

|  | <div> Universitas Negeri Surabaya<br/> Fakultas Matematika dan Ilmu Pengetahuan Alam<br/> Program Studi S1 Matematika </div> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |       |           |                                 | Kode Dokumen   |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------|-----------|---------------------------------|----------------|-------|--------|-------|--------|--------|---|---|---|--|---|---|--|--|--------|--|---|--|---|---|--|--|--|--------|--|--|---|--|---|---|--|--|--------|--|--|---|---|--|--|---|--|--------|--|--|--|---|---|---|--|---|
|                                                                                   | <div>RENCANA PEMBELAJARAN SEMESTER</div>                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |       |           |                                 |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
| MATA KULIAH (MK)                                                                  | KODE                                                                                                                         | Rumpun MK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | BOBOT (sks)            |       |           | SEMESTER                        | Tgl Penyusunan |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
| Sistem Dinamik                                                                    | 4420103118                                                                                                                   | Mata Kuliah Pilihan Program Studi                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | T=3                    | P=0   | ECTS=4.77 | 7                               | 1 Agustus 2024 |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
| OTORISASI                                                                         | Pengembang RPS                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Koordinator RMK        |       |           | Koordinator Program Studi       |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
|                                                                                   | Dr. Dian Savitri, S.Si., M.Si.                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Prof. Dr. Abadi, M.Sc. |       |           | Prof. Dr. Raden Sulaiman, M.Si. |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
| Model Pembelajaran                                                                | Project Based Learning                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |       |           |                                 |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
| Capaian Pembelajaran (CP)                                                         | CPL-PRODI yang dibebankan pada MK                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |       |           |                                 |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
|                                                                                   | CPL-1                                                                                                                        | Mampu menunjukkan nilai-nilai agama, kebangsaan dan budaya nasional, serta etika akademik dalam melaksanakan tugasnya                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |       |           |                                 |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
|                                                                                   | CPL-2                                                                                                                        | Menunjukkan karakter tangguh, kolaboratif, adaptif, inovatif, inklusif, belajar sepanjang hayat, dan berjiwa kewirausahaan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                        |       |           |                                 |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
|                                                                                   | CPL-3                                                                                                                        | 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-4                                                                                                                        | Mengembangkan diri secara berkelanjutan dan berkolaborasi.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                        |       |           |                                 |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
|                                                                                   | CPL-7                                                                                                                        | Mampu menerapkan prinsip dasar matematika untuk menyelesaikan masalah matematika sederhana*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |       |           |                                 |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
|                                                                                   | CPL-8                                                                                                                        | Mampu menganalisis struktur formal masalah matematika dan bidang-bidang yang relevan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                        |       |           |                                 |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
|                                                                                   | CPL-9                                                                                                                        | Mampu mengimplementasikan prosedur matematis sederhana dalam program komputer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                        |       |           |                                 |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
|                                                                                   | CPL-11                                                                                                                       | Mampu menghasilkan ide yang digunakan untuk penyelesaian tugas matematika dan mengkomunikasikannya secara tertulis dan lisan, sesuai dengan kaidah ilmiah                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |       |           |                                 |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
|                                                                                   | Capaian Pembelajaran Mata Kuliah (CPMK)                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |       |           |                                 |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
|                                                                                   | CPMK - 1                                                                                                                     | Mengkonstruksi sistem dinamik berdasarkan fenomena di dunia nyata melalui prinsip-prinsip pemodelan yang valid                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |       |           |                                 |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
|                                                                                   | CPMK - 2                                                                                                                     | Menganalisis penyelesaian sistem dinamik (penentuan titik ekuilibrium dan (pendekatan) solusi umum, kestabilan solusi).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                        |       |           |                                 |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
|                                                                                   | CPMK - 3                                                                                                                     | Mampu melakukan analisis bifurkasi penyelesaian sistem dinamik.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |       |           |                                 |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
|                                                                                   | CPMK - 4                                                                                                                     | Menganalisis secara numerik berbasis IT (software) penyelesaian sistem dinamik.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |       |           |                                 |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
|                                                                                   | CPMK - 5                                                                                                                     | Menginterpretasikan hasil analisis analitik dan numerik dan mengkomunikasikannya.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                        |       |           |                                 |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
|                                                                                   | Matrik CPL - CPMK                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |       |           |                                 |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
|                                                                                   |                                                                                                                              | <table border="1"> <tr> <th>CPMK</th> <th>CPL-1</th> <th>CPL-2</th> <th>CPL-3</th> <th>CPL-4</th> <th>CPL-7</th> <th>CPL-8</th> <th>CPL-9</th> <th>CPL-11</th> </tr> <tr> <td>CPMK-1</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> </tr> <tr> <td>CPMK-3</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> </tr> <tr> <td>CPMK-5</td> <td></td> <td></td> <td></td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> </tr> </table> | CPMK                   | CPL-1 | CPL-2     | CPL-3                           | CPL-4          | CPL-7 | CPL-8  | CPL-9 | CPL-11 | CPMK-1 | ✓ | ✓ | ✓ |  | ✓ | ✓ |  |  | CPMK-2 |  | ✓ |  | ✓ | ✓ |  |  |  | CPMK-3 |  |  | ✓ |  | ✓ | ✓ |  |  | CPMK-4 |  |  | ✓ | ✓ |  |  | ✓ |  | CPMK-5 |  |  |  | ✓ | ✓ | ✓ |  | ✓ |
|                                                                                   | CPMK                                                                                                                         | CPL-1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | CPL-2                  | CPL-3 | CPL-4     | CPL-7                           | CPL-8          | CPL-9 | CPL-11 |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
|                                                                                   | CPMK-1                                                                                                                       | ✓                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ✓                      | ✓     |           | ✓                               | ✓              |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
|                                                                                   | CPMK-2                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ✓                      |       | ✓         | ✓                               |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
| CPMK-3                                                                            |                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ✓                      |       | ✓         | ✓                               |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
| CPMK-4                                                                            |                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ✓                      | ✓     |           |                                 | ✓              |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
| CPMK-5                                                                            |                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        | ✓     | ✓         | ✓                               |                | ✓     |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
| Matrik CPMK pada Kemampuan akhir tiap tahapan belajar (Sub-CPMK)                  |                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |       |           |                                 |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |
|                                                                                   |                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |       |           |                                 |                |       |        |       |        |        |   |   |   |  |   |   |  |  |        |  |   |  |   |   |  |  |  |        |  |  |   |  |   |   |  |  |        |  |  |   |   |  |  |   |  |        |  |  |  |   |   |   |  |   |

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|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <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></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                 | 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               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                  |   |                 |   |                                 |   |                     |    |    |    | ✓  | ✓  | ✓  |  |  |  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |        |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |
| Deskripsi Singkat MK | Matakuliah ini mengkaji tentang fenomena linear dan nonlinear yang ada di alam semesta melalui model-model matematika, khususnya melalui sistem persamaan diferensial biasa. Perkuliahan diawali dengan mengingat kembali tahapan pemodelan matematika, kemudian dengan melibatkan mahasiswa secara aktif perkuliahan menuntut mahasiswa untuk mengkonstruksi model matematika dari fenomena yang selalu berubah setiap saat menjadi suatu Sistem Dinamik. Pembahasan dilanjutkan dengan menentukan penyelesaian sistem dinamik: titik-titik equilibrium dan penyelesaian umum sistem, linearisasi dan analisis kestabilan. Pembahasan tentang kestabilan diperluas dengan memperkenalkan teori perturbasi. Metode penyelesaian dari sistem dilakukan secara analitik dan aproksimasi dengan metode averaging. Sedangkan kestabilan sistem dilakukan secara analitik melalui linearisasi dan/atau teori perturbasi yang diterapkan pada sistem yang teraverage dan dilanjutkan dengan teori bifurkasi baik secara analitik maupun secara numerik menggunakan bantuan software. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                  |   |                 |   |                                 |   |                     |    |    |    |    |    |    |  |  |  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |        |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |
| Pustaka              | Utama :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <div>1. F. Verhulst. 2000. Nonlinear Differential Equations and Dynamical Systems . Berlin: Springer-Verlag.</div> <div>2. M. W. Hirsch, S. Smale, &amp; R. L. Devaney. 2004. Differential Equations, Dynamical Systems &amp; Introduction to Chaos. Boston, USA. Elsevier.</div> <div>3. G. C. Layek. 2015. An Introduction to Dynamical Systems. New Delhi. Springer.</div> <div>4. J. D. Murray. 2002 . Mathematical Biology 1, An introduction . Berlin. Springer-Verlag</div> <div>5. Yu A. Kuznetsov. 2009. Using MatCont for Numerical Integration of ODEs, Tutorial Sheet . Universiteit Utrecht. The Netherlands</div> <div>6. J. C. Polking. 2008. dfield dan pplane a software for interactive numerical analysis of ODE. <a href="http://math.rice.edu/~dfield/index.html">http://math.rice.edu/~dfield/index.html</a></div> |                                                                                  |   |                 |   |                                 |   |                     |    |    |    |    |    |    |  |  |  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |        |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |
|                      | Pendukung :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                  |   |                 |   |                                 |   |                     |    |    |    |    |    |    |  |  |  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |        |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |
|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <div>1. Meyer, Walter J., 1984, Concepts of Mathematical Modeling, Dover Publications Inc., Mineola, New York.</div> <div>2. Giordano, F. R., Fox, W. P., and Horton, S. B., 2014, A First Course in Mathematical Modeling, Fifth Edition, Brooks/Cole, Cengage Learning, Boston, MA, 02210, USA.</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                  |   |                 |   |                                 |   |                     |    |    |    |    |    |    |  |  |  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |        |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |
| Dosen Pengampu       | Prof. Dr. Abadi, M.Sc.<br>Dr. Dian Savitri, S.Si., M.Si.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                  |   |                 |   |                                 |   |                     |    |    |    |    |    |    |  |  |  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |        |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |
| Mg Ke-               | Kemampuan akhir tiap tahapan belajar (Sub-CPMK)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Penilaian                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Bantuk Pembelajaran, Metode Pembelajaran, Penugasan Mahasiswa, [ Estimasi Waktu] |   |                 |   | Materi Pembelajaran [ Pustaka ] |   | Bobot Penilaian (%) |    |    |    |    |    |    |  |  |  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |        |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |
|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Indikator                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Kriteria & Bentuk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Luring (offline)                                                                 |   | Daring (online) |   |                                 |   |                     |    |    |    |    |    |    |  |  |  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |        |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |
| (1)                  | (2)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | (3)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | (4)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | (5)                                                                              |   | (6)             |   | (7)                             |   | (8)                 |    |    |    |    |    |    |  |  |  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |        |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |   |   |   |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |

|   |                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                    |                                                                           |                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |    |
|---|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 1 | <p>1.Mengingat kembali prinsip-prinsip pemodelan dan memberikan contoh.</p> <p>2.Pemodelan sistem kompleks yang bergantung pada waktu.</p> | <p>1.Menjelaskan pengertian sistem dinamik.</p> <p>2.Menjelaskan contoh-contoh sistem dinamik berdasarkan tahapan pemodelan matematika.</p> <p>3.mengkonstruksi sistem dinamik planar berdasarkan tahapan pemodelan.</p> <p>4.Mampu menjelaskan sistem dinamik planar berdasarkan tahapan pemodelan.</p> <p>5.Menjelaskan tahapan pemodelan matematika dari fenomena sederhana.</p> | <p><b>Bentuk Penilaian :</b><br/>Aktifitas Partisipatif, Praktik / Unjuk Kerja</p> | <p>Pembelajaran dengan pendekatan kolaboratif dan mandiri.<br/>3 X 50</p> | <p>Pembelajaran mandiri secara daring menggunakan LMS.<br/>100</p> | <p><b>Materi:</b><br/>Contoh-contoh sistem dinamik</p> <p><b>Pustaka:</b> <i>F. Verhulst. 2000. Nonlinear Differential Equations and Dynamical Systems . Berlin: Springer-Verlag.</i></p> <hr/> <p><b>Materi:</b><br/>Contoh-contoh sistem dinamik di bidang biologi</p> <p><b>Pustaka:</b> <i>J. D. Murray. 2002 . Mathematical Biology 1, An introduction . Berlin. Springer-Verlag</i></p> <hr/> <p><b>Materi:</b><br/>Contoh-contoh pemodelan fari fenomena sederhana</p> <p><b>Pustaka:</b><br/><i>Giordano, F. R., Fox, W. P., and Horton, S. B., 2014, A First Course in Mathematical Modeling, Fifth Edition, Brooks/Cole, Cengage Learning, Boston, MA, 02210, USA.</i></p> | 5% |
|---|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|

|   |                                                                                                                                   |                                                                                                                                                                                                                                                                                            |                                                                                                          |                                                                           |                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |    |
|---|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 2 | <p>1. Menjelaskan pengertian sistem dinamik</p> <p>2. Membedakan sistem dinamik diskrit dan kontinu.</p>                          | <p>1. Mengkonstruksi sistem dinamik diskrit berdasarkan tahapan pemodelan matematika.</p> <p>2. Mengkonstruksi sistem dinamik kontinu berdasarkan tahapan pemodelan matematika.</p>                                                                                                        | <p><b>Bentuk Penilaian :</b><br/>Aktifitas Partisipatif, Penilaian Portofolio, Praktik / Unjuk Kerja</p> | <p>Pembelajaran dengan pendekatan kolaboratif dan mandiri.<br/>3 X 50</p> | <p>Pembelajaran mandiri secara daring menggunakan LMS.<br/>100</p> | <p><b>Materi:</b><br/>Pengertian Sistem dinamik</p> <p><b>Pustaka:</b> G. C. Layek. 2015. <i>An Introduction to Dynamical Systems</i>. New Delhi. Springer.</p> <hr/> <p><b>Materi:</b><br/>contoh-contoh sistem dinamik diskrit dan kontinu.</p> <p><b>Pustaka:</b> Giordano, F. R., Fox, W. P., and Horton, S. B., 2014, <i>A First Course in Mathematical Modeling, Fifth Edition</i>, Brooks/Cole, Cengage Learning, Boston, MA, 02210, USA.</p> <hr/> <p><b>Materi:</b><br/>Contoh-contoh Sistem dinamik diskrit dan kontinu.</p> <p><b>Pustaka:</b> Meyer, Walter J., 1984, <i>Concepts of Mathematical Modeling</i>, Dover Publications Inc., Mineola, New York.</p> | 5% |
| 3 | <p>Menentukan titik ekuilibrium sistem dinamik, penyelesaian eksak dan pendekatan (aproksimasi) menggunakan teori perturbasi.</p> | <p>1. Menjelaskan pengertian penyelesaian eksak dan pendekatan (aproksimasi) sistem dinamik.</p> <p>2. Menentukan titik ekuilibrium sistem dinamik.</p> <p>3. Menentukan penyelesaian eksak sistem dinamik.</p> <p>4. Menentukan penyelesaian pendekatan (aproksimasi) sistem dinamik.</p> | <p><b>Bentuk Penilaian :</b><br/>Penilaian Hasil Project / Penilaian Produk, Praktik / Unjuk Kerja</p>   | <p>Pembelajaran dengan pendekatan kolaboratif dan mandiri.<br/>3 X 50</p> | <p>Pembelajaran mandiri secara daring menggunakan LMS.<br/>100</p> | <p><b>Materi:</b> Titik ekuilibrium dan penyelesaian eksak sistem dinamik</p> <p><b>Pustaka:</b> F. Verhulst. 2000. <i>Nonlinear Differential Equations and Dynamical Systems</i>. Berlin: Springer-Verlag.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 5% |

|   |                                                                                                                            |                                                                                    |                                                                                                |                                                                                                                                                                                |                                                            |                                                                                                                                                                                                                                                                                                                                                                                                              |    |
|---|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 4 | Menentukan titik ekuilibrium sistem dinamik, penyelesaian eksak dan pendekatan (aproksimasi) menggunakan teori perturbasi. | Menentukan penyelesaian pendekatan (aproksimasi) sistem dinamik.                   | <b>Bentuk Penilaian :</b><br>Penilaian Hasil Project / Penilaian Produk, Praktik / Unjuk Kerja | Pembelajaran dengan pendekatan kolaboratif dan mandiri.<br>3 X 50                                                                                                              | Pembelajaran mandiri secara daring menggunakan LMS.<br>100 | <b>Materi:</b> Titik ekuilibrium dan penyelesaian eksak sistem dinamik<br><b>Pustaka:</b> F. Verhulst. 2000. <i>Nonlinear Differential Equations and Dynamical Systems</i> . Berlin: Springer-Verlag.<br><b>Materi:</b> Penyelesaian pendekatan (aproksimasi) sistem dinamik.<br><b>Pustaka:</b> F. Verhulst. 2000. <i>Nonlinear Differential Equations and Dynamical Systems</i> . Berlin: Springer-Verlag. | 5% |
| 5 | Memahami titik equilibrium dan jenis-jenisnya pada sistem dinamik linear planar                                            | Menentukan titik-titik kritis dan jenis-jenisnya pada sistem dinamik linear planar | <b>Bentuk Penilaian :</b><br>Aktifitas Partisipasi                                             | Kuliah, Responsi, dan Tutorial menggunakan LMS Vinesa/Google Classroom dengan metode Synchronous menggunakan platform video conference (google meet)<br>3 x 50 menit<br>9 X 50 |                                                            |                                                                                                                                                                                                                                                                                                                                                                                                              | 0% |
| 6 | Memahami titik equilibrium dan jenis-jenisnya pada sistem dinamik linear planar                                            | Menentukan titik-titik kritis dan jenis-jenisnya pada sistem dinamik linear planar | <b>Bentuk Penilaian :</b><br>Penilaian Portofolio                                              | Kuliah, Responsi, dan Tutorial menggunakan LMS Vinesa/Google Classroom dengan metode Synchronous menggunakan platform video conference (google meet)<br>3 x 50 menit<br>9 X 50 |                                                            |                                                                                                                                                                                                                                                                                                                                                                                                              | 0% |
| 7 | Memahami titik equilibrium dan jenis-jenisnya pada sistem dinamik linear planar                                            | Menentukan titik-titik kritis dan jenis-jenisnya pada sistem dinamik linear planar |                                                                                                | Kuliah, Responsi, dan Tutorial menggunakan LMS Vinesa/Google Classroom dengan metode Synchronous menggunakan platform video conference (google meet)<br>3 x 50 menit<br>9 X 50 |                                                            |                                                                                                                                                                                                                                                                                                                                                                                                              | 0% |

|    |                                                                                 |                                                                                                               |                                            |                                                                                                                                                                                                                       |  |  |    |
|----|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|----|
| 8  | Memahami titik equilibrium dan jenis-jenisnya pada sistem dinamik linear planar | Menentukan titik-titik kritis dan jenis-jenisnya pada sistem dinamik linear planar                            | Bentuk Penilaian :<br>Penilaian Portofolio | Kuliah,<br>Responsi, dan<br>Tutorial<br>menggunakan<br>LMS<br>Vinesa/Google<br>Classroom<br>dengan<br>metode<br>Synchronous<br>menggunakan<br>platform video<br>conference<br>(google meet)<br>3 x 50 menit<br>9 X 50 |  |  | 0% |
| 9  | Memahami solusi periodik dari suatu sistem dinamik nonlinear                    | 1.<br>Mengidentifikasi sistem dinamik nonlinear<br>2.Menentukan solusi periodik dari sistem dinamik nonlinear |                                            | Kuliah,<br>Responsi, dan<br>Tutorial<br>menggunakan<br>LMS<br>Vinesa/Google<br>Classroom<br>dengan<br>metode<br>Synchronous<br>menggunakan<br>platform video<br>conference<br>(google meet)<br>3 x 50 menit<br>6 X 50 |  |  | 0% |
| 10 | Memahami solusi periodik dari suatu sistem dinamik nonlinear                    | 1.<br>Mengidentifikasi sistem dinamik nonlinear<br>2.Menentukan solusi periodik dari sistem dinamik nonlinear |                                            | Kuliah,<br>Responsi, dan<br>Tutorial<br>menggunakan<br>LMS<br>Vinesa/Google<br>Classroom<br>dengan<br>metode<br>Synchronous<br>menggunakan<br>platform video<br>conference<br>(google meet)<br>3 x 50 menit<br>6 X 50 |  |  | 0% |
| 11 | Memahami solusi periodik dari suatu sistem dinamik nonlinear                    | 1.<br>Mengidentifikasi sistem dinamik nonlinear<br>2.Menentukan solusi periodik dari sistem dinamik nonlinear |                                            | Kuliah,<br>Responsi, dan<br>Tutorial<br>menggunakan<br>LMS<br>Vinesa/Google<br>Classroom<br>dengan<br>metode<br>Synchronous<br>menggunakan<br>platform video<br>conference<br>(google meet)<br>3 x 50 menit<br>6 X 50 |  |  | 0% |
| 12 | Memahami solusi periodik dari suatu sistem dinamik nonlinear                    | 1.<br>Mengidentifikasi sistem dinamik nonlinear<br>2.Menentukan solusi periodik dari sistem dinamik nonlinear |                                            | Kuliah,<br>Responsi, dan<br>Tutorial<br>menggunakan<br>LMS<br>Vinesa/Google<br>Classroom<br>dengan<br>metode<br>Synchronous<br>menggunakan<br>platform video<br>conference<br>(google meet)<br>3 x 50 menit<br>6 X 50 |  |  | 0% |

|    |                                                                                       |                                                                                    |                                                                      |                                                                                                                                                                         |  |                                                                                                                                                                        |     |
|----|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 13 | Memahami bifurkasi solusi sistem dinamik dan jenis-jenisnya                           | 1.Menentukan bifurkasi solusi sistem dinamik<br>2.Menentukan jenis-jenis bifurkasi |                                                                      | Kuliah, Responsi, dan Tutorial menggunakan LMS Vinesa/Google Classroom dengan metode Synchronus menggunakan platform video conference (google meet) 3 x 50 menit 3 X 50 |  |                                                                                                                                                                        | 5%  |
| 14 | Memahami bifurkasi solusi sistem dinamik dan jenis-jenisnya                           | 1.Menentukan bifurkasi solusi sistem dinamik<br>2.Menentukan jenis-jenis bifurkasi |                                                                      | Kuliah, Responsi, dan Tutorial menggunakan LMS Vinesa/Google Classroom dengan metode Synchronus menggunakan platform video conference (google meet) 3 x 50 menit 3 X 50 |  |                                                                                                                                                                        | 5%  |
| 15 | Memahami bifurkasi melalui pembahasan sistem dinamik yang diambil dari artikel jurnal | Menentukan jenis bifurkasi pada artikel jurnal                                     |                                                                      | 3 X 50                                                                                                                                                                  |  |                                                                                                                                                                        | 5%  |
| 16 | UAS                                                                                   | Semua indikator sebelum setelah UTS dan sebelum UAS                                | <b>Kriteria:</b><br>1.Tes essay secara luring<br>2.Skor maksimum 100 | UAS 100                                                                                                                                                                 |  | <b>Materi:</b> Semua materi sebelum UAS<br><b>Pustaka:</b> F. Verhulst. 2000. <i>Nonlinear Differential Equations and Dynamical Systems</i> . Berlin: Springer-Verlag. | 30% |

#### Rekap Persentase Evaluasi : Project Based Learning

| No | Evaluasi                                   | Persentase |
|----|--------------------------------------------|------------|
| 1. | Aktifitas Partisipatif                     | 4.17%      |
| 2. | Penilaian Hasil Project / Penilaian Produk | 5%         |
| 3. | Penilaian Portofolio                       | 1.67%      |
| 4. | Praktik / Unjuk Kerja                      | 9.17%      |
|    |                                            | 20.01%     |

#### Catatan

1. **Capaian Pembelajaran Lulusan Prodi (CPL - Prodi)** adalah kemampuan yang dimiliki oleh setiap lulusan prodi yang merupakan internalisasi dari sikap, penguasaan pengetahuan dan ketrampilan sesuai dengan jenjang prodinya yang diperoleh melalui proses pembelajaran.
2. **CPL yang dibebankan pada mata kuliah** adalah beberapa capaian pembelajaran lulusan program studi (CPL-Prodi) yang digunakan untuk pembentukan/pengembangan sebuah mata kuliah yang terdiri dari aspek sikap, ketrampilan umum, ketrampilan khusus dan pengetahuan.
3. **CP Mata kuliah (CPMK)** adalah kemampuan yang dijabarkan secara spesifik dari CPL yang dibebankan pada mata kuliah, dan bersifat spesifik terhadap bahan kajian atau materi pembelajaran mata kuliah tersebut.
4. **Sub-CPMK Mata kuliah (Sub-CPMK)** adalah kemampuan yang dijabarkan secara spesifik dari CPMK yang dapat diukur atau diamati dan merupakan kemampuan akhir yang direncanakan pada tiap tahap pembelajaran, dan bersifat spesifik terhadap materi pembelajaran mata kuliah tersebut.
5. **Indikator penilaian** kemampuan dalam proses maupun hasil belajar mahasiswa adalah pernyataan spesifik dan terukur yang mengidentifikasi kemampuan atau kinerja hasil belajar mahasiswa yang disertai bukti-bukti.
6. **Kreteria Penilaian** adalah patokan yang digunakan sebagai ukuran atau tolok ukur ketercapaian pembelajaran dalam penilaian berdasarkan indikator-indikator yang telah ditetapkan. Kreteria penilaian merupakan pedoman bagi penilai agar penilaian konsisten dan tidak bias. Kreteria dapat berupa kuantitatif ataupun kualitatif.
7. **Bentuk penilaian:** tes dan non-tes.

8. **Bentuk pembelajaran:** Kuliah, Responsi, Tutorial, Seminar atau yang setara, Praktikum, Praktik Studio, Praktik Bengkel, Praktik Lapangan, Penelitian, Pengabdian Kepada Masyarakat dan/atau bentuk pembelajaran lain yang setara.
9. **Metode Pembelajaran:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, dan metode lainnya yg setara.
10. **Materi Pembelajaran** adalah rincian atau uraian dari bahan kajian yg dapat disajikan dalam bentuk beberapa pokok dan sub-pokok bahasan.
11. **Bobot penilaian** adalah prosentasi penilaian terhadap setiap pencapaian sub-CPMK yang besarnya proposional dengan tingkat kesulitan pencapaian sub-CPMK tsb., dan totalnya 100%.
12. TM=Tatap Muka, PT=Penugasan terstruktur, BM=Belajar mandiri.