



# BUKU PEDOMAN MATA KULIAH *COURSE MODULE HANDBOOK*

## OSEANOGRAFI FISIK LANJUT *ADVANCED PHYSICAL OCEANOGRAPHY*

DEPARTEMEN TEKNIK GEOMATIKA  
Fakultas Teknik Sipil, Perencanaan, dan Kebumihan

*DEPARTMENT OF GEOMATICS ENGINEERING*  
*Faculty of Civil Engineering, Planning, and Geo Engineering*

INSTITUT TEKNOLOGI SEPULUH NOPEMBER

## MATA KULIAH PILIHAN (ELECTIVE COURSE)

### Oseanografi Fisik Lanjut / *Advanced Physical Oceanography*

|                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| <b>Nama modul</b><br><i>Module name</i>                                                                          | <b>Rekayasa Survei Hidrografi</b><br><i>Applied Hydrographic Survey</i>                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Tingkatan</b><br><i>Module level</i>                                                                          | Pasca Sarjana (S2)<br><i>Master Degree</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Kode</b><br><i>Code</i>                                                                                       | RM185914                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Mata kuliah</b><br><i>Course</i>                                                                              | Rekayasa Survei Hidrografi<br><i>Applied Hydrographic Survey</i>                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Semester</b><br><i>Semester</i>                                                                               | III (tiga) atau IV (empat)<br><i>III (three) or IV (four)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Penanggung jawab mata kuliah</b><br><i>Person responsible for the module</i>                                  | Danar Guruh Pratomo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Dosen</b><br><i>Lecturer</i>                                                                                  | Danar Guruh Pratomo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Bahasa</b><br><i>Language</i>                                                                                 | Bahasa Indonesia dan Bahasa Inggris<br><i>Indonesian and English</i>                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Relasi pada kurikulum</b><br><i>Relation to curriculum</i>                                                    | Mata kuliah pilihan untuk Program Master Teknik Geomatika<br><i>Elective Courses for Master of Geomatics Engineering</i>                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Tipe pertemuan, jam tatap muka</b><br><i>Type of teaching, contact hours</i>                                  | Kuliah, 1.67 jam x 16 minggu per semester<br><i>Lecture, 1.67 hours x 16 weeks per semester</i>                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Beban belajar</b><br><br><br><br><br><br><br><br><br><br><i>Workload</i>                                      | Kuliah: 1.67 jam x 14 minggu = 23.38 jam<br>Penugasan terstruktur: 4 jam x 14 minggu = 56 jam<br>Kegiatan mandiri: 4 jam x 14 minggu = 56 jam<br>Ujian: 1.67 jam x 2 kali = 3.34 jam<br>Total = 138.72 jam<br><br><i>Lecture: 1.67 hours x 14 weeks = 23.38 hours</i><br><i>Structured exercises and assignments: 4 hours x 14 weeks = 56 hours</i><br><i>Independent activities: 4 hours x 14 weeks = 56 hours</i><br><i>Exam: 1.67 hours x 2 time = 3.34 hours</i><br><i>Total = 138.72 hours</i> |
| <b>Kredit</b><br><i>Credits</i>                                                                                  | 2 SKS<br><i>2 credits</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Persyaratan sesuai dengan peraturan ujian</b><br><i>Requirements according to the examination regulations</i> | Minimum 80% kehadiran untuk mengikuti ujian tertulis<br><br><i>Minimum 80% attendance in this course in order to take the exams</i>                                                                                                                                                                                                                                                                                                                                                                 |

|                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| <p><b>Deskripsi Mata Kuliah</b></p><br><br><br><br><br><br><br><p><i>Description of Course</i></p> | <p>Mata kuliah ini berfokus pada pengenalan dan pemahaman mengenai proses fisik lautan dan keterkaitannya terhadap survei pemetaan di laut. Secara umum, pendekatan fenomena yang terjadi di area pesisir seperti proses pantai maupun estuari dan fluktuasi muka air laut juga disampaikan dalam mata kuliah ini. Selain itu, dipaparkan pula berbagai instrumen untuk mengobservasi fenomena tersebut. Mata kuliah ini ditujukan kepada mahasiswa magister yang akan melakukan penelitian mengenai geomatika kelautan. Program pada mata kuliah ini baik berupa pemaparan materi, praktikum atau pemodelan, maupun penugasan lainnya akan mampu memberikan kesempatan kepada mahasiswa agar dapat berpikir kritis terhadap fenomena fisik di lautan beserta pengaruhnya terhadap hasil akuisisi data kedalaman menggunakan instrumen akuistik untuk pemetaan laut.</p><br><br><br><br><br><br><br><p><i>This course focuses on the introduction and understanding of the physical processes of the ocean and their relationship to mapping surveys at sea. In general, approaches to phenomena that occur in coastal areas such as coastal processes and estuaries and sea level fluctuations are also presented in this course. In addition, various instruments to observe this phenomenon are presented. This course is intended for master students who will conduct research on marine geomatics. Programs in this course in the form of material presentations, practicum or modeling, as well as other assignments will be able to provide opportunities for students to think critically about physical phenomena in the ocean and their effects on the results of depth data acquisition using acoustic instruments for ocean mapping.</i></p> |
| <p><b>Capaian Pembelajaran / Course Learning Outcomes</b></p>                                      | <ol style="list-style-type: none"> <li>1. Mahasiswa mampu memahami konsep dan teori dari proses fisik di lautan atau oseanografi fisik</li> <li>2. Mahasiswa mampu menjelaskan keterikatan antara laut dan atmosfer</li> <li>3. Mahasiswa mengetahui proses dan parameter distribusi panas di lautan (ocean heat budget)</li> <li>4. Mahasiswa memahami berbagai parameter fisik lautan yang berhubungan dengan propagasi gelombang suara di kolom air</li> <li>5. Mahasiswa mampu menjelaskan konsep pengaruh parameter fisik lautan terhadap cepat rambat gelombang suara</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

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| <div>Module objectives / course learning outcomes</div>                                                    | <div><div><div>6. Mahasiswa mampu mengetahui tentang dinamika air laut</div><div>7. Mahasiswa mengetahui proses terbentuknya pantai beserta geomorfologi pesisir</div><div>8. Mahasiswa mengetahui instrumen yang digunakan dalam observasi fenomena fisik di lautan</div></div><div><div>1. Students are able to understand the concepts and theories of physical processes in the ocean or physical oceanography</div><div>2. Students are able to explain the relationship between the ocean and the atmosphere</div><div>3. Students know the process and parameters of heat distribution in the ocean (ocean heat budget)</div><div>4. Students understand the various physical parameters of the oceans related to the propagation of sound waves in the water column</div><div>5. Students are able to explain the concept of the influence of ocean physical parameters on the speed of sound waves</div><div>6. Students are able to know about the dynamics of seawater</div><div>7. Students know the process of the formation of the coast along with coastal geomorphology</div><div>8. tudents know the instruments used in observing physical phenomena in the ocean</div></div></div>                                                                                                          |       |       |       |       |       |       |       |       |        |        |        |        |        |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |   |   |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |  |   |  |  |  |  |  |  |  |  |  |  |       |  |  |   |   |  |  |  |  |  |  |  |  |       |  |  |  |  |  |  |   |  |  |  |  |  |
| <div>CPMK dan hubungan dengan CPL Prodi</div> <div>Learning outcomes and their corresponding to PLOs</div> | <table><tr><td></td><td>PLO.1</td><td>PLO.2</td><td>PLO.3</td><td>PLO.4</td><td>PLO.5</td><td>PLO.6</td><td>PLO.7</td><td>PLO.8</td><td>PLO.9</td><td>PLO.10</td><td>PLO.11</td><td>PLO.12</td></tr><tr><td>CLO.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></tr><tr><td>CLO.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></tr><tr><td>CLO.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></tr><tr><td>CLO.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></tr><tr><td>CLO.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></tr><tr><td>CLO.6</td><td></td><td>✓</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CLO.7</td><td></td><td></td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CLO.8</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> |       | PLO.1 | PLO.2 | PLO.3 | PLO.4 | PLO.5 | PLO.6 | PLO.7 | PLO.8  | PLO.9  | PLO.10 | PLO.11 | PLO.12 | CLO.1 | ✓ |  |  |  |  |  |  |  |  |  |  |  | CLO.2 |  | ✓ | ✓ |  |  |  |  |  |  |  |  |  | CLO.3 |  |  |  | ✓ |  |  |  |  |  |  |  |  | CLO.4 | ✓ |  |  |  |  |  |  |  |  |  |  |  | CLO.5 |  |  |  | ✓ |  |  |  |  |  |  |  |  | CLO.6 |  | ✓ |  |  |  |  |  |  |  |  |  |  | CLO.7 |  |  | ✓ | ✓ |  |  |  |  |  |  |  |  | CLO.8 |  |  |  |  |  |  | ✓ |  |  |  |  |  |
|                                                                                                            | PLO.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | PLO.2 | PLO.3 | PLO.4 | PLO.5 | PLO.6 | PLO.7 | PLO.8 | PLO.9 | PLO.10 | PLO.11 | PLO.12 |        |        |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |   |   |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |  |   |  |  |  |  |  |  |  |  |  |  |       |  |  |   |   |  |  |  |  |  |  |  |  |       |  |  |  |  |  |  |   |  |  |  |  |  |
| CLO.1                                                                                                      | ✓                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |       |       |       |       |       |       |       |        |        |        |        |        |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |   |   |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |  |   |  |  |  |  |  |  |  |  |  |  |       |  |  |   |   |  |  |  |  |  |  |  |  |       |  |  |  |  |  |  |   |  |  |  |  |  |
| CLO.2                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ✓     | ✓     |       |       |       |       |       |       |        |        |        |        |        |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |   |   |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |  |   |  |  |  |  |  |  |  |  |  |  |       |  |  |   |   |  |  |  |  |  |  |  |  |       |  |  |  |  |  |  |   |  |  |  |  |  |
| CLO.3                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |       |       | ✓     |       |       |       |       |       |        |        |        |        |        |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |   |   |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |  |   |  |  |  |  |  |  |  |  |  |  |       |  |  |   |   |  |  |  |  |  |  |  |  |       |  |  |  |  |  |  |   |  |  |  |  |  |
| CLO.4                                                                                                      | ✓                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |       |       |       |       |       |       |       |        |        |        |        |        |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |   |   |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |  |   |  |  |  |  |  |  |  |  |  |  |       |  |  |   |   |  |  |  |  |  |  |  |  |       |  |  |  |  |  |  |   |  |  |  |  |  |
| CLO.5                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |       |       | ✓     |       |       |       |       |       |        |        |        |        |        |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |   |   |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |  |   |  |  |  |  |  |  |  |  |  |  |       |  |  |   |   |  |  |  |  |  |  |  |  |       |  |  |  |  |  |  |   |  |  |  |  |  |
| CLO.6                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ✓     |       |       |       |       |       |       |       |        |        |        |        |        |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |   |   |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |  |   |  |  |  |  |  |  |  |  |  |  |       |  |  |   |   |  |  |  |  |  |  |  |  |       |  |  |  |  |  |  |   |  |  |  |  |  |
| CLO.7                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |       | ✓     | ✓     |       |       |       |       |       |        |        |        |        |        |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |   |   |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |  |   |  |  |  |  |  |  |  |  |  |  |       |  |  |   |   |  |  |  |  |  |  |  |  |       |  |  |  |  |  |  |   |  |  |  |  |  |
| CLO.8                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |       |       |       |       |       | ✓     |       |       |        |        |        |        |        |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |   |   |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |  |   |  |  |  |  |  |  |  |  |  |  |       |  |  |   |   |  |  |  |  |  |  |  |  |       |  |  |  |  |  |  |   |  |  |  |  |  |
| <div>Mata kuliah wajib prasyarat</div> <div>Mandatory prerequisites</div>                                  | <div>-</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |       |       |       |       |       |       |       |        |        |        |        |        |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |   |   |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |  |   |  |  |  |  |  |  |  |  |  |  |       |  |  |   |   |  |  |  |  |  |  |  |  |       |  |  |  |  |  |  |   |  |  |  |  |  |
| <div>Pokok Bahasan</div>                                                                                   | <div><div><div>• Pengantar oceanografi dan oseanografi fisika</div><div>• Pengaruh atmosfer terhadap lautan</div><div>• Ocean heat budget</div><div>• Temperatur, salinitas, densitas</div><div>• Harmonic sound speed</div><div>• Dinamika air laut: current, ocean wave, tides</div></div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |       |       |       |       |       |       |       |        |        |        |        |        |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |   |   |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |   |  |  |  |  |  |  |  |  |  |  |  |       |  |  |  |   |  |  |  |  |  |  |  |  |       |  |   |  |  |  |  |  |  |  |  |  |  |       |  |  |   |   |  |  |  |  |  |  |  |  |       |  |  |  |  |  |  |   |  |  |  |  |  |

| <b>Content</b>                                                                                                  | <ul style="list-style-type: none"> <li>• Proses pantai: <i>coastal process</i> dan pasang surut</li> <li>• Estuari</li> <li>• Instrumen observasi parameter oseanografi</li> <li>• <i>Shelf processes-stratification</i></li> <li>• R.O.F.I's</li> <li>• <i>Introduction to oceanography and physical oceanography</i></li> <li>• <i>The influence of the atmosphere on the ocean</i></li> <li>• <i>Ocean heat budget</i></li> <li>• <i>Temperature, salinity, density</i></li> <li>• <i>Harmonic sound speed</i></li> <li>• <i>Ocean dynamics: current, ocean wave, tides</i></li> <li>• <i>Coastal processes: coastal process and tides</i></li> <li>• <i>Estuary</i></li> <li>• <i>Instruments for observing oceanographic parameters</i></li> <li>• <i>Shelf processes-stratification</i></li> <li>• <i>R.O.F.I's</i></li> </ul> |                  |              |                                |     |                                |     |                                |     |                                                      |     |                                |    |                                              |     |
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| <b>Pembelajaran dan Persyaratan Ujian</b><br><i>Study and examination requirements and forms of examination</i> | <table border="1"> <thead> <tr> <th>Rencana Evaluasi</th><th>Bobot Weight</th></tr> </thead> <tbody> <tr> <td>Tugas 1<br/><i>Assignment 1</i></td><td>20%</td></tr> <tr> <td>Tugas 2<br/><i>Assignment 2</i></td><td>10%</td></tr> <tr> <td>Tugas 3<br/><i>Assignment 3</i></td><td>15%</td></tr> <tr> <td>Evaluasi Tengah Semester<br/><i>Mid Semester Exam</i></td><td>25%</td></tr> <tr> <td>Tugas 4<br/><i>Assignment 4</i></td><td>5%</td></tr> <tr> <td>Evaluasi Akhir Semester<br/><i>Final Exam</i></td><td>25%</td></tr> </tbody> </table>                                                                                                                                                                                                                                                                                  | Rencana Evaluasi | Bobot Weight | Tugas 1<br><i>Assignment 1</i> | 20% | Tugas 2<br><i>Assignment 2</i> | 10% | Tugas 3<br><i>Assignment 3</i> | 15% | Evaluasi Tengah Semester<br><i>Mid Semester Exam</i> | 25% | Tugas 4<br><i>Assignment 4</i> | 5% | Evaluasi Akhir Semester<br><i>Final Exam</i> | 25% |
| Rencana Evaluasi                                                                                                | Bobot Weight                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                  |              |                                |     |                                |     |                                |     |                                                      |     |                                |    |                                              |     |
| Tugas 1<br><i>Assignment 1</i>                                                                                  | 20%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |              |                                |     |                                |     |                                |     |                                                      |     |                                |    |                                              |     |
| Tugas 2<br><i>Assignment 2</i>                                                                                  | 10%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |              |                                |     |                                |     |                                |     |                                                      |     |                                |    |                                              |     |
| Tugas 3<br><i>Assignment 3</i>                                                                                  | 15%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |              |                                |     |                                |     |                                |     |                                                      |     |                                |    |                                              |     |
| Evaluasi Tengah Semester<br><i>Mid Semester Exam</i>                                                            | 25%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |              |                                |     |                                |     |                                |     |                                                      |     |                                |    |                                              |     |
| Tugas 4<br><i>Assignment 4</i>                                                                                  | 5%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                  |              |                                |     |                                |     |                                |     |                                                      |     |                                |    |                                              |     |
| Evaluasi Akhir Semester<br><i>Final Exam</i>                                                                    | 25%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |              |                                |     |                                |     |                                |     |                                                      |     |                                |    |                                              |     |
| <b>Media yang digunakan</b><br><i>Media employed</i>                                                            | Media pengajaran secara klasik dengan papan tulis dan presentasi power point<br><i>Classical teaching tools with white board and power point presentation</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |              |                                |     |                                |     |                                |     |                                                      |     |                                |    |                                              |     |
| <b>Daftar Pustaka</b><br><i>Reading list</i>                                                                    | <ol style="list-style-type: none"> <li>1. Stewart, R.H., 2000. Introduction to Physical Oceanography. Department of Oceanography</li> <li>2. Sahala Hutabarat dan Stewart M. Evans. 2008. Pengantar Oseanografi. UI Press</li> <li>3. David Tolmazin. 1985. Elements of Dynamic Oceanography. Springer, Dordrecht</li> <li>4. John H. Simpson dan Jonathan Sharples. 2012. Introduction to the Physical and Biological Oceanography of Shelf Seas. Cambridge University Press</li> <li>5. Matthias Tomczak. 2000. Introduction to Physical Oceanography</li> </ol>                                                                                                                                                                                                                                                                   |                  |              |                                |     |                                |     |                                |     |                                                      |     |                                |    |                                              |     |

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|  | 6. Matthias Tomczak. 2000. Shelf and Coastal Oceanography. |
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