Satuan Acara Pengajaran

MMM8120801 - Perlakuan Panas & Rekayasa Permukaan

Pengajar
Nofrijon Bin Imam Sofyan Ph.D

Tujuan Perkuliahan

Peserta ajar mampu menjelaskan fenomena perubahan sifat bahan logam dan mikrostrukturnya yang terkait dengan rangkaian proses perlakuan panas. Menguasai dan mampu memilih berbagai metoda perlakuan panas dan rekayasa permukaan beserta aplikasinya, menganalisis, serta melakukan pemecahan masalah atas penyimpangan dan kegagalan yang terjadi pada proses perlakuan panas dan rekayasa permukaan.

Minggu 1

Materi	- Class introduction and information - Course content - Grading - General introduction to Heat Treatment and Surface Engineering
Media	LCD Projector E-learning
Referensi	1. ASM Handbook Vol. 4: Heat Treating, ASM International, Ohio, USA, 1991. 2. ASM Handbook Vol. 5: Surface Engineering, ASM International, Ohio, USA, 1994. 3. Karl-Erik Thelning: "Steel and its heat treatment," Butterworths, 1984.
Aktivitas	

Minggu 2

Materi	Fundamental of heat treatment #1 Fe-Fe3C phase diagram Heating Cooling Formation of pealite Formation of bainite Formation of martensite TTT and CCT diagrams.
Media	LCD Projector E-learning
Referensi	1. ASM Handbook Vol 4: Heat Treating, ASM International, Ohio, USA, 1991. 2. ASM Handbook Vol 5: Surface Engineering, ASM International, Ohio, USA, 1994. 3. Karl-Erik Thelning: "Steel and its heat treatment," Butterworths, 1984.
Aktivitas	

Minggu 3

Materi	Fundamental of heat treatment # 2 - Decomposition of martensite - Retained austenite on tempering - The role of diffusion - The role of dislocation - Hardening mechanism in steel.
Media	LCD Projector E-learning
Referensi	1. ASM Handbook Vol 4: Heat Treating, ASM International, Ohio, USA, 1991. 2. ASM Handbook Vol 5: Surface Engineering, ASM International, Ohio, USA, 1994. 3. Karl-Erik Thelning: "Steel and its heat treatment," Butterworths, 1984.
Aktivitas	

Minggu 4

Materi	Fundamental of heat treatment #3 The role of grain - Grain boundary - Grain size - Grain growth
Media	LCD Projector E-learning
Referensi	1. ASM Handbook Vol 4: Heat Treating, ASM International, Ohio, USA, 1991. 2. ASM Handbook Vol 5: Surface Engineering, ASM International, Ohio, USA, 1994. 3. Karl-Erik Thelning" "Steel and its heat treatment," Butterworths, 1984.
Aktivitas	

Minggu 5

Materi	Effect of alloying elements in steel - Austenite-forming elements - Ferrite-forming elements - Carbide-forming elements - Nitride-forming elements - Multi-alloyed steels and carbide stabilizer - Effect of temperature on martensite formation - Effect on the formation of pearlite and bainite during isothermal transformation.
Media	LCD Projector E-learning
Referensi	1. ASM Handbook Vol 4: Heat Treating, ASM International, Ohio, USA, 1991. 2. ASM Handbook Vol 5: Surface Engineering, ASM International, Ohio, USA, 1994. 3. Karl-Erik Thelning: "Steel and its heat treatment," Butterworths, 1984.
Aktivitas	

Minggu 6

Materi	Hardenability (1) - Hardenability concept - The Grossmann hardenability test - Calculation of Di-values from the Grossmann curves - The Jominy end-quench hardenability test - Practical applications of Jominy curves.
Media	LCD Projectors E-learning
Referensi	1. Karl-Erik Thelning: Steel and its heat treatment, Butterworths, 1984. 2. ASM Handbook: Vol 4, Heat Treating, ASM International, Ohio, USA, 1991. 3. G.E. Totten: Steel Heat Treatment, Metallurgy and Technologies, Taylor & Francis, Boca Raton, 2006.
Aktivitas	

Minggu 7

Materi	Hardenability (2) - Practical application of the TTT and the CCT diagrams - Practical applications of hardenability - The influence of the depth of hardening on the stress pattern.
Media	LCD Projector E-learning
Referensi	1. Karl-Erik Thelning: Steel and its heat treatment, Butterworths, 1984. 2. ASM Handbook: Vol 4, Heat Treating, ASM International, Ohio, USA, 1991. 3. G.E. Totten: Steel Heat Treatment, Metallurgy and Technologies, Taylor & Francis, Boca Raton, 2006.
Aktivitas	

Minggu 8

Materi	Midterm
Media	
Referensi	
Aktivitas	

Minggu 9

Materi	General Heat Treatment (1) - Annealing: spheroidizing, recrystallization, stress-relief, isothermal, quench, and homogenizing annealing; normalizing; - Hardening: heating media, rate of heating, hardening temperature, holding time, methods of cooling and quenching media
Media	LCD Projector E-learning
Referensi	1. Karl-Erik Thelning: Steel and its heat treatment, Butterworths, 1984. 2. ASM Handbook: Vol 4, Heat Treating, ASM International, Ohio, USA, 1991. 3. G.E. Totten: Steel Heat Treatment, Metallurgy and Technologies, Taylor & Francis, Boca Raton, 2006.
Aktivitas	

Minggu 10

Materi	General Heat Treatment (2) Tempering: - Heating to temperature, - Rate of heating, - Holding time, - Double tempering, - Self-tempering, and - Temper brittleness
Media	LCD Projector E-learning
Referensi	1. Karl-Erik Thelning: Steel and its heat treatment, Butterworths, 1984. 2. ASM Handbook: Vol 4, Heat Treating, ASM International, Ohio, USA, 1991. 3. G.E. Totten: Steel Heat Treatment, Metallurgy and Technologies, Taylor & Francis, Boca Raton, 2006.
Aktivitas	

Minggu 11

Materi	Special Heat Treatment - Hardening and tempering of tools steels; - Heat treatment of HSLA steels; - Hardening and tempering of conventional constructional steels; - Hardening and tempering of boron-alloyed steels.
Media	LCD Projector E-learning
Referensi	1. Karl-Erik Thelning: Steel and its heat treatment, Butterworths, 1984. 2. ASM Handbook: Vol 4, Heat Treating, ASM International, Ohio, USA, 1991. 3. G.E. Totten: Steel Heat Treatment, Metallurgy and Technologies, Taylor & Francis, Boca Raton, 2006.
Aktivitas	

Minggu 12

Materi	Surface treatment: - Carbonitriding; - Nitriding; - Boriding; - Induction hardening; - Flame hardening; - Laser and electron beam surface hardening
Media	LCD Projector
Referensi	1. Karl-Erik Thelning: Steel and its heat treatment, Butterworths, 1984. 2. ASM Handbook: Vol 4, Heat Treating, ASM International, Ohio, USA, 1991. 3. ASM Handbook Vol 5: Surface Engineering, ASM International, Ohio, USA, 1994. 4. G.E. Totten: Steel Heat Treatment, Metallurgy and Technologies, Taylor & Francis, Boca Raton, 2006.
Aktivitas	

Minggu 13

Materi	Principles of heat treating of nonferrous alloys: - Heat treatment for aluminum, - Heat treatment for copper, - Heat treatment for nickel base alloys, - Precipitation hardening, - Solution treatment, quenching, aging, overaging.

Media	LCD Projector E-learning
Referensi	1. Karl-Erik Thelning: Steel and its heat treatment, Butterworths, 1984. 2. ASM Handbook: Vol 4, Heat Treating, ASM International, Ohio, USA, 1991. 3. ASM Handbook Vol 5: Surface Engineering, ASM International, Ohio, USA, 1994. 4. G.E. Totten: Steel Heat Treatment, Metallurgy and Technologies, Taylor & Francis, Boca Raton, 2006.
Aktivitas	

Minggu 14

Materi	Heat Treatment Equipment: - Heat-treating furnaces; - Salt bath heat-treating equipment; - Fluidized-bed heat-treating equipment; - Heat treating in vacuum furnaces and auxiliary equipment.
Media	LCD Projector E-learning
Referensi	1. Karl-Erik Thelning: Steel and its heat treatment, Butterworths, 1984. 2. ASM Handbook: Vol 4, Heat Treating, ASM International, Ohio, USA, 1991. 3. ASM Handbook Vol 5: Surface Engineering, ASM International, Ohio, USA, 1994. 4. G.E. Totten: Steel Heat Treatment, Metallurgy and Technologies, Taylor & Francis, Boca Raton, 2006.
Aktivitas	

Minggu 15

Materi	Defects and Distortion during Heat-Treatment: - Overheating and Burning of Low-Alloy Steels - Residual Stresses - Quench Cracking - Distortion in Heat Treatment/dimensional change during heat treatment
Media	LCD Projector E-learning

Referensi	1. Karl-Erik Thelning: Steel and its heat treatment, Butterworths, 1984. 2. ASM Handbook: Vol 4, Heat Treating, ASM International, Ohio, USA, 1991. 3. ASM Handbook Vol 5: Surface Engineering, ASM International, Ohio, USA, 1994. 4. G.E. Totten: Steel Heat Treatment, Metallurgy and Technologies, Taylor & Francis, Boca Raton, 2006.
Aktivitas	

Minggu 16

Materi	Final examination
Media	
Referensi	
Aktivitas	