



# Satuan Acara Pengajaran

ENMT800006 - Analisa Kerusakan + Lab

Pengajar

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*Dr. Badrul Munir ST., M.Eng.Sc.*

## Tujuan Perkuliahan

Mahasiswa mampu memahami dan menganalisa Teori Kegagalan (failure) berbagai jenis Material dengan Teknik Analisa Kegagalan serta mampu menerapkan beberapa contoh studi kasus FA di lapangan. Selain itu mahasiswa juga dapat mempraktekan metoda pengujian dan menganalisa hasil pengujian material yang rusak/patah di Laboratorium Uji Material.

## Minggu 1

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**Materi**           INTRODUKSI:  
- Penjelasan SAP MK Perpatahan & FA  
- Aspek enjiniring Kegagalan & Analisanya  
- Sumber/Faktor Kegagalan Material.

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**Media**            LCD

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**Referensi**       1. Wulpi, D.J., "Understanding How Components Fail?", ASM, 1988.  
2. Brooks C R., Metallurgical Failure Analysis

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**Aktivitas**

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## Minggu 2

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**Materi**           TEKNIK ANALISA KEGAGALAN-1  
- Tujuan Analisa Kegagalan  
- Tahapan dalam Analisa kegagalan  
- Uraian Skematis  
- Pengumpulan Data  
- Pengamatan Awal Patahan  
- NDT

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**Media**            LCD

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**Referensi**       1. Wulpi, D.J., "Understanding How Components Fail?", ASM, 1988.  
2. Brooks C R., Metallurgical Failure Analysis

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**Aktivitas**       Tatap Muka  
Home-Work

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### Minggu 3

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**Materi**           JENIS PERPATAHAN  
- Distorsi  
- Patah Ulet (Ductile)  
- Patah Getas (Brittle)  
- Patah Fatik (Fatigue)  
  
STUDI KASUS LANJUTAN (Bahas 2 Contoh Kasus)

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**Media**            LCD

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**Referensi**       1. Wulpi, D.J., "Understanding How Components Fail?", ASM, 1988.  
2. Brooks C R., Metallurgical Failure Analysis

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**Aktivitas**       Kuliah Tatap Muka  
Tugas kelompok

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### Minggu 4

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**Materi**           JENIS PERPATAHAN  
- Distorsi  
- Patah Ulet (Ductile)  
- Patah Getas (Brittle)  
- Patah Fatik (Fatigue)  
  
STUDI KASUS LANJUTAN (Bahas 2 Contoh Kasus)

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**Media** LCD

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**Referensi** Referensi

1. Wulpi, D.J., "Understanding How Components Fail?", ASM, 1988.
  2. Brooks C R., Metallurgical Failure Analysis
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**Aktivitas** Kuliah Tatap Muka  
Tugas kelompok

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## Minggu 5

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**Materi** Sistim Tegangan dan Residual Stress

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**Media** LCD

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**Referensi** 1. Wulpi, D.J., "Understanding How Components Fail?", ASM, 1988.  
2. Brooks C R., Metallurgical Failure Analysis

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**Aktivitas** Kuliah Tatap Muka  
Tugas Kelompok

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## Minggu 6

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**Materi** Teori Mekanika Perpatahan & Aplikasinya

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**Media** LCD

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**Referensi** 1. Wulpi, D.J., "Understanding How Components Fail?", ASM, 1988.  
2. Brooks C R., Metallurgical Failure Analysis  
3. Boyer, H.E.(Ed.), "Failures Analysis & Prevention?", Metal Handbook, 8th Ed. Vol. 11, ASM, 1992  
4. Fellows, J.A.(Ed.), "Fractography & Atlas Fractography?" Metal Handbook, 9th Ed. Vol. 12, ASM, 1992

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**Aktivitas** Kuliah Tatap Muka  
Tugas Kelompok

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## Minggu 7

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**Materi** Tolls for Failure Analysis

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**Media** LCD

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- Referensi**
1. Wulpi, D.J., "Understanding How Components Fail?", ASM, 1988.
  2. Brooks C R., Metallurgical Failure Analysis
  3. Boyer, H.E.(Ed.), "Failures Analysis & Prevention? Metal Handbook, 8th Ed. Vol. 11, ASM, 1992
  4. Fellows, J.A.(Ed.), "Fractography & Atlas Fractography", Metal Handbook, 9th Ed. Vol. 12, ASM, 1992
  5. Khlefa A. Esaklul , "Hand Book Of Case Histories In Failure Analysis" Vol. 1
  6. Khlefa A. Esaklul , "Hand Book Of Case Histories In Failure Analysis" Vol . 2
  7. Stuart A. Shiels , "Corrosion, Failure Analysis and Metallography"
  8. Stephens, R.I (Ed), "Case Studies for Fatigue Education" ASTM PCN, STP 1250, 1994
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**Aktivitas** Kuliah Tatap Muka  
Tugas Kelompok

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## Minggu 8

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**Materi** Perpatahan Akibat Keausan (wear)  
STUDI KASUS DI KELAS (Bahas 2 Contoh Kasus)

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**Media** LCD

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- Referensi**
1. Wulpi, D.J., "Understanding How Components Fail?", ASM, 1988.
  2. Brooks C R., Metallurgical Failure Analysis
  3. Boyer, H.E.(Ed.), "Failures Analysis & Prevention? Metal Handbook, 8th Ed. Vol. 11, ASM, 1992
  4. Fellows, J.A.(Ed.), "Fractography & Atlas Fractography", Metal Handbook, 9th Ed. Vol. 12, ASM, 1992
  5. Khlefa A. Esaklul , "Hand Book Of Case Histories In Failure Analysis" Vol. 1
  6. Khlefa A. Esaklul , "Hand Book Of Case Histories In Failure Analysis" Vol . 2
  7. Stuart A. Shiels , "Corrosion, Failure Analysis and Metallography"
  8. Stephens, R.I (Ed), "Case Studies for Fatigue Education" ASTM PCN, STP 1250, 1994
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**Aktivitas** Kuliah & Diskusi  
Tuags Kelompok

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## Minggu 9

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**Materi** Perpatahan Akibat Kerapuhan (embrittlement)  
STUDI KASUS LANJUTAN (Bahas 2 Contoh Kasus)

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**Media** LCD

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**Referensi**

1. Wulpi, D.J., "Understanding How Components Fail?", ASM, 1988.
2. Brooks C R., Metallurgical Failure Analysis
3. Boyer, H.E.(Ed.), "Failures Analysis & Prevention? Metal Handbook, 8th Ed. Vol. 11, ASM, 1992
4. Fellows, J.A.(Ed.), "Fractography & Atlas Fractography", Metal Handbook, 9th Ed. Vol. 12, ASM, 1992
5. Khlefa A. Esaklul , "Hand Book Of Case Histories In Failure Analysis" Vol. 1
6. Khlefa A. Esaklul , "Hand Book Of Case Histories In Failure Analysis" Vol . 2
7. Stuart A. Shiels , "Corrosion, Failure Analysis and Metallography"
8. Stephens, R.I (Ed), "Case Studies for Fatigue Education" ASTM PCN, STP 1250, 1994

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**Aktivitas** Kuliah & Diskusi  
Tugas Kelompok

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## Minggu 10

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**Materi** Perpatahan Akibat Proses Heat Treatment  
STUDI KASUS LANJUTAN (Bahas 2 Contoh Kasus)

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**Media** LCD

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- Referensi**
1. Wulpi, D.J., "Understanding How Components Fail?", ASM, 1988.
  2. Brooks C R., Metallurgical Failure Analysis
  3. Boyer, H.E.(Ed.), "Failures Analysis & Prevention? Metal Handbook, 8th Ed. Vol. 11, ASM, 1992
  4. Fellows, J.A.(Ed.), "Fractography & Atlas Fractography", Metal Handbook, 9th Ed. Vol. 12, ASM, 1992
  5. Khlefa A. Esaklul , "Hand Book Of Case Histories In Failure Analysis" Vol. 1
  6. Khlefa A. Esaklul , "Hand Book Of Case Histories In Failure Analysis" Vol . 2
  7. Stuart A. Shiels , "Corrosion, Failure Analysis and Metallography"
  8. Stephens, R.I (Ed), "Case Studies for Fatigue Education" ASTM PCN, STP 1250, 1994
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**Aktivitas**      Kuliah & Diskusi  
Tugas Kelompok

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## Minggu 11

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**Materi**            Perpatahan Akibat Proses Creep  
STUDI KASUS LANJUTAN (Bahas 2 Contoh Kasus)

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**Media**            LCD

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- Referensi**
1. Wulpi, D.J., "Understanding How Components Fail?", ASM, 1988.
  2. Brooks C R., Metallurgical Failure Analysis
  3. Boyer, H.E.(Ed.), "Failures Analysis & Prevention? Metal Handbook, 8th Ed. Vol. 11, ASM, 1992
  4. Fellows, J.A.(Ed.), "Fractography & Atlas Fractography", Metal Handbook, 9th Ed. Vol. 12, ASM, 1992
  5. Khlefa A. Esaklul , "Hand Book Of Case Histories In Failure Analysis" Vol. 1
  6. Khlefa A. Esaklul , "Hand Book Of Case Histories In Failure Analysis" Vol . 2
  7. Stuart A. Shiels , "Corrosion, Failure Analysis and Metallography"
  8. Stephens, R.I (Ed), "Case Studies for Fatigue Education" ASTM PCN, STP 1250, 1994
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**Aktivitas**      Kuliah & Diskusi  
Tugas Kelompok

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## Minggu 12

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**Materi** Perpatahan Akibat Tegangan Sisa (Residual Stress)  
Studi Kasus & Analisa Permasalahan FA

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**Media** LCD

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**Referensi**

1. Wulpi, D.J., "Understanding How Components Fail?", ASM, 1988.
2. Brooks C R., Metallurgical Failure Analysis
3. Boyer, H.E.(Ed.), "Failures Analysis & Prevention? Metal Handbook, 8th Ed. Vol. 11, ASM, 1992
4. Fellows, J.A.(Ed.), "Fractography & Atlas Fractography", Metal Handbook, 9th Ed. Vol. 12, ASM, 1992
5. Khlefa A. Esaklul , "Hand Book Of Case Histories In Failure Analysis" Vol. 1
6. Khlefa A. Esaklul , "Hand Book Of Case Histories In Failure Analysis" Vol . 2
7. Stuart A. Shiels , "Corrosion, Failure Analysis and Metallography"
8. Stephens, R.I (Ed), "Case Studies for Fatigue Education" ASTM PCN, STP 1250, 1994

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**Aktivitas** Kuliah & Diskusi  
Tugas Kelompok

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## Minggu 13

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**Materi** Studi Kasus & Pembahasan Permasalahan FA

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**Media** LCD

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<b>Referensi</b>	<ol style="list-style-type: none"> <li>1. Wulpi, D.J., "Understanding How Components Fail?", ASM, 1988.</li> <li>2. Brooks C R., Metallurgical Failure Analysis</li> <li>3. Boyer, H.E.(Ed.), "Failures Analysis &amp; Prevention? Metal Handbook, 8th Ed. Vol. 11, ASM, 1992</li> <li>4. Fellows, J.A.(Ed.), "Fractography &amp; Atlas Fractography", Metal Handbook, 9th Ed. Vol. 12, ASM, 1992</li> <li>5. Khlefa A. Esaklul , "Hand Book Of Case Histories In Failure Analysis" Vol. 1</li> <li>6. Khlefa A. Esaklul , "Hand Book Of Case Histories In Failure Analysis" Vol . 2</li> <li>7. Stuart A. Shiels , "Corrosion, Failure Analysis and Metallography"</li> <li>8. Stephens, R.I (Ed), "Case Studies for Fatigue Education" ASTM PCN, STP 1250, 1994</li> </ol>
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<b>Aktivitas</b>	Kuliah & Diskusi Tugas Kelompok
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## Minggu 14

<b>Materi</b>	PRESENTASI TIAP GROUP
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<b>Media</b>	LCD
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<b>Referensi</b>	<ol style="list-style-type: none"> <li>1. Wulpi, D.J., "Understanding How Components Fail?", ASM, 1988.</li> <li>2. Brooks C R., Metallurgical Failure Analysis</li> <li>3. Boyer, H.E.(Ed.), "Failures Analysis &amp; Prevention? Metal Handbook, 8th Ed. Vol. 11, ASM, 1992</li> <li>4. Fellows, J.A.(Ed.), "Fractography &amp; Atlas Fractography", Metal Handbook, 9th Ed. Vol. 12, ASM, 1992</li> <li>5. Khlefa A. Esaklul , "Hand Book Of Case Histories In Failure Analysis" Vol. 1</li> <li>6. Khlefa A. Esaklul , "Hand Book Of Case Histories In Failure Analysis" Vol . 2</li> <li>7. Stuart A. Shiels , "Corrosion, Failure Analysis and Metallography"</li> <li>8. Stephens, R.I (Ed), "Case Studies for Fatigue Education" ASTM PCN, STP 1250, 1994</li> </ol>
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<b>Aktivitas</b>	Kuliah & Diskusi Tugas Kelompok
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## Minggu 15



**Materi** Final Examination (UAS)

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**Media** Paper

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**Referensi**

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**Aktivitas** UAS

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