

v1.1-db4

BAIKABP UNDIP

PRODI S3 Ilmu Lingkungan  
 KODE MK PCIL9132  
 NAMA MK Ekologi dan Perubahan Lingkungan Global  
 KURIKULUM 0  
 UUID 42c50abc-3765-4ffb-bc37-de9d57b7e4fd

Silakan copy sheet, rename nama sheet jadi kode MK, pilih kode MK dan isi pada cell yang berwarna putih. Sheet **bisa dicopy** dalam workbook yang sama untuk mengisi MK yang lain (Satu sheet satu MK). Mohon tidak menambah atau mengurangi kolom karena berdampak pada tidak terbacanya excel oleh sistem.

**Panduan selengkapnya bisa dilihat di (Klik box ini)**  
[https://1drv.ms/w/s!A1a6piOvcyPupFU4UCjgRMQ\\_NWuE?e=caPoli](https://1drv.ms/w/s!A1a6piOvcyPupFU4UCjgRMQ_NWuE?e=caPoli)

No.	Evaluasi	Komponen	Bobot (%)	Deskripsi*	Deskripsi (Inggris)
1	Aktivitas Partisipatif	-	30	Setiap mahasiswa diberi tugas dengan tema yang sudah ditetapkan. Bahan disarikan dari perkembangan terkini dari jurnal 5 tahun terakhir. Isi terdiri dari pengantar teori, contoh permasalahan diambil dari jurnal dan solusi terhadap permasalahan tersebut dari berbagai pendekatan abiotik (fisika, kimia), biotik (biologi), dan culture (kebijakan, sosial, kemasayarakatan, dan kesehatan). Minimal referensi 20, utamanya dari jurnal internasional bereputasi. Setiap mahasiswa mempresentasikan tugasnya dan diskusi kelas. Kegiatan ini merupakan PBL ( <i>project based learning</i> ). TM 4, 9, 13	Each student is assigned a task with a pre-set theme. The material is abstracted from the latest developments of journals of the last 5 years. The content consists of an introduction to theory, examples of problems taken from journals and solutions to these problems from various abiotic (physics, chemistry), biotic (biology), and culture (policy, social, community, and health). Minimum reference 20, mainly from reputable international journals. Each student presents his or her assignments and class discussions. This activity is PBL ( <i>project based learning</i> ). Weeks 4, 9, 13.
2	Hasil Proyek	-	30	Mahasiswa melakukan analisis terkait permasalahan lingkungan global. Mahasiswa berdiskusi secara aktif untuk mencari solusi atas dampak permasalahan lingkungan global, tekanannya terhadap ekosistem, dan solusi penyelesaian dengan pendekatan energi dan teknologi, yaitu perubahan kualitas dan komposisi pada skala global. Studi kasus ( <i>case study methods</i> ) diambil dari jurnal, youtube atau sumber lainnya, pembahasan secara holistik dari aspek ABC (abiotic, biotic, culture). TM 3, 6, 10,14	Students conduct an analysis of global environmental issues. Students discuss actively to find solutions to the impact of global environmental problems, their pressures on ecosystems, and solutions with energy and technology approaches, namely changes in quality and composition on a global scale. Case study methods are taken from journals, youtube or other sources, a holistic discussion of the aspect of ABC (abiotic, biotic, culture). Weeks 3, 6, 10, 14.
3	Kognitif/Pengetahuan	Tugas	5	Mahasiswa diskusi kelompoknya untuk TM 4,9,13	Student group discussion for Weeks 4,9,13
		Quiz	5	Kuis diberikan oleh dosen di KULON/MSTEAMS untuk topik tertentu	Quiz given by lecturers at KULON/MSTEAMS for specific topics
		UTS	15	UTS diberikan kepada mahasiswa dengan mengerjakan soal dan jawaban dan analisis diupload pada KULON atau TEAMS	Mid exam is provided to students by working on questions and answers and the analysis uploaded to KULON or TEAMS
		UAS	15	UAS diberikan kepada mahasiswa dengan mengerjakan soal dan jawaban dan analisis diupload pada KULON atau TEAMS	Final exam is given to students by working on questions and answers and analysis uploaded on KULON or TEAMS
<b>TOTAL</b>			<b>100</b>	<b>OK</b>	

## RENCANA PEMBELAJARAN

Pertemuan	Materi	Materi (Inggris)
1	<ol style="list-style-type: none"> <li>Kontrak Kuliah</li> <li>Tujuan dan rancangan materi kuliah keseluruhan</li> <li>Pengantar: sejarah</li> <li>Struktur ekosistem</li> <li>Keseimbangan fungsi ekosistem:               <ul style="list-style-type: none"> <li>- aliran energi di bumi</li> <li>- siklus biogeokimia (energi terbarukan dan relatif tak terbarukan)</li> <li>- rantai makanan &amp; efisiensi jaring-jaring makanan di bumi</li> <li>- arus informasi</li> </ul> </li> <li>Keberlanjutan ekosistem: respon terhadap gangguan               <ul style="list-style-type: none"> <li>- daya lenting, proses suksesi I dan II</li> <li>- daya dukung dan kemampuan asimilasi limbah</li> <li>- keanekaragaman, distribusi dan stabilitas komunitas</li> <li>- respon komunitas terhadap gangguan skala kecil</li> <li>- konsep dominasi spesies</li> </ul> </li> </ol> <p>(self directed learning). 14.0625 jam = 0.5625 ECTS. 16 minggu pertemuan adalah 225 jam = 9 ECTS.</p>	<ol style="list-style-type: none"> <li>Lecture Contract</li> <li>The purpose and design of the overall course material</li> <li>Introduction: history</li> <li>Ecosystem structure</li> <li>The balance of ecosystem functions:               <ul style="list-style-type: none"> <li>- energy flow on earth</li> <li>- biogeochemical cycles (renewable and relatively non-renewable energy)</li> <li>- food chains &amp; the efficiency of food webs on earth</li> <li>- information flow</li> </ul> </li> <li>Ecosystem sustainability: response to disturbance               <ul style="list-style-type: none"> <li>- resilience, succession process I and II</li> <li>- carrying capacity and waste assimilation ability</li> <li>- community diversity, distribution and stability</li> <li>- community response to small-scale disturbance</li> <li>- the concept of species dominance</li> </ul> </li> </ol> <p>(self-directed learning). 14.0625 hours = 0.5625 ECTS. 16 weeks of meetings is 225 hours = 9 ECTS.</p>

## TIP:

Gunakan shortcut Alt + Enter untuk menyisipkan baris baru

2	<p>Krisis ekologi, Pengelolaan homeostasis pada aras populasi-komunitas-ekosistem</p> <ul style="list-style-type: none"> <li>- adaptasi dan variasi genetika,</li> <li>- mutasi dan seleksi alam</li> <li>- spesiasi dan evolusi</li> <li>- adaptive radiation</li> </ul> <p>Sistem hara utama di ekosistem (C, O, N, P)</p> <ul style="list-style-type: none"> <li>- Siklus karbon</li> <li>- Siklus oksigen</li> <li>- Siklus nitrogen</li> <li>- Siklus fosfor</li> </ul> <p>Krisis Sumberdaya Alam dan perubahan iklim skala global</p> <ul style="list-style-type: none"> <li>- Prinsip-prinsip yang salah kaprah tentang sumberdaya alam di bumi (self directed learning). 14.0625 jam = 0.5625 ECTS</li> </ul>	<p>1. Homeostasis management at the population-community-ecosystem level</p> <ul style="list-style-type: none"> <li>- genetic adaptation and variation,</li> <li>- mutation and natural selection</li> <li>- speciation and evolution</li> <li>- adaptive radiation</li> </ul> <p>2. The main nutrient system in the ecosystem (C, O, N, P)</p> <ul style="list-style-type: none"> <li>- Carbon cycle</li> <li>- Oxygen cycle</li> <li>- Nitrogen cycle</li> <li>- Phosphorus Cycle</li> </ul> <p>3. Natural Resource Crisis and global climate change</p> <ul style="list-style-type: none"> <li>- Misguided principles about natural resources on earth (self-directed learning). 14.0625 hours = 0.5625 ECTS</li> </ul>
3	<p>Pemanasan global</p> <ul style="list-style-type: none"> <li>- Jumlah Gas CO2</li> <li>- Sumber-sumber gas CO2</li> <li>- Konsentrasi CO2 di atmosfer dari tahun ke tahun</li> <li>- Konsentrasi CO2 atmosfer terhadap temperatur rata-rata bumi</li> <li>- Keseimbangan energi di planet bumi</li> <li>- Krisis Kependudukan</li> <li>- Krisis Teknologi dan Ilmu Pengetahuan (self directed learning). 14.0625 jam = 0.5625 ECTS</li> </ul>	<p>1. Understanding of global warming:</p> <ul style="list-style-type: none"> <li>- Amount of CO2</li> <li>- Sources of CO2 . gas</li> <li>- Concentration of CO2 in the atmosphere from year to year</li> <li>- Atmospheric CO2 concentration to Earth's average temperature</li> <li>- Energy balance on planet earth</li> <li>- Population Crisis</li> <li>- Technology and Science Crisis (self-directed learning). 14.0625 hours = 0.5625 ECTS</li> </ul>
4	<p>Dampak perubahan iklim skala global:</p> <ul style="list-style-type: none"> <li>- Dampak peningkatan suhu air permukaan laut &amp; muka air laut</li> <li>- Dampak terhadap air tawar</li> <li>- Dampak terhadap ekosistem terestrik dan akuatik</li> <li>- Dampak terhadap biota, pertanian dan persediaan pangan</li> <li>- Dampak terhadap penyakit dan kesehatan manusia (problem-based learning, tugas kelompok). 14.0625 jam = 0.5625 ECTS</li> </ul>	<p>1. Global scale impacts of climate change:</p> <ul style="list-style-type: none"> <li>- The impact of increasing sea surface water temperature &amp; sea level</li> <li>- Impact on fresh water</li> <li>- Impact on terrestrial and aquatic ecosystems</li> <li>- Impact on biota, agriculture and food supply</li> <li>- Impact on disease and human health (problem-based learning, group assignments). 14.0625 hours = 0.5625 ECTS</li> </ul>
5	<p>Jasa Ekosistem dan pengelolaan lingkungan</p> <ul style="list-style-type: none"> <li>- Jasa &amp; layanan ekosistem</li> <li>- Program pengelolaan lingkungan hidup dan energi di Indonesia</li> <li>- Pengembangan pengelolaan lingkungan hidup dan energi di Indonesia</li> <li>- Perundangan RI tentang Pengelolaan Lingkungan &amp; Energi (berubah sesuai perundangan yang sedang berlaku)</li> <li>- Kekuatan hukum dan kebijakan internasional</li> <li>- Undang Undang RI terkait perubahan lingkungan skala global</li> <li>- Ratifikasi kesepakatan internasional (problem-based learning, tugas individual). 14.0625 jam = 0.5625 ECTS</li> </ul>	<p>1. Principles of environmentally friendly energy development</p> <ul style="list-style-type: none"> <li>- Ecosystem services &amp; services</li> <li>- Environmental and energy management programs in Indonesia</li> <li>- Development of environmental and energy management in Indonesia</li> <li>- The Republic of Indonesia Law on Environmental &amp; Energy Management (changes according to current legislation)</li> <li>- The power of international law and policy</li> <li>- Law of the Republic of Indonesia regarding global environmental changes</li> <li>- Ratification of international agreements (problem-based learning, individual assignments). 14.0625 hours = 0.5625 ECTS</li> </ul>
6	<p>1. Produksi bersih limbah</p> <ul style="list-style-type: none"> <li>- Produksi bersih</li> <li>- Produksi buangan domestik</li> <li>- Produksi buangan industri</li> <li>- Penggunaan non renewable resources</li> <li>- Alternatif bentuk-bentuk upaya keberlanjutan (discovery learning, self directed learning).14.0625 jam = 0.5625 ECTS</li> </ul>	<p>1. Clean production of activity waste</p> <ul style="list-style-type: none"> <li>- Clean production</li> <li>- Domestic waste production</li> <li>- Industrial waste production</li> <li>- Use of non-renewable resources</li> <li>- Alternative forms of sustainability efforts (discovery learning, self-directed learning). 14.0625 hours = 0.5625 ECTS</li> </ul>

7	<p>Emisi karbon</p> <ul style="list-style-type: none"> <li>- Emisi karbon (metrik ton/kapita), jejak karbon</li> <li>- Profil emisi CO2 Indonesia dan perdagangannya</li> <li>- Kegiatan utama penghasil emisi karbon (energi listrik, pertanian, transportasi, manufaktur, kehutanan)</li> <li>- Mengapa emisi karbon dapat diperdagangkan? apa unitnya?</li> <li>- Pajak karbon/carbon tax di Indonesia</li> <li>- Apakah perdagangan emisi karbon berhasil mengurangi kadar CO2 atmosfer? (case study individual). 14.0625 jam = 0.5625 ECTS</li> </ul>	<p>1. Trading on carbon emission quotas</p> <ul style="list-style-type: none"> <li>- Carbon emissions (metric tons/capita), carbon footprint</li> <li>- Indonesia's CO2 emission profile and trade</li> <li>- The main carbon emitting activities (electric energy, agriculture, transportation, manufacturing, forestry)</li> <li>- Why are carbon emissions tradeable? what is the unit?</li> <li>- Carbon tax in Indonesia</li> <li>- Has carbon emission trading been successful in reducing atmospheric CO2 levels? (individual case study). 14.0625 hours = 0.5625 ECTS</li> </ul>
8	<p>UTS. 14.0625 jam = 0.5625 ECTS</p>	<p>Mid Exam. 14.0625 hours = 0.5625 ECTS</p>
9	<p>Mitigasi emisi CO2 bidang energi</p> <ul style="list-style-type: none"> <li>- Perhitungan emisi sektor energi</li> <li>- Base line emisi sektor energi daerah</li> <li>- Contoh perhitungan mitigasi emisi CO2</li> <li>- Potensi aksi mitigasi emisi sektor energi daerah (sisi penyediaan dan kebutuhan energi)</li> <li>- Contoh Rencana Aksi Daerah</li> <li>- Aplikasi Software LEAP (Long Range Energy Alternative Program) (self directed learning). 14.0625 jam = 0.5625 ECTS</li> </ul>	<p>1. Mitigation of energy sector CO2 emissions:</p> <ul style="list-style-type: none"> <li>- Energy sector emission calculation</li> <li>- Base line for regional energy sector emissions</li> <li>- Example of CO2 emission mitigation calculation</li> <li>- Potential emission mitigation actions in the regional energy sector (energy supply and demand side)</li> <li>- Sample Regional Action Plan</li> <li>- LEAP (Long Range Energy Alternative Program) Software Application (self-directed learning). 14.0625 hours = 0.5625 ECTS</li> </ul>
10	<p>Potensi energi</p> <ul style="list-style-type: none"> <li>- Klasifikasi jenis energi</li> <li>- Potensi energi fosil</li> <li>- Potensi Energi terbarukan</li> <li>- Kebijakan di bidang Energi di Indonesia</li> <li>- Emisi CO2 berbagai jenis energi fosil</li> <li>- Akibat penggunaan energi fosil (self directed learning). 14.0625 jam = 0.5625 ECTS</li> </ul>	<p>1. Fossil energy and its consequences:</p> <ul style="list-style-type: none"> <li>- Classification of energy types</li> <li>- Fossil energy potential</li> <li>- Renewable energy potential</li> <li>- Energy Policy in Indonesia</li> <li>- CO2 emissions of various types of fossil energy</li> <li>- Due to the use of fossil energy (self-directed learning). 14.0625 hours = 0.5625 ECTS</li> </ul>
11	<p>Energi masa depan</p> <ul style="list-style-type: none"> <li>- Efisiensi penggunaan energi fosil</li> <li>- Substitusi oleh energi terbarukan</li> <li>- Sumber –sumber energi ramah lingkungan untuk masa depan</li> <li>-Tecnologi energi masa depan (problem-based learning, tugas kelompok). 14.0625 jam = 0.5625 ECTS</li> </ul>	<p>1. Minimum behavior to slow global warming</p> <ul style="list-style-type: none"> <li>- Efficient use of fossil energy</li> <li>- Substitution by renewable energy</li> <li>- Environmentally friendly energy sources for the future</li> <li>-Future energy technology (problem-based learning, group assignments). 14.0625 hours = 0.5625 ECTS</li> </ul>
12	<p>Konservasi energi</p> <ul style="list-style-type: none"> <li>- Konservasi energi pada bangunan</li> <li>- Konservasi energi pada alat transportasi</li> <li>- Konservasi energi pada industri</li> <li>- Pemanfaatan teknologi hemat energi</li> <li>- Efisiensi penggunaan energi</li> <li>- Energi dan moda transportasi di masa depan (case method, tugas individual). 14.0625 jam = 0.5625 ECTS</li> </ul>	<p>1. Conventional energy conservation techniques</p> <ul style="list-style-type: none"> <li>- Energy conservation in buildings</li> <li>- Energy conservation in means of transportation</li> <li>- Energy conservation in industry</li> <li>- Utilization of energy-saving technology</li> <li>- Energy use efficiency</li> <li>- Energy and future modes of transportation (case method, individual task). 14.0625 hours = 0.5625 ECTS</li> </ul>
13	<p>Energi ramah lingkungan</p> <ul style="list-style-type: none"> <li>- energi matahari,</li> <li>- energi angin,</li> <li>- energi air,</li> <li>- energi biomass</li> <li>- trend jenis-jenis energi terbarukan ramah lingkungan (case study). 14.0625 jam = 0.5625 ECTS</li> </ul>	<p>1. Technologies developed for environmentally friendly energy</p> <ul style="list-style-type: none"> <li>- solar energy,</li> <li>- wind energy,</li> <li>- water energy,</li> <li>- biomass energy</li> <li>- trend of environmentally friendly renewable energy types (case study). 14.0625 hours = 0.5625 ECTS</li> </ul>

14	<p>1. Teknologi yang dikembangkan untuk energi ramah lingkungan</p> <ul style="list-style-type: none"> <li>- beragam teknologi energi gas,</li> <li>- teknologi energi geotermal,</li> <li>- energi nuklir dan radioisotop</li> <li>- teknologi bahan bakar hayati</li> </ul> <p>(research-based learning, case study). 14.0625 jam = 0.5625 ECTS</p>	<p>1. Technologies developed for environmentally friendly energy</p> <ul style="list-style-type: none"> <li>- a variety of gas energy technologies,</li> <li>- geothermal energy technology,</li> <li>- nuclear energy and radioisotopes</li> <li>- biofuel technology</li> </ul> <p>(research-based learning, case studies). 14.0625 hours = 0.5625 ECTS</p>
15	<p>Integrated and management energy</p> <ul style="list-style-type: none"> <li>- Energi terintegrasi</li> <li>- Konsep manajemen energi (case study, project based learning, presentasi). 14.0625 jam = 0.5625 ECTS</li> </ul>	<p>1. Concepts of integrated energy and energy management</p> <ul style="list-style-type: none"> <li>- Integrated energy</li> <li>- Energy management concept (case study, project based learning, presentation). 14.0625 hours = 0.5625 ECTS</li> </ul>
16	<p>UAS. 14.0625 jam = 0.5625 ECTS</p>	<p>Final exams. 14.0625 hours = 0.5625 ECTS</p>

