

|                                                                                   |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                  |                 |             |                           |              |                 |
|-----------------------------------------------------------------------------------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------|---------------------------|--------------|-----------------|
|  |  | Universitas Negeri Surabaya<br>S2 Teknik Mesin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                  |                 |             |                           | Kode Dokumen |                 |
| RENCANA PEMBELAJARAN SEMESTER                                                     |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                  |                 |             |                           |              |                 |
| MATA KULIAH (MK)                                                                  |  | KODE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Rumpun MK                                                                                                                                                                                                                                        |                 | BOBOT (sks) |                           | SEMESTER     | Tgl Penyusunan  |
| Termofluida                                                                       |  | 2110303013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                  |                 | 3           |                           |              | 25 Agustus 2026 |
| OTORISASI                                                                         |  | Pengembang RPS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                  | Koordinator RMK |             | Koordinator Program Studi |              |                 |
|                                                                                   |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                  |                 |             | ARIS ANSORI               |              |                 |
| Deskripsi Singkat MK                                                              |  | Mata kuliah ini untuk meningkatkan dan menguatkan kemampuan dasar mahasiswa di bidang konversi energi, yaitu Termodinamika, Mekanika Fluida, dan Perpindahan Panas. Materi perkuliahan meliputi materi-materi yang bersifat pokok dan mendukung pemahaman terhadap tiga materi dasar bidang konversi energi. Selain itu juga integrasi tiga materi dasar dalam bentuk merancang dan menganalisis desain dan unjuk kerja sistem termofluida seperti: sistem distribusi udara; sistem pipa fluida; sistem alat penukar kalor, dan sistem pembangkit tenaga |                                                                                                                                                                                                                                                  |                 |             |                           |              |                 |
| Capaian Pembelajaran (CP)                                                         |  | CPL-PRODI yang dibebankan pada MK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                  |                 |             |                           |              |                 |
|                                                                                   |  | CPL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Mengembangkan pemikiran logis, kritis, sistematis, dan kreatif dalam melakukan pekerjaan yang spesifik di bidang keahliannya serta sesuai dengan standar kompetensi kerja bidang yang bersangkutan                                               |                 |             |                           |              |                 |
|                                                                                   |  | CPL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Mengembangkan diri secara berkelanjutan dan berkolaborasi.                                                                                                                                                                                       |                 |             |                           |              |                 |
|                                                                                   |  | CPL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Mampu mengintegrasikan teori, konsep, dan fundamental teknologi teknik untuk mengambil keputusan solusi permasalahan dibidang renewable energy, material energi serta proses produksi produk-produk energi berbasis artificial intelligence (AI) |                 |             |                           |              |                 |
|                                                                                   |  | CPL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Mampu mengembangkan sistem smart green technology yang inovatif beserta komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin                                                                              |                 |             |                           |              |                 |
|                                                                                   |  | CPL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Mampu merumuskan ide-ide inovatif untuk memberikan solusi terhadap permasalahan material energi dan proses produksi produk-produk energi secara professional.                                                                                    |                 |             |                           |              |                 |
|                                                                                   |  | Capaian Pembelajaran Mata Kuliah (CPMK)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                  |                 |             |                           |              |                 |
|                                                                                   |  | CPMK-1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Mampu menjelaskan keterlibatan konsep konversi energi dalam sistem termofluida                                                                                                                                                                   |                 |             |                           |              |                 |
|                                                                                   |  | CPMK-2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Mampu menjelaskan tentang termofluida, aplikasi dalam bidang termodinamika dan mekanika fluida; sumber energi dan konversi; bentuk-bentuk energi                                                                                                 |                 |             |                           |              |                 |
|                                                                                   |  | CPMK-3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Mampu menjelaskan prinsip dasar dalam termodinamika pada sistem termofluida                                                                                                                                                                      |                 |             |                           |              |                 |
|                                                                                   |  | CPMK-4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Mampu menjelaskan prinsip dasar dalam perpindahan panas pada sistem termofluida                                                                                                                                                                  |                 |             |                           |              |                 |
|                                                                                   |  | CPMK-5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Mampu melakukan perancangan pada sistem termofluida                                                                                                                                                                                              |                 |             |                           |              |                 |
|                                                                                   |  | CPMK-6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Mampu melakukan analisis pada sistem termofluida                                                                                                                                                                                                 |                 |             |                           |              |                 |
|                                                                                   |  | CPMK-7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Mampu menjelaskan prinsip dasar dalam mekanika fluida, pada sistem termofluida                                                                                                                                                                   |                 |             |                           |              |                 |
|                                                                                   |  | Matrik CPL - CPMK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                  |                 |             |                           |              |                 |

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|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-----------------|---------------------|---------------------|-----|--------|----|----|----|----|----|--------|----|---|--|---|---|--------|---|---|---|---|---|--------|----|----|----|----|----|--------|----|--------|---|--|--|--------|--|--|--|---|--|--------|--|--|--|--|---|--|--------|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--------|--|--|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--------|--|--|--|--|--|---|---|---|--|--|--|--|--|--|--|--|--------|--|--|--|--|--|--|--|--|---|---|--|--|--|--|--|--|--------|--|--|--|--|--|--|--|--|--|--|---|---|---|---|--|--|--------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|---|--|--|--|--|--|
|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <table><tr><td>CPMK</td><td>CPL</td><td>CPL</td><td>CPL</td><td>CPL</td><td>CPL</td></tr><tr><td>CPMK-1</td><td>✓</td><td></td><td></td><td></td><td></td></tr><tr><td>CPMK-2</td><td></td><td>✓</td><td></td><td></td><td></td></tr><tr><td>CPMK-3</td><td></td><td></td><td>✓</td><td></td><td></td></tr><tr><td>CPMK-4</td><td></td><td></td><td>✓</td><td></td><td></td></tr><tr><td>CPMK-5</td><td></td><td></td><td>✓</td><td></td><td></td></tr><tr><td>CPMK-6</td><td></td><td></td><td></td><td>✓</td><td></td></tr><tr><td>CPMK-7</td><td></td><td></td><td></td><td></td><td>✓</td></tr></table> | CPMK                                                                                                                                                                                                                               | CPL                                                                              | CPL             | CPL                 | CPL                 | CPL | CPMK-1 | ✓  |    |    |    |    | CPMK-2 |    | ✓ |  |   |   | CPMK-3 |   |   | ✓ |   |   | CPMK-4 |    |    | ✓  |    |    | CPMK-5 |    |        | ✓ |  |  | CPMK-6 |  |  |  | ✓ |  | CPMK-7 |  |  |  |  | ✓ |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
| CPMK                                                             | CPL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | CPL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | CPL                                                                                                                                                                                                                                | CPL                                                                              | CPL             |                     |                     |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
| CPMK-1                                                           | ✓                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                    |                                                                                  |                 |                     |                     |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
| CPMK-2                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ✓                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                    |                                                                                  |                 |                     |                     |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
| CPMK-3                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ✓                                                                                                                                                                                                                                  |                                                                                  |                 |                     |                     |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
| CPMK-4                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ✓                                                                                                                                                                                                                                  |                                                                                  |                 |                     |                     |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
| CPMK-5                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ✓                                                                                                                                                                                                                                  |                                                                                  |                 |                     |                     |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
| CPMK-6                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                    | ✓                                                                                |                 |                     |                     |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
| CPMK-7                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                    |                                                                                  | ✓               |                     |                     |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
| Matrik CPMK pada Kemampuan akhir tiap tahapan belajar (Sub-CPMK) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                    |                                                                                  |                 |                     |                     |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
|                                                                  | <table><tr><td rowspan="2">CPMK</td><td colspan="16">Minggu Ke</td></tr><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td></tr><tr><td>CPMK-1</td><td>✓</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CPMK-2</td><td></td><td>✓</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CPMK-3</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CPMK-4</td><td></td><td></td><td></td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CPMK-5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CPMK-6</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td></tr><tr><td>CPMK-7</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>✓</td><td>✓</td></tr></table> | CPMK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Minggu Ke                                                                                                                                                                                                                          |                                                                                  |                 |                     |                     |     |        |    |    |    |    |    |        |    |   |  | 1 | 2 | 3      | 4 | 5 | 6 | 7 | 8 | 9      | 10 | 11 | 12 | 13 | 14 | 15     | 16 | CPMK-1 | ✓ |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  | CPMK-2 |  | ✓ |  |  |  |  |  |  |  |  |  |  |  |  |  |  | CPMK-3 |  |  | ✓ | ✓ | ✓ |  |  |  |  |  |  |  |  |  |  |  | CPMK-4 |  |  |  |  |  | ✓ | ✓ | ✓ |  |  |  |  |  |  |  |  | CPMK-5 |  |  |  |  |  |  |  |  | ✓ | ✓ |  |  |  |  |  |  | CPMK-6 |  |  |  |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ |  |  | CPMK-7 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ✓ | ✓ |  |  |  |  |  |
| CPMK                                                             | Minggu Ke                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                    |                                                                                  |                 |                     |                     |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
|                                                                  | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3                                                                                                                                                                                                                                  | 4                                                                                | 5               | 6                   | 7                   | 8   | 9      | 10 | 11 | 12 | 13 | 14 | 15     | 16 |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
| CPMK-1                                                           | ✓                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                    |                                                                                  |                 |                     |                     |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
| CPMK-2                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ✓                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                    |                                                                                  |                 |                     |                     |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
| CPMK-3                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ✓                                                                                                                                                                                                                                  | ✓                                                                                | ✓               |                     |                     |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
| CPMK-4                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                    |                                                                                  |                 | ✓                   | ✓                   | ✓   |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
| CPMK-5                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                    |                                                                                  |                 |                     |                     |     | ✓      | ✓  |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
| CPMK-6                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                    |                                                                                  |                 |                     |                     |     |        |    | ✓  | ✓  | ✓  | ✓  |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
| CPMK-7                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                    |                                                                                  |                 |                     |                     |     |        |    |    |    |    |    | ✓      | ✓  |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
| Pustaka                                                          | Utama :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                    |                                                                                  |                 |                     |                     |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1. 1. Mahmoud Massoud, Engineering Thermofluids: Thermodynamics, Fluid Mechanics, and Heat Transfer, Springer<br>2. 2. M.Masud K. Khan, Ashfaque Ahmed C, Nur M Sayeed H, Application of Thermo-fluids Processes in Energy Systems |                                                                                  |                 |                     |                     |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
|                                                                  | Pendukung :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                    |                                                                                  |                 |                     |                     |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                    |                                                                                  |                 |                     |                     |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
| Mg Ke-                                                           | Kemampuan akhir tiap tahapan belajar (Sub-CPMK)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Penilaian                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                    | Bentuk Pembelajaran, Metode Pembelajaran, Penugasan Mahasiswa, [ Estimasi Waktu] |                 | Materi Pembelajaran | Bobot Penilaian (%) |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                    | Luring (offline)                                                                 | Daring (online) |                     |                     |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
| (1)                                                              | (2)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | (3)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | (4)                                                                                                                                                                                                                                | (5)                                                                              | (6)             | (7)                 | (8)                 |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |
| 1                                                                | Mampu menjelaskan tentang thermofluida, aplikasi dalam bidang thermodinamika dan mekanika fluida; sumber energi dan konversi; bentuk-bentuk energi                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                    |                                                                                  |                 |                     | 5%                  |     |        |    |    |    |    |    |        |    |   |  |   |   |        |   |   |   |   |   |        |    |    |    |    |    |        |    |        |   |  |  |        |  |  |  |   |  |        |  |  |  |  |   |  |        |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |   |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |  |  |  |  |  |

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|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|----|
| 2 | Mampu menjelaskan dan menerapkan Dimensi dan satuan; lima persamaan dasar dalam analisis thermofluid; pendekatan sistem dan control volume                         | 1. Dapat menjelaskan Dimensi dan satuan; lima persamaan dasar dalam analisis thermofluid; pendekatan sistem dan control volume<br>2. Dapat menerapkan Dimensi dan satuan; lima persamaan dasar dalam analisis thermofluid; pendekatan sistem dan control volume                                                 | 1..Tingkat partisipasi mahasiswa baik dalam hal kehadiran/ perkuliahan, keaktifan dalam mengikuti perkuliahan<br>2.Tugas yang dikerjakan |  |  |  | 8% |
| 3 | Mampu menjelaskan dan menerapkan fluida; tingkat keadaan dan keseimbangan; proses dan siklus; aliran steady; density; spesifik weight; spesifik gravity; viscosity | 1. Dapat menjelaskan fluida; tingkat keadaan dan keseimbangan; proses dan siklus; aliran steady; density; spesifik weight; spesifik gravity; viscosity<br>2. Dapat menerapkan fluida; tingkat keadaan dan keseimbangan; proses dan siklus; aliran steady; density; spesifik weight; spesifik gravity; viscosity | Tingkat partisipasi mahasiswa baik dalam hal kehadiran/ perkuliahan, keaktifan dalam mengikuti perkuliahan                               |  |  |  | 5% |
| 4 | Mampu menjelaskan dan menerapkan tekanan; peralatan pengukuran tekanan; variasi perbedaan tekanan                                                                  | 1. Dapat menjelaskan tekanan; peralatan pengukuran tekanan; variasi perbedaan tekanan<br>2. Dapat menerapkan tekanan; peralatan pengukuran tekanan; variasi perbedaan tekanan                                                                                                                                   | 1..Tingkat partisipasi mahasiswa baik dalam hal kehadiran/ perkuliahan, keaktifan dalam mengikuti perkuliahan<br>2.Tugas yang dikerjakan |  |  |  | 8% |
| 5 | Mampu menjelaskan dan menerapkan buoyancy dan stability; percepatan linier; hukum archimedes                                                                       | 1. Dapat menjelaskan buoyancy dan stability; percepatan linier; hukum archimedes<br>2. Dapat menerapkan buoyancy dan stability; percepatan linier; hukum archimedes                                                                                                                                             | Tingkat partisipasi mahasiswa baik dalam hal kehadiran/ perkuliahan, keaktifan dalam mengikuti perkuliahan                               |  |  |  | 5% |

|   |                                                                                                                                        |                                                                                                                                                                                                                                                      |                                                                                                                                       |  |  |  |    |
|---|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--|--|--|----|
| 6 | Mampu menjelaskan dan menerapkan dasar termodinamika: energi dan entropi; pendekatan sistem; tingkat keadaan; sifat properties; energi | 1. Dapat menjelaskan dasar termodinamika: energi dan entropi; pendekatan sistem; tingkat keadaan; sifat properties; energi 2. Dapat menerapkan dasar termodinamika: energi dan entropi; pendekatan sistem; tingkat keadaan; sifat properties; energi | Tingkat partisipasi mahasiswa baik dalam hal kehadiran/ perkuliahan, keaktifan dalam mengikuti perkuliahan                            |  |  |  | 5% |
| 7 | Mampu menjelaskan dan menerapkan hukum pertama termodinamika; keseimbangan energi pada proses/siklus                                   | 1. Dapat menjelaskan hukum pertama termodinamika; keseimbangan energi pada proses/siklus 2. Dapat menerapkan hukum pertama termodinamika; keseimbangan energi pada proses/siklus                                                                     | 1..Tingkat partisipasi mahasiswa baik dalam hal kehadiran/ perkuliahan, keaktifan dalam mengikuti perkuliahan 2.Tugas yang dikerjakan |  |  |  | 8% |
| 8 | Mampu menjelaskan dan menerapkan hukum kedua termodinamika; proses reversible dan irreversible; sistem massa atur                      | 1. Dapat menjelaskan hukum kedua termodinamika; proses reversible dan irreversible; sistem massa atur 2. Dapat menerapkan hukum kedua termodinamika; proses reversible dan irreversible; sistem massa atur                                           | 1..Tingkat partisipasi mahasiswa baik dalam hal kehadiran/ perkuliahan, keaktifan dalam mengikuti perkuliahan 2.Tugas yang dikerjakan |  |  |  | 8% |
| 9 | Mampu menjelaskan dan menerapkan konsep perpindahan panas; konduksi, konveksi, dan radiasi                                             | 1. Dapat menjelaskan konsep perpindahan panas; konduksi, konveksi, dan radiasi 2. Dapat menerapkan konsep perpindahan panas; konduksi, konveksi, dan radiasi                                                                                         | Tingkat partisipasi mahasiswa baik dalam hal kehadiran/ perkuliahan, keaktifan dalam mengikuti perkuliahan                            |  |  |  | 5% |

|    |                                                                           |                                                                                                                            |                                                                                                                                       |  |  |  |    |
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| 10 | Mampu menjelaskan dan menerapkan desain analisis sistem distribusi udara  | 1. Dapat menjelaskan desain analisis sistem distribusi udara 2. Dapat menerapkan desain analisis sistem distribusi udara   | 1..Tingkat partisipasi mahasiswa baik dalam hal kehadiran/ perkuliahan, keaktifan dalam mengikuti perkuliahan 2.Tugas yang dikerjakan |  |  |  | 7% |
| 11 | Mampu menjelaskan dan menerapkan desain analisis sistem perpipaan         | 1. Dapat menjelaskan desain analisis sistem perpipaan 2. Dapat menerapkan desain analisis sistem perpipaan                 | Tingkat partisipasi mahasiswa baik dalam hal kehadiran/ perkuliahan, keaktifan dalam mengikuti perkuliahan                            |  |  |  | 6% |
| 12 | Mampu menjelaskan dan menerapkan desain analisis sistem perpindahan kalor | 1. Dapat menjelaskan desain analisis sistem perpindahan kalor 2. Dapat menerapkan desain analisis sistem perpindahan kalor | Tingkat partisipasi mahasiswa baik dalam hal kehadiran/ perkuliahan, keaktifan dalam mengikuti perkuliahan                            |  |  |  | 6% |
| 13 | Mampu menjelaskan dan menerapkan desain analisis sistem perpindahan kalor | 1. Dapat menjelaskan desain analisis sistem perpindahan kalor 2. Dapat menerapkan desain analisis sistem perpindahan kalor | Tingkat partisipasi mahasiswa baik dalam hal kehadiran/ perkuliahan, keaktifan dalam mengikuti perkuliahan                            |  |  |  | 6% |
| 14 | Mampu menjelaskan dan menerapkan desain analisis sistem perpindahan kalor | 1. Dapat menjelaskan desain analisis sistem perpindahan kalor 2. Dapat menerapkan desain analisis sistem perpindahan kalor | 1..Tingkat partisipasi mahasiswa baik dalam hal kehadiran/ perkuliahan, keaktifan dalam mengikuti perkuliahan 2.Tugas yang dikerjakan |  |  |  | 6% |
| 15 | Mampu menjelaskan dan menerapkan desain analisis sistem pembangkit tenaga | 1. Dapat menjelaskan desain analisis sistem pembangkit tenaga 2. Dapat menerapkan desain analisis sistem pembangkit tenaga | Tingkat partisipasi mahasiswa baik dalam hal kehadiran/ perkuliahan, keaktifan dalam mengikuti perkuliahan                            |  |  |  | 6% |

|    |                                                                           |                                                                                                                            |                                                                                                                                       |  |  |  |    |
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| 16 | Mampu menjelaskan dan menerapkan desain analisis sistem pembangkit tenaga | 1. Dapat menjelaskan desain analisis sistem pembangkit tenaga 2. Dapat menerapkan desain analisis sistem pembangkit tenaga | 1..Tingkat partisipasi mahasiswa baik dalam hal kehadiran/ perkuliahan, keaktifan dalam mengikuti perkuliahan 2.Tugas yang dikerjakan |  |  |  | 6% |
|----|---------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--|--|--|----|

#### SDGS (Sustainable Development Goals)



#### Catatan

1. **Capaian Pembelajaran Lulusan Program Studi (CPL-Prodi)** adalah rumusan kemampuan yang harus dimiliki oleh lulusan program studi yang mencakup sikap, penguasaan pengetahuan, keterampilan umum, dan keterampilan khusus sesuai dengan jenjang kualifikasi, yang diperoleh melalui proses pembelajaran.
2. **CPL-Prodi yang dibebankan pada Mata Kuliah** adalah bagian dari CPL-Prodi yang dipilih dan relevan untuk dikembangkan melalui suatu mata kuliah, sebagai dasar perumusan capaian pembelajaran mata kuliah.
3. **Capaian Pembelajaran Mata Kuliah (CPMK)** adalah kemampuan yang dirumuskan secara spesifik dan diturunkan dari CPL-Prodi yang dibebankan pada mata kuliah, serta menggambarkan kompetensi yang harus dicapai mahasiswa setelah menyelesaikan mata kuliah.
4. **Sub-CPMK** adalah kemampuan akhir yang direncanakan pada setiap tahap pembelajaran, sebagai penjabaran lebih rinci dari CPMK, bersifat terukur dan dapat diamati sesuai dengan materi pembelajaran.
5. **Indikator Penilaian** adalah pernyataan spesifik dan terukur yang digunakan untuk menilai ketercapaian Sub-CPMK, baik dari proses maupun hasil belajar mahasiswa, yang didukung dengan bukti penilaian.
6. **Kriteria Penilaian** adalah tolok ukur yang digunakan untuk menentukan tingkat ketercapaian hasil belajar mahasiswa berdasarkan indikator penilaian, guna menjamin penilaian yang objektif, konsisten, dan adil. Kriteria penilaian dapat bersifat kuantitatif dan/atau kualitatif.
7. **Bentuk Penilaian** meliputi penilaian tes dan non-tes sesuai dengan karakteristik capaian pembelajaran.
8. **Bentuk Pembelajaran** meliputi kuliah, responsi, tutorial, seminar atau bentuk lain yang setara, praktikum, praktik studio, praktik bengkel, praktik lapangan, penelitian, dan pengabdian kepada masyarakat.
9. **Metode Pembelajaran** merupakan cara penyampaian pembelajaran yang digunakan untuk mencapai capaian pembelajaran, antara lain Small Group Discussion, Project Based Learning, Case Based Learning, Collaborative Learning, Discovery Learning, Self-Directed Learning, serta metode lain yang relevan.
10. **Materi Pembelajaran** adalah bahan kajian yang disusun secara sistematis dalam bentuk pokok dan sub-pokok bahasan untuk mendukung pencapaian Sub-CPMK.
11. **Bobot Penilaian** adalah persentase kontribusi setiap komponen penilaian terhadap nilai akhir mata kuliah, yang ditetapkan secara proporsional sesuai tingkat kompleksitas dan ketercapaian Sub-CPMK, dengan total keseluruhan sebesar 100%.
12. TM = Tatap Muka, PT = Penugasan Terstruktur, BM = Belajar Mandiri.