & Coatings Technology 217
(2013) 88-93

Aktivitas Independent Learning and Problem Solving

Minggu 10

Materi Physical vapor deposition
- Principle of PVD
- Two classes of PVD: Evaporation and Sputtering
- Processes in PVD

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Referensi 1. ASM Handbook Vol 5: Surface Engineering, ASM International, Ohio, USA, 1994.
2. A.A. Tracton: Coatings Technology Handbook, Taylor & Francis Group, Boca Raton, 2006
3. R. F. Bunshah: Handbook of Deposition Technologies for Films and Coatings Science, Technology and Applications, Noyes Publications, Park Ridge, NJ 1994
4. D. M. Mattox: Handbook of Physical Vapor Deposition (PVD) Processing Film Formation, Adhesion, Surface Preparation and Contamination Control, Noyes Publications, Westwood, NJ 1998

Aktivitas Lecture

Minggu 11

Materi PVD (Continued)
- Evaporation PVD:
- Thermal
- Electron beam
- Sputtering:
- Reactive sputter
- Cathodic arc
Material treatment for PVD

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- Referensi**
1. ASM Handbook Vol 5: Surface Engineering, ASM International, Ohio, USA, 1994.
 2. A.A. Tracton: Coatings Technology Handbook, Taylor & Francis Group, Boca Raton, 2006
 3. R. F. Bunshah: Handbook of Deposition Technologies for Films and Coatings Science, Technology and Applications, Noyes Publications, Park Ridge, NJ 1994
 4. D. M. Mattox: Handbook of Physical Vapor Deposition (PVD) Processing Film Formation, Adhesion, Surface Preparation and Contamination Control, Noyes Publications, Westwood, NJ 1998
-

Aktivitas Lecture

Minggu 12

Materi Fundamental of Chemical Vapor Deposition

- Theoretical analysis
- Rate limiting
- Microstructure
- Equipment
- Reactions

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- Referensi**
1. A.A. Tracton: Coatings Technology Handbook, Taylor & Francis Group, Boca Raton, 2006
 2. R. F. Bunshah: Handbook of Deposition Technologies for Films and Coatings Science, Technology and Applications, Noyes Publications, Park Ridge, NJ 1994
 3. H. O. Pierson: Handbook of Chemical Vapor Deposition (CVD) Principles, Technology, and Applications, 2nd Ed., Noyes Publications, Park Ridge, NJ 1999
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Aktivitas Lecture

Minggu 13

Materi Journal Reading:
Chemical reaction engineering in the design of CVD reactors

Media Internet
Computer

Referensi H. Komiyama!, Y. Shimogaki, Y. Egashira: Chem. Eng. Sci. 54 (1999) 1941-1957

Aktivitas Reading the Prescribed Journal
Quiz

Minggu 14

Materi Journal reading:
Understanding the chemical vapor deposition of diamond: recent progress

Media Internet
Computer

Referensi J. E. Butler, Y. A. Mankelevich, A. Cheesman, JieMa, and M.N. R. Ashfold: J.
Phys. Condens. Matter 21 (2009) 364201

Aktivitas Reading, self-learning
Case study

Minggu 15

Materi Final examination

Media

Referensi

Aktivitas
