



Satuan Acara Pengajaran

ENMT800104 - Metalurgi Las

Pengajar

Prof. Dr. Ir. Winarto M.Sc

Prof. Dr. Ir. Muhammad Anis M.Met.

Tujuan Perkuliahan

Mahasiswa mampu menjelaskan kemampu-lasan (weldability) pada beberapa jenis material (ferrous dan non ferrous) untuk aplikasi rekayasa serta mampu menjelaskan dan menganalisis pengaruh unsur paduan, pengaruh siklus termal dan kecepatan pendinginan serta beberapa parameter lasan terhadap karakteristik hasil lasan untuk mengontrol kualitas hasil lasan dalam konstruksi rekayasa.

Minggu 1

Materi INTRODUKSI:
- Penjelasan SAP & Tujuan MK
- Definisi Pengelasan
- Klasifikasi Penyambungan Material
- Aplikasi Pengelasan di Bidang Teknik

Media LCD

Referensi 1. M. Anis & Winarto, Pengelasan, Diktat Kuliah (Lecture Notes)
2. Kou, S., Welding Metallurgy, Wiley & Sons, ISBN 0-471-43491-4
3. Granjon, H., Fundamentals of Welding Metallurgy, Abington Publishing, ISBN 1-85573-019-7
4. Easterling, K., Introduction to the Physical Metallurgy of Welding, Butterworth-Heneimann Ltd. ISBN 0-7506-0394-1
5. AWS Welding Handbook, Metals and Their Weldability, AWS, ISBN 0-87171-218-0
6. Norrish, J., Advanced Welding Processes, IOP Publishing Ltd., ISBN 0-85274-326-2
7. AWS - Welding Jurnal - published by The American Welding Society (AWS)

Aktivitas

Minggu 2

Materi PENGELASAN BUSUR LISTRIK
- Uraian SMAW, FCAW, SAW, ESW
- Uraian GMAW (TIG & MIG)
- Uraian Plasma Arc Welding (PAW)
- Kawat Las : Coated & Wire electrodes

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Referensi 1. M. Anis & Winarto, Pengelasan, Diktat Kuliah (Lecture Notes)
2. Kou, S., Welding Metallurgy, Wiley & Sons, ISBN 0-471-43491-4
3. Granjon, H., Fundamentals of Welding Metallurgy, Abington Publishing, ISBN 1-85573-019-7
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Minggu 3

Materi PENGELASAN BUSUR LISTRIK
- Karakteristik Busur Listrik
- Peralatan / Mesin Las Busur Listrik
- Masukan Panas
- Parameter Las

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- Referensi**
1. M. Anis & Winarto, Pengelasan, Diktat Kuliah (Lecture Notes)
 2. Kou, S., Welding Metallurgy, Wiley & Sons, ISBN 0-471-43491-4
 3. Granjon, H., Fundamentals of Welding Metallurgy, Abington Publishing, ISBN 1-85573-019-7
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 6. Norrish, J., Advanced Welding Processes, IOP Publishing Ltd., ISBN 0-85274-326-2
 7. AWS - Welding Jurnal - published by The American Welding Society (AWS)
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Minggu 4

- Materi**
- The Principles of Welding Metallurgy
 - Physical Welding Metallurgy
 - Effect of Heating & Cooling Rate
 - Geometrical of Weldments
 - Factors Influencing of Weld Properties
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- Referensi**
1. M. Anis & Winarto, Pengelasan, Diktat Kuliah (Lecture Notes)
 2. Kou, S., Welding Metallurgy, Wiley & Sons, ISBN 0-471-43491-4
 3. Granjon, H., Fundamentals of Welding Metallurgy, Abington Publishing, ISBN 1-85573-019-7
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Aktivitas

Minggu 5

Materi	Weldability of Carbon Steel (Metalurgi Las Baja Karbon) <ul style="list-style-type: none"> - What is Weldability - Factors influencing Weldability - Carbon Steel Classification & Their Weldability - How to Measure the Weldability of CS - What kind of defects on Welding of CS - How to Weld CS
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Referensi	<ol style="list-style-type: none"> 1. M. Anis & Winarto, Pengelasan, Diktat Kuliah (Lecture Notes) 2. Kou, S., Welding Metallurgy, Wiley & Sons, ISBN 0-471-43491-4 3. Granjon, H., Fundamentals of Welding Metallurgy, Abington Publishing, ISBN 1-85573-019-7 4. Easterling, K., Introduction to the Physical Metallurgy of Welding, Butterworth-Heneimann Ltd. ISBN 0-7506-0394-1 5. AWS Welding Handbook, Metals and Their Weldability, AWS, ISBN 0-87171-218-0 6. Norrish, J., Advanced Welding Processes, IOP Publishing Ltd., ISBN 0-85274-326-2 7. AWS - Welding Jurnal - published by The American Welding Society (AWS)
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Minggu 6

Materi	Weldability of Low Alloy Steel (Metalurgi Las Baja Paduan rendah) <ul style="list-style-type: none"> - Low Alloy Steel Classification & Their Weldability - How to Measure the Weldability of Low Alloy Steel - What kind of defects occurring on Welding of Low Alloy Steels - How to Weld the Low Alloy Steel
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Referensi	<ol style="list-style-type: none"> 1. M. Anis & Winarto, Pengelasan, Diktat Kuliah (Lecture Notes) 2. Kou, S., Welding Metallurgy, Wiley & Sons, ISBN 0-471-43491-4 3. Granjon, H., Fundamentals of Welding Metallurgy, Abington Publishing, ISBN 1-85573-019-7 4. Easterling, K., Introduction to the Physical Metallurgy of Welding, Butterworth-Heneimann Ltd. ISBN 0-7506-0394-1 5. AWS Welding Handbook, Metals and Their Weldability, AWS, ISBN 0-87171-218-0 6. Norrish, J., Advanced Welding Processes, IOP Publishing Ltd., ISBN 0-85274-326-2 7. AWS - Welding Jurnal - published by The American Welding Society (AWS)
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Aktivitas

Minggu 7

Materi Weldability of High Alloy Steel (Metalurgi Las Baja Paduan Tinggi)
- High Alloy Steel Classification & Their Weldability
- How to Measure the Weldability of High Alloy Steel
- What kind of defects occurring on Welding of High Alloy Steels
- How to Weld the High Alloy Steel

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Referensi

1. M. Anis & Winarto, Pengelasan, Diktat Kuliah (Lecture Notes)
2. Kou, S., Welding Metallurgy, Wiley & Sons, ISBN 0-471-43491-4
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Minggu 8

Materi MID TEST

Media Paper

Referensi

1. M. Anis & Winarto, Pengelasan, Diktat Kuliah (Lecture Notes)
2. Kou, S., Welding Metallurgy, Wiley & Sons, ISBN 0-471-43491-4
3. Granjon, H., Fundamentals of Welding Metallurgy, Abington Publishing, ISBN 1-85573-019-7
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Aktivitas UTS

Minggu 9

- Materi** Weldability of Cast Irons (Metalurgi Las Besi Tuang)
- Cast iron Classification & Their Weldability
 - How to Measure the Weldability of Cast Irons
 - What kind of defects occurring on Welding of Cast Irons
 - How to Weld the Cast Irons & Their Alloys
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Media LCD

- Referensi**
1. M. Anis & Winarto, Pengelasan, Diktat Kuliah (Lecture Notes)
 2. Kou, S., Welding Metallurgy, Wiley & Sons, ISBN 0-471-43491-4
 3. Granjon, H., Fundamentals of Welding Metallurgy, Abington Publishing, ISBN 1-85573-019-7
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Aktivitas

Minggu 10

- Materi** Weldability of Aluminium Aloys (Metalurgi Las Aluminum & Paduannya)
- Aluminum Alloys Classification & Their Weldability
 - How to Measure the Weldability of Aluminum Alloys
 - What kind of defects occurring on Welding of Aluminum Alloys
 - How to Weld the Aluminum Alloys
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Media LCD

- Referensi**
1. M. Anis & Winarto, Pengelasan, Diktat Kuliah (Lecture Notes)
 2. Kou, S., Welding Metallurgy, Wiley & Sons, ISBN 0-471-43491-4
 3. Granjon, H., Fundamentals of Welding Metallurgy, Abington Publishing, ISBN 1-85573-019-7
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Minggu 11

Materi Weldability of Copper, Nickel & Magnesium (Metalurgi Las Cu, Ni, Mg)
- Cu, Ni, Mg Clasification & Their Weldability
- How to Measure the Weldability of Cu, Ni & Mg
- What kind of defects occuring on Welding of Cu, Ni & Mg
- How to Weld Cu, Ni & Mg

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Referensi

1. M. Anis & Winarto, Pengelasan, Diktat Kuliah (Lecture Notes)
2. Kou, S., Welding Metallurgy, Wiley & Sons, ISBN 0-471-43491-4
3. Granjon, H., Fundamentals of Welding Metallurgy, Abington Publishing, ISBN 1-85573-019-7
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Minggu 12

Materi Weldability of Titanium Alloys (Metalurgi Las Titanium & Paduannya)
- Ti Alloys Clasification & Their Weldability
- How to Measure the Weldability of Ti Alloys
- What kind of defects occuring on Welding of Ti Alloys
- How to Weld the Ti Alloys

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- Referensi**
1. M. Anis & Winarto, Pengelasan, Diktat Kuliah (Lecture Notes)
 2. Kou, S., Welding Metallurgy, Wiley & Sons, ISBN 0-471-43491-4
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Minggu 13

Materi Group 1 - Presentation

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- Referensi**
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 2. Kou, S., Welding Metallurgy, Wiley & Sons, ISBN 0-471-43491-4
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Aktivitas Presentasi Kelompok & Diskusi

Minggu 14

Materi Group 2 - Presentation

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- Referensi**
1. M. Anis & Winarto, Pengelasan, Diktat Kuliah (Lecture Notes)
 2. Kou, S., Welding Metallurgy, Wiley & Sons, ISBN 0-471-43491-4
 3. Granjon, H., Fundamentals of Welding Metallurgy, Abington Publishing, ISBN 1-85573-019-7
 4. Easterling, K., Introduction to the Physical Metallurgy of Welding, Butterworth-Heneimann Ltd. ISBN 0-7506-0394-1
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 6. Norrish, J., Advanced Welding Processes, IOP Publishing Ltd., ISBN 0-85274-326-2
 7. AWS - Welding Jurnal - published by The American Welding Society (AWS)
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Aktivitas Presentasi Kelompok & Diskusi

Minggu 15

Materi Final Test

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- Referensi**
1. M. Anis & Winarto, Pengelasan, Diktat Kuliah (Lecture Notes)
 2. Kou, S., Welding Metallurgy, Wiley & Sons, ISBN 0-471-43491-4
 3. Granjon, H., Fundamentals of Welding Metallurgy, Abington Publishing, ISBN 1-85573-019-7
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 6. Norrish, J., Advanced Welding Processes, IOP Publishing Ltd., ISBN 0-85274-326-2
 7. AWS - Welding Jurnal - published by The American Welding Society (AWS)
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Aktivitas UAS & Kumpulkan Paper
