PORTFOLIO

EARTH AND PLANETARY SCIENCE COURSE

ACADEMIC YEAR 2019/2020

Undergraduate Programme in Science Education

Module Coordinator:
Dr. Wahono Widodo, M.Si.

Team:
An Nuril Maulida Fauziah, S.Pd., M.Pd.
Muhamad Arif Mahdiannur, S.Pd., M.Pd.

DEPARTMENT OF NATURAL SCIENCE
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
UNIVERSITAS NEGERI SURABAYA

EARTH AND PLANETARY SCIENCE COURSE PORTFOLIO
ACADEMIC YEAR 2019/2020

Module Coordinator:
Dr. Wahono Widodo, M.Si.

Team:
An Nuril Maulida Fauziah, S.Pd., M.Pd.
Muhamad Arif Mahdiannur, S.Pd., M.Pd.

Table of Content

A. Learning Activities Plan

1. Course Identity (Module Handbook Summary)

Module Name:	*Pengetahuan Bumi dan Antariksa* (Earth and Planetary Science)
Module Level:	Bachelor degree/Undergraduate Programme
Course Code:	8420103123
Abbreviation, if applicable:	PBA
Courses included in the module, if applicable:	Not applicable
Semester/term	VII/fourth year (senior)
Module coordinator(s):	Dr. Wahono Widodo, M.Si.
Lecturer(s):	Dr. Wahono Widodo, M.Si. An Nuril Maulida Fauziah, S.Pd., M.Pd. Muhamad Arif Mahdiannur, S.Pd., M.Pd.
Language:	*Bahasa Indonesia* (Indonesian Language)
Classification within the curriculum:	Compulsory / ~~Elective~~
Teaching format/class hours per week during the semester:	3 contact hours of lectures (Indonesia credit semester or *sks**)
Workload:	3 x 50 minutes lectures, 3 x 60 minutes structured activity, 3 x 60 minutes individual activity, 14 weeks per semester, 119 total hours per semester ~ 4.577 ECTS**
Credit point:	3 *sks* (4.577 ECTS)
Requirements:	General Physics (8420103045) General Chemistry (8420103074) General Biology (8420103023) Biodiversity (8420103065) Introductory of Biochemistry (8420103163) Wave and Optics (8420103049) Atom and Radioactivity (8420103171)
Learning goals/competencies:	**Course Learning Outcomes (CLOs):** After taking this course, students will be able to: 1. Apply principles/laws/theories to various the Earth physical phenomena; 2. Apply principles/laws/theories to various physical phenomena in the solar system and universe; 3. Applying substantive concepts (principles/laws/ theories) in the field of the Earth and space science in making science learning media; and 4. Design and conduct the Moon observation experiments based-on substantive and procedural concepts.
Content:	Lithosphere, Volcanoes, Earthquakes, Hydrosphere and Its Pollution, the Atmosphere and the Factors that Influence It, the Solar system, the Earth, the Revolutions and Rotation of the Earth and Moon and their Effects on Humans and Culture, Star Evolution, and Cosmology.
Attribute Soft skill:	Discipline, collaboration, responsibility, and argumentation in the natural classroom setting
Study/exam achievements:	Students are considered to be competent and pass if at least get 40% of the maximum final grade. The final grade (NA) is calculated based on the following weight:

<table>
<tr><td></td><td>
<table>
<tr><th>Assessment Components</th><th>Percentage Contribution</th></tr>
<tr><td>Participation</td><td>20%</td></tr>
<tr><td>Assignment</td><td>30%</td></tr>
<tr><td>Mid-semester test</td><td>20%</td></tr>
<tr><td>Final semester test</td><td>30%</td></tr>
<tr><td>Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Learning Methods</td><td>Constructivist, student-centred approach, project-based learning, lecturing, discussion, and presentation (structured activities), and flip learning</td></tr>
<tr><td>Form of Media:</td><td>LCD, PowerPoint slides, worksheets, telescope, and e-learning Vinesa (https://vinesa.unesa.ac.id/course/view.php?id=423)</td></tr>
<tr><td>Literature (primary references):</td><td>

1. Trefil, J. and Hazen, R.M., 2016. The Sciences: An Integrated Approach. Wiley Global Education.
2. Lunine, J.I., 2013. Earth: evolution of a habitable world. Cambridge University Press.
3. Hewitt, P.G., Lyons, S.A., Suchocki, J.A. and Yeh, J., 2013. Conceptual Integrated Science: Pearson New International Edition. Pearson Higher Ed.
4. Roy, A.E. and Clarke, D., 2003. Astronomy: Principles and Practice, (PBK). CRC Press.
5. Ringwood, A.E., 2012. Origin of the Earth and Moon. Springer Science & Business Media.
6. Druyan, A., MacFarlane, S., Cannold, M., Braga, B. and Clark, J., 2014. The cosmos: A spacetime odyssey [Video Series]. Beverly Hills, CA: Twentieth Century Fox.
7. Selin, H. ed., 2012. Astronomy across cultures: the history of non-Western astronomy (Vol. 1). Springer Science & Business Media.
8. Tim Pengembang Bahan Ajar IPBA. n.d. Buku Ajar IPBA. Unesa University Press.

</td></tr>
<tr><td rowspan="2">Notes:</td><td>*1 sks in learning process = three contact hours that consist of: (a) scheduled instruction in a classroom or laboratory (50 minutes); (b) structured activity (60 minutes); and (c) individual activity (60 minutes) according to the Regulation of Indonesia Ministry of Research, Technology, and Higher Education No. 44 Year 2015 jo. the Regulation of Indonesia Ministry of Research, Technology, and Higher Education No. 50 Year 2018.</td></tr>
<tr><td>**Total ECTS = (total hours workload)/26 hours
26 study hours = 1 ECTS credit point</td></tr>
</table>

2. Course Topics

The Earth and Planetary Science course discusses physical phenomena on Earth, planetary, and space science, including the structure of the Earth, lithosphere, atmosphere, solar system & other celestial bodies, and analyses the theory of the evolution of the universe.

3. Semester Learning Plan (RPS)

UNESA	**UNIVERSITAS NEGERI SURABAYA** **FACULTY OF MATHEMATICS AND NATURAL SCIENCES** **BACHELOR OF EDUCATION IN SCIENCE EDUCATION PROGRAMME**	**Document Code**

SEMESTER LEARNING/LESSON PLAN (RPS)

Course (MK)	**CODE**	**Course Type**	**Credit (sks)**		**SEMESTER**	**Date of Preparation**
Pengetahuan Bumi dan Antariksa (Earth and Planetary Science)	8420103123	Mandatory	**T = 3**	**P = 0**	VII	July 4th, 2019

AUTHORIZATION	**RPS Developer(s)**	**Course Group Coordinator**	**Head of Department/Programme**
	Dr. Wahono Widodo, M.Si. **An Nuril Maulida Fauziah, S.Pd., M.Pd.** **Muhamad Arif Mahdiannur, S.Pd., M.Pd.**	**Dr. Wahono Widodo, M.Si.**	**Prof. Dr. Erman, M.Pd.**

Learning Outcomes		
	Programme Learning Outcomes (PLOs) charged to the Course	
	PLO 2	Demonstrate knowledge of integrated science (physics, chemistry, and biology)
	Course Learning Outcomes (CLOs)	
	CLO 1	Apply principles/laws/theories to various the Earth physical phenomena
	CLO 2	Apply principles/laws/theories to various physical phenomena in the solar system and universe
	CLO 3	Apply substantive concepts (principles/laws/ theories) in the field of the Earth and planetary science in making science learning media
	CLO 4	Design and conduct the Moon observation experiments based-on substantive and procedural concepts
	The final ability of each learning phase (Sub-CLOs)	
	Sub-CLO 1	Apply principles/laws/theories to various physical phenomena in the lithosphere (characteristics of the lithosphere, layers of the Earth, rock cycles and minerals, volcanoes, and disaster mitigation due to earthquakes and tsunami)

	Sub-CLO 2	Apply principles/laws/theories to various physical phenomena in the hydrosphere (hydrosphere characteristics, hydrological cycle, water systems on the Earth, water resource management, and natural disaster mitigation in the hydrosphere layer)
	Sub-CLO 3	Apply principles/laws/theories to various physical phenomena in the atmosphere (atmospheric characteristics, vertical structure of the Earth's atmosphere, pollution, greenhouse gases and particulate pollutants, and mitigation of natural disasters in the atmosphere)
	Sub-CLO 4	Explain the theory of the origin of the solar system, the types of planets, satellites and their characteristics in the solar system, and the process of rotation and revolution of members of the solar system
	Sub-CLO 5	Applying the concept of the Earth-Moon system in the process of the eclipse of the Moon and the eclipse of the Sun and the process of the phases of the Moon
	Sub-CLO 6	Explain the theory of the big bang, astrological cosmology, and its influence in human life
	Sub-CLO 7	Apply the concept of the cosmic calendar and dark matter in the evolution of the universe
	Sub-CLO 8	Design and conduct the Moon observational experiments based on substantive and procedural concepts
	Sub-CLO 9	Explain the theory of the origin of the Earth, the process of Earth's occurrence, and the beginning of life on Earth
	Sub-CLO 10	Apply substantive concepts (principles/laws/ theories) in the field of Earth and space in making science learning media for junior high schools
Course Brief Description	This course discusses physical phenomena on earth and space, including the structure of the Earth, the lithosphere, the atmosphere, the solar system, and other celestial bodies, and analyses the theory of the evolution of the universe.	
Learning Materials	Lithosphere, volcanoes, earthquakes, hydrosphere and its pollution, the atmosphere and the factors that influence it, the solar system, the earth, the revolutions and rotation of the earth and moon and their effects on humans and culture, star evolution, and cosmology.	
References	**Primary:**	
	1. Trefil, J. and Hazen, R.M., 2016. *The Sciences: An Integrated Approach*. Wiley Global Education. 2. Lunine, J.I., 2013. *Earth: evolution of a habitable world*. Cambridge University Press. 3. Hewitt, P.G., Lyons, S.A., Suchocki, J.A. and Yeh, J., 2013. *Conceptual Integrated Science: Pearson New International Edition*. Pearson Higher Ed. 4. Roy, A.E. and Clarke, D., 2003. *Astronomy: Principles and Practice*, (PBK). CRC Press. 5. Ringwood, A.E., 2012. *Origin of the Earth and Moon*. Springer Science & Business Media. 6. Druyan, A., MacFarlane, S., Cannold, M., Braga, B. and Clark, J., 2014. The cosmos: A spacetime odyssey [Video Series]. *Beverly Hills, CA: Twentieth Century Fox*. 7. Selin, H. ed., 2012. *Astronomy across cultures: the history of non-Western astronomy* (Vol. 1). Springer Science & Business Media. 8. Tim Pengembang Bahan Ajar IPBA. n.d. *Buku Ajar IPBA*. Unesa University Press.	
	Support:	
	9. "Sky Map - Apps on Google Play". n.d. , available at: https://play.google.com/store/apps/details?id=com.google.android.stardroid&hl=en (accessed 9 December 2019).	

	10. "SkyView® Lite - Apps on Google Play". n.d. , available at: https://play.google.com/store/apps/details?id=com.t11.skyviewfree&hl=en (accessed 9 December 2019). 11. "Apparent retrograde motion - Wikipedia". n.d., available at: https://en.wikipedia.org/wiki/Apparent_retrograde_motion (accessed 9 December 2019). 12. "Kalender Jawa - Wikipedia bahasa Indonesia, ensiklopedia bebas". n.d., available at: https://id.wikipedia.org/wiki/Kalender_Jawa (accessed 9 December 2019). 13. "Kalender Jawa Sultan Agungan | Karaton Ngayogyakarta Hadiningrat - Kraton Jogja". n.d., available at: https://www.kratonjogja.id/ragam/21/kalender-jawa-sultan-agungan (accessed 9 December 2019). 14. "Perseid meteors 2019: All you need to know | Astronomy Essentials | EarthSky". n.d., available at: https://earthsky.org/astronomy-essentials/everything-you-need-to-know-perseid-meteor-shower (accessed 9 December 2019). 15. Divisi Pertanian. n.d. Panduan Praktis Menentukan Saat Tanam Berdasarkan Pranoto Mongso, available at: www.pplhseloliman.or.id (accessed 9 December 2019). 16 "Pranata mangsa - Wikipedia bahasa Indonesia, ensiklopedia bebas". n.d., available at: https://id.wikipedia.org/wiki/Pranata_mangsa (accessed 9 December 2019).
Lecturer(s)	Dr. Wahono Widodo, M.Si.; An Nuril Maulida Fauziah, S.Pd., M.Pd.; & Muhamad Arif Mahdiannur, S.Pd., M.Pd.
Requirements	General Physics (8420103045); General Chemistry (8420103074); General Biology (8420103023); Biodiversity (8420103065); Introductory of Biochemistry (8420103163); Wave and Optics (8420103049); & Atom and Radioactivity (8420103171)

Week	**Sub-CLOs**	**Assessment**		**Learning Format, Teaching Method, University Student Assignment [Estimated Time]**		**Learning Materials [Reference]**	**Weight (%)**
		Indicator	**Criteria & Format**	**Offline**	**Online**		
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
1-3	Sub-CLO 1	▪ Explain the characteristics of existing Earth lithosphere ▪ Apply principles/laws/theories to	**Criteria:** Accuracy in explaining and applying the characteristics of the lithosphere, the layers of the Earth, the cycle of rocks	**Method:** Constructivist, and discussion [TM: 3 x 3 x 50'] Assignment: #1 [PT+BM: 6 x 3 x 60']	-	**The Earth's Lithosphere & Variety of Disasters in the Lithosphere and Its Mitigation** **[1, 2, 3, 8]**	**13**

Week	Sub-CLOs	Assessment		Learning Format, Teaching Method, University Student Assignment [Estimated Time]		Learning Materials [Reference]	Weight (%)
		Indicator	Criteria & Format	Offline	Online		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		various physical phenomena in the lithos-phere (charac-teristics of the lithosphere, layers of the Earth, rock and mineral cycles, volcanoes, and disaster mitigation due to earthquake and tsunami) ▪ Communica-ting natural disaster relief efforts in the layers of the Earth's lithosphere	and minerals, volcanoes, and disasters that occur in the lithosphere and its mitigation **Non-test Format:** Making paper on lithosphere and disaster mitigation in the lithosphere layer Group presentation				
4-5	Sub-CLO 2	▪ Explain the characteristics that exist in	**Criteria:** Accuracy in explaining and	**Method:** Flip learning, constructivist, student-	**Method:** Virtual Learning Unesa, Vinesa	**Hydrosphere, Hydrological Cycle & Disaster Potential in**	**13**

Week	Sub-CLOs	Assessment		Learning Format, Teaching Method, University Student Assignment [Estimated Time]		Learning Materials [Reference]	Weight (%)
		Indicator	Criteria & Format	Offline	Online		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Earth's hydrosphere ▪ Apply principles/ laws/theories to various physical phenomena in the hydro-sphere (hydrosphere characteris-tics, hydrolo-gical cycle, water systems on Earth, water resource management, and natural disaster mitigation in the hydro-sphere layer) ▪ Communica-ting efforts to protect hydro-	applying the characteristics of the Earth hydrosphere, the hydrological cycle, the water system on Earth, and natural disasters in the hydrosphere and its mitigation **Non-test Format:** Making paper on hydrosphere, hydrological cycle, and disaster mitigation in the hydrosphere Group presentation	centred, and discussion [TM: 1 x 3 x 50'] Assignment: #2 [PT+BM: 4 x 3 x 60']	(https://vinesa.unesa.ac.id/course/view.php?id=423), Student-centred learning, and online discussion [TM: 1 x 3 x 50']	**Earth Hydrosphere and its Mitigation [1, 2, 3, 8]**	

Week	Sub-CLOs	Assessment		Learning Format, Teaching Method, University Student Assignment [Estimated Time]		Learning Materials [Reference]	Weight (%)
		Indicator	Criteria & Format	Offline	Online		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		spheres affected by natural disasters and pollution caused by human activities					
6-7	Sub-CLO 3	▪ Explain the characteristics that exist in the Earth's atmosphere ▪ Apply principles/ laws/theories to various physical phenomena in the atmos-phere (atmos-pheric charac-teristics, ver-tical structure of the Earth's atmosphere, pollution,	**Criteria:** Accuracy in explaining and applying the characteristics of the Earth's atmosphere, Earth's vertical structure, pollution, greenhouse gas & particulate pollutants, and the potential for disasters in the atmosphere and their mitigation **Non-test Format:** Making paper about the atmosphere of	**Method:** Constructivist, and discussion [TM: 2 x 3 x 50'] Assignment: #3 [PT+BM: 4 x 3 x 60']	-	**Atmosphere, Pollution & Potential Disasters in the Atmosphere and Its Mitigation** **[1, 2, 3, 8]**	**13**

Week	Sub-CLOs	Assessment		Learning Format, Teaching Method, University Student Assignment [Estimated Time]		Learning Materials [Reference]	Weight (%)
		Indicator	Criteria & Format	Offline	Online		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		greenhouse gases & particulate pollutants, and mitigation of natural disasters in the atmosphere) ▪ Communicating efforts in the atmosphere affected by natural disasters and pollution caused by human activities	the Earth, the factors that influence the atmosphere, pollution, potential disasters in the atmosphere and their mitigation Group presentation				
8	**Mid-semester Test**						
9	Sub-CLO 4	▪ Explain the theory of the origin of the solar system ▪ Mention planets and satellites in	**Criteria:** Accuracy and explains the theory of the origin of the solar system and members of the solar system	-	**Method:** Virtual Learning Unesa, Vinesa (https://vinesa.unesa.ac.id/course/view.php?id=423), Student-	**Theories of the Origins of the Solar System and Members of the Solar System [1, 3, 4, 6, 8]**	**8**

Week	Sub-CLOs	Assessment		Learning Format, Teaching Method, University Student Assignment [Estimated Time]		Learning Materials [Reference]	Weight (%)
		Indicator	Criteria & Format	Offline	Online		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		the solar system ▪ Explain the process of rotation and revolution	**Test format:** Essay		centred learning, and online discussion [TM: 1 x 3 x 50'] Assignment: #4 [PT+BM: 2 x 3 x 60']		
10-11	Sub-CLO 4 Sub-CLO 5 Sub-CLO 8	▪ Explain the characteristics of members of the solar system ▪ Applying the concept of the Earth-Moon system in the process of a lunar eclipse and a solar eclipse ▪ Applying the concept of the Earth-Moon system in the process of the phases of the Moon	**Criteria:** Accuracy and explain and apply the criteria of planets, satellites, asteroids, meteors, meteorites, phases of the Moon, and eclipses of the Sun and Moon **Non-test Format:** Moon observation experiment	**Method:** Lecturing, student-centred, and discussion [TM: 2 x 3 x 50'] Assignment: #5 [PT+BM: 4 x 3 x 60']		**Planets, Satellites, Asteroids, Meteors, Meteoroids, Moon phases, and Solar and Moon Eclipses** **[1, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16]**	**19**

Week	Sub-CLOs	Assessment		Learning Format, Teaching Method, University Student Assignment [Estimated Time]		Learning Materials [Reference]	Weight (%)
		Indicator	Criteria & Format	Offline	Online		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		▪ Design and conduct the Moon observation experiments based-on substantive and procedural concepts					
12	Sub-CLO 6 Sub-CLO 7	▪ Explain the theory of the big bang, astrological cosmology, and its influence in human life ▪ Apply the concept of cosmic calendar and dark matter in the evolution of the universe	**Criteria:** Accuracy in explaining and applying the theory of the big bang, the evolution of stars, the influence of astronomy on human life, the cosmic calendar and dark matter **Non-test Format:** Making paper about the cosmology Group presentation	-	**Method:** Virtual Learning Unesa, Vinesa (https://vinesa.unesa.ac.id/course/view.php?id=423), Student-centred learning, and online discussion [TM: 1 x 3 x 50'] Assignment: #6 [PT+BM: 2 x 3 x 60']	**Cosmology (star evolution)** **[1, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16]**	**8**

Week	Sub-CLOs	Assessment		Learning Format, Teaching Method, University Student Assignment [Estimated Time]		Learning Materials [Reference]	Weight (%)
		Indicator	Criteria & Format	Offline	Online		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
13	Sub-CLO 9	▪ Explain the theory of the origin of the Earth and the beginning of life on Earth	**Criteria:** Accuracy in explaining Earth (origin of Earth and origin of life on Earth) **Test Format:** Essay	**Method:** Constructivist, and discussion [TM: 1 x 3 x 50’] Assignment: #7 [PT+BM: 2 x 3 x 60’]	-	**Earth (the origin of the Earth and the origin of life on Earth) [1, 5, 6, 8]**	**3**
14-15	Sub-CLO 10	▪ Applying substantive concepts (principles/laws/theories) in the making of learning media	**Criteria:** The accuracy in applying the substantive concepts of the Earth and Planetary Science in making project assignments according to Rubric **Non-test Format:** Project-based learning, product quality	**Method:** Project-based learning, student-centred, and discussion [TM: 2 x 3 x 50’] Assignment: #8 [PT+BM: 4 x 3 x 60’]	-	**Media Project [1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16]**	**24**
16	**Final Semester Test**						

Note:
TM=Face-to-face, PT=Structured activity, BM=Independent activity, T=Theory, P=Practice.

4. Mapping Programme Learning Outcomes (PLOs)-Course Learning Outcomes (CLOs)

a. PLOs of B.Ed. in Science Education Programme, Universitas Negeri Surabaya

PLO 1	Demonstrate basic knowledge of physics, chemistry, and biology
PLO 2	Demonstrate knowledge of integrated science (physics, chemistry, and biology)
PLO 3	Demonstrate pedagogical knowledge of designing, implementing, and evaluating integrated science learning
PLO 4	Demonstrate knowledge related to science education research
PLO 5	Design, implement, and evaluate science learning using ICT
PLO 6	Design and conduct research about learning of integrated science, and acquire, analyse, and interpret the research data.
PLO 7	Communicate ideas and research results effectively both in oral and written forms
PLO 8	Make decisions based on data/information in order to complete tasks and evaluate the performance that has been done
PLO 9	Work effectively both individually and in groups, and have entrepreneurial spirits and environmental awareness
PLO 10	Demonstrate scientific, critical, and innovative attitudes in integrated science learning, laboratory activities, and professional-related tasks
PLO 11	Demonstrate religious and cultural values as well as academic ethics in carrying out their professional-related duties

b. Expected Learning Outcomes of the Earth and Planetary Science Course

CLO 1	Apply principles/laws/theories to various the Earth physical phenomena
CLO 2	Apply principles/laws/theories to various physical phenomena in the solar system and universe
CLO 3	Apply substantive concepts (principles/laws/ theories) in the field of the Earth and planetary science in making science learning media
CLO 4	Design and conduct the Moon observation experiments based-on substantive and procedural concepts

c. Mapping PLO and CLO in the Earth and Planetary Science Course

CLO	PLO										
	1	2	3	4	5	6	7	8	9	10	11
1		✓									
2		✓									
3		✓									
4		✓									

B. Course Assessment

1. Assessment Rubrics

a. Attitudes/Affective Domain

In this domain, we evaluated the students to participate in the classroom, such as discipline, willingness to communicate, debate, and cooperate/collaborate with the peer. The rubric used in this course:

Criteria	Score (S_A)
Really appreciate others, discipline to attend the class and gather the assignment, and can interact in the group or with peer	$75 \leq S_A \leq 100$
Appreciate the argumentations of others, 90% present in the class, but are not able to interact in a group or with peer	$65 \leq S_A < 75$
No respect the argumentations of others, 80% present in the class, but can interact in the group or with peer	$55 \leq S_A < 65$
No respect to the argumentations of others, less than 80% present in the class, not gather the assignment, and do not cooperate/collaborate in a group or with peer	$0 \leq S_A < 55$

b. Knowledge/Cognitive Domain

The students' knowledge assessed through assignments (individual and group) and tests (mid- and final semester). The criteria of assignment (individual and group) according to Assignment Rubrics (see Appendix 1). The criteria for tests (mid- and final semester) that use in this course are:

1) The ability to give answers correctly according to the Key and Rubrics;
2) The ability to provide robust argumentation according to theory;
3) The ability to provide systematic explanations; and
4) The ability to apply the substantive concepts in a situation comprehensively according to the Key and Rubrics.

c. Skills/Psychomotor Domain

The students' skills focused on science process skills. These skills assessed based on direct assessment of practical skills (DAPS) and indirect assessment of practical skills (IAPS) based on their reports.

2. Universitas Negeri Surabaya's Assessment System

University students are considered to be competent and pass if at least get 40% of the maximum final grade. The final grade (NA) is calculated based on the following weight:

Assessment Components	Percentage Contribution
Participation (including attitudes/affective)	20%
Assignment	30%
Mid-semester test	20%
Final semester test	30%
Total	**100%**

The final grade (NA) category according to the Universitas Negeri Surabaya Academic Regulation, that is:

NA Interval (out of 100)	Grade Point	Letter Grade
85 ≤ NA ≤ 100	4.00	A
80 ≤ NA < 85	3.75	A-
75 ≤ NA < 80	3.50	B+
70 ≤ NA < 75	3.00	B
65 ≤ NA < 70	2.75	B-
60 ≤ NA < 65	2.50	C+
55 ≤ NA < 60	2.00	C
40 ≤ NA < 55	1.00	D
0 ≤ NA < 40	0	E

C. Course Evaluation & Development

1. Academic Year 2019/2020 Result

a. Statistics Descriptive of Assessment

Category	Assessment Components				NA
	Participation	Assignment	Mid-semester Test	Final Semester Test	
Maximum	90	88	90	90	86
Minimum	78	78	68	80	77.20
Mean	81.51	82.88	70.74	84.30	80.60
Median	80	82	70	85	80.60
Mode	78	82	68	85	80.10
Std. Dev.	3.36	2.76	3.50	3.14	2.07
Std. Error	0.39	0.32	0.41	0.36	0.24

b. Final Result

Parameters	Total	Percentage
Number of the students taking the Earth and Planetary Science course	74	100%
Number of the students re-programming the Earth and Planetary Science course	0	0%
Number of the students pass at first attempt (≥D)	74	100%
Number of the students must take remedial	0	0%
Number of failed the students after remedial (<D)	0	0%

2. Problem Analysis

To evaluate the Earth and Planetary Science course, we used a comparison of final grade (NA) in the last two academic years is needed (the 2019/2020 and 2018/2020 Academic Years). The number of students programmed the Earth and Planetary Science course was 75 students in the 2018/2019 Academic Year. 74 students programmed the Earth and Planetary Science course in the 2019/2020 Academic Year. The results of the students' achievements in the last two academic years are presented in Figure 1.

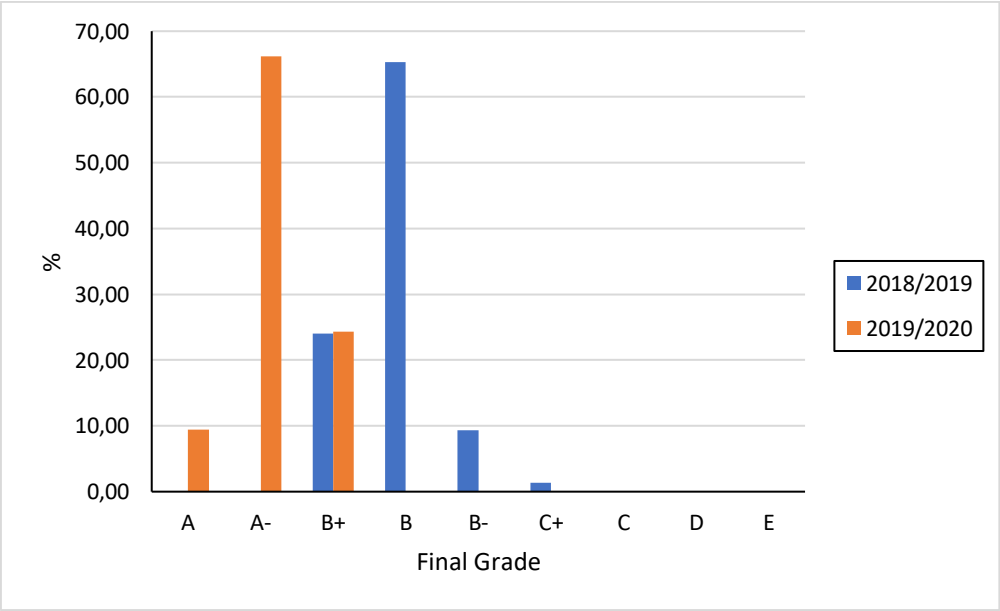


Figure 1 The results of the students' achievements in the Earth and Planetary Science course

Based on Figure 1, the overall performance in the 2018/2019 Academic Year is lower than in the 2019/2020 Academic Year. It is due to the involvement of counsellors and academic advisors who monitor student learning progress, even though the learning material and technical tasks are the same. It can be concluded that there are differences in the achievement of grades from the Earth and Planetary Science course in the last two academic years.

3. Solution & Strategy

The methods and course design during the Academic Year 2019/2020 useful to increase the students' achievement. So, the approach should be retained and improved for the next academic year. The plan to improve the Earth and Planetary Science course are:

a. Redesigning the course material (PPT slides, course contents, etc.) to become more interesting and interactive to stimulate the university student's interest to the Earth and Planetary Science course;
b. Interactively delivering the lecture by giving more and project based-learning to the students so that they can solve the problem based on their substantive and procedural concepts; and
c. Providing "threaded-discussion method" on social media to challenge, facilitate, and support the students to learn the next-topic of the lecture.

APPENDICES

Appendix 1

1. Students' Project Assignment Rubric

RUBRIK PENILAIAN TUGAS PROYEK/PRODUK

KOMPONEN PENILAIAN	SKOR			
	4	**3**	**2**	**1**
Kecukupan dan kelayakan desain	Proses dan prosedur dinyatakan dengan baik, teratur dan sistematis, serta komprehensif	Proses dan prosedur untuk melaksanakan desain tampak teratur, tapi masih belum komprehensif	Proses dan prosedur masih belum jelas, tidak mengikuti petunjuk umum yang diberikan, tetapi masih mungkin dilakukan	Proses dan prosedur tampak tidak teratur dan tidak sistematis, tidak mengikuti petunjuk umum, dan tidak mungkin dilaksanakan
Tujuan dan produk	Tujuan proyek dinyatakan dengan jelas. Dampak signifikan dari proyek dijelaskan dengan baik dengan dampak yang sangat wajar	Tujuan proyek cukup dinyatakan secara jelas. Produk yang diusulkan memiliki dampak sedang	Tujuan proyek tidak dinyatakan secara jelas. Produk yang diusulkan memiliki dampak minimal	Tujuan proyek tidak dinyatakan secara jelas atau tidak ada. Tidak ada produk yang dijelaskan dengan jelas.
Peran, keterlibatan dan kegiatan mahasiswa dalam merancang dan membuat produk	Peran, keterlibatan, dan kegiatan mahasiswa disajikan dan dijelaskan dengan cermat. Jelas bahwa kegiatan yang diusulkan dan dilakukan dilaksanakan seluruhnya oleh anggota kelompok/tim/grup	Peran, keterlibatan, dan kegiatan siswa dijelaskan dengan jelas, tetapi proses keterlibatan anggota kelompok hanya disajikan secara umum	Peran, keterlibatan, dan kegiatan siswa tidak dijelaskan dengan jelas, hanya melibatkan <70% seluruh anggota kelompok	Peran, keterlibatan, dan kegiatan siswa tidak dijelaskan dengan jelas, hanya ada 1-2 orang anggota kelompok yang mengerjakan produk (tugas tiap anggota tidak dijelaskan)
Penyampaian materi/ presentasi oral	Peserta berbicara dengan santun, lantang dan jelas, menggunakan tata bahasa yang sesuai, dan mampu menampilkan pengetahuan dasar secara singkat dan jelas	Peserta berbicara dengan santun, lantang dan jelas, tetapi tata bahasa yang digunakan masih ada (sedikit) yang belum sesuai, dan cukup mampu menampilkan pengetahuan dasar secara jelas	Peserta berbicara dengan cukup santun, lantang tetapi belum jelas dan/atau tata bahasa yang digunakan sebagian besar tidak tepat, dan/atau belum mampu menampilkan pengetahuan dasar secara singkat dan jelas	Salah satu atau lebih anggota kelompok/grup/tim tidak berbicara. Peserta berbicara dengan cukup santun, tetapi belum jelas dan/atau tata bahasa yang digunakan sebagian besar tidak tepat, dan/atau menampilkan pengetahuan dasar yang lemah
Demonstrasi produk	Demonstrasi produk (unjuk kerja produk) jelas dan produk menunjukkan manfaat yang sesuai dengan tujuan	Demonstrasi produk (unjuk kerja produk) kurang jelas, tetapi produk menunjukkan manfaat yang sesuai dengan tujuan	Demonstrasi produk (unjuk kerja produk) jelas tetapi produk menunjukkan manfaat yang kurang sesuai dengan tujuan	Demonstrasi produk (unjuk kerja produk) kurang jelas dan produk menunjukkan manfaat yang kurang sesuai dengan tujuan
Tanya jawab	Peserta menampilkan tingkat penguasaan pengetahuan yang tinggi (**high**) mengenai apa yang dilakukannya	Peserta menampilkan tingkat penguasaan pengetahuan yang sedang (**moderate**) mengenai	Peserta menampilkan tingkat penguasaan pengetahuan yang cukup (**fair**) mengenai apa yang	Peserta menampilkan tingkat penguasaan pengetahuan yang lemah (**poor**) mengenai apa yang

KOMPONEN PENILAIAN	SKOR			
	4	3	2	1
	Siswa dapat mengekstrapolasi dari referensi yang diacu dan produk yang dihasilkan. Menjawab dengan benar, lancar, dan tepat waktu	apa yang dilakukannya dari referensi yang diacu dan produk yang dihasilkan. Menjawab dengan benar, lancar tetapi melebihi waktu yang ditentukan	dilakukannya dari referensi yang diacu dan produk yang dihasilkan. Menjawab dengan benar, tersendat-sendat tetapi tepat waktu	dilakukannya dari referensi yang diacu dan produk yang dihasilkan. Menjawab salah, lancar atau tidak lancar, dan tepat waktu atau tidak tepat waktu
Tingkat kesulitan/ kreativitas/orisinalitas	Permasalahan yang dipilih, membutuhkan usaha ekstra, aktualisasi topik jelas, ada fokus analisis yang dipilih, melibatkan pemecahan masalah secara kreatif, dan sesuai dengan salah satu jenis orisinalitas menurut Phillips & Pugh (2000)*	Permasalahan yang dipilih rumit, aktualisasi topik jelas, melibatkan pendekatan kreatif, tetapi tidak ada fokus analisis yang dipilih, dan masih sesuai dengan salah satu jenis orisinalitas menurut Phillips & Pugh (2000)*	Permasalahan yang dipilih rumit, aktualisasi topik tidak jelas, dan proses kreatif sedikit, ada fokus analisis yang dipilih, dan masih sesuai dengan salah satu jenis orisinalitas menurut Phillips & Pugh (2000)*	Permasalahan yang dipilih sederhana, tidak melibatkan pendekatan kreatif, aktualisasi topik jelas atau tidak jelas, dan ada fokus analisis yang dipilih atau fokus masih belum jelas, dan tidak memenuhi kriteria orisinalitas menurut Phillips & Pugh (2000)*
Rujukan	Memuat > 3 referensi	Hanya memuat 3 referensi	Hanya memuat 2 referensi	Hanya memuat 1 referensi

* Kriteria orisinalitas menurut Phillips & Pugh (2000) pp. 63–64, yaitu:

- *You say something no one has said before.*
- *You do empirical work that has not been done before.*
- *You synthesize things that have not been put together before.*
- *You make a new interpretation of someone else's material/ideas.*
- *You do something in this country that has only been done elsewhere.*
- *You take an existing technique and apply it to a new area.*
- *You work across disciplines, using different methodologies.*
- *You look at topics that people in your discipline have not looked at.*
- *You test existing knowledge in an original way.*
- *You add to knowledge in a way that has not been done before.*
- *You write down a new piece of information for the first time.*
- *You give a good exposition of someone else's idea.*
- *You continue an original piece of work.*

Sumber: Phillips, E.M., & Pugh, D.S. (2000). *How to Get a PhD: A Handbook for Students and their Supervisors* (3rd ed.). Buckingham: Open University Press.

Appendix 2

1. Course Activities Records

a. Sample of Students' Attendance

KEMENTERIAN RISET, TEKNOLOGI, DAN PENDIDIKAN TINGGI
UNIVERSITAS NEGERI SURABAYA

Jl. Lidah Wetan, Surabaya - 60213
Telepon :+6231-99424932
Faksimile :+6231-99424932
e-mail :bakpk@unesa.ac.id

PRESENSI KULIAH
Periode 2019/2020 Gasal

Mata Kuliah : **Pengetahuan Bumi dan Antariksa**
Kelas : 2016A
Prodi : S1 Pendidikan Sains

Dosen : Dr. Wahono Widodo, M.Si.
An Nuril Maulida Fauziah, S.Pd., M.Pd.
Muhamad Arif Mahdiannur, S.Pd., M.Pd.

No	NIM	Nama Mahasiswa	Pertemuan Ke															%
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
			22 Aug 19	29 Aug 19	05 Sep 19	12 Sep 19	19 Sep 19	26 Sep 19	03 Oct 19	10 Oct 19	17 Oct 19	17 Oct 19	31 Oct 19	07 Nov 19	14 Nov 19	21 Nov 19	28 Nov 19	
1.	16030654001	SISCA FIRDAYANTI	H	H	H	A	H	H	H	H	H	H	H	H	H	H	H	93.3 %
2.	16030654002	MEI HIDAYATUS SHOLICHAH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
3.	16030654005	MAILATURROBIATIS SA'DIYAH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
4.	16030654006	VIRA NABILAH	H	H	H	A	H	H	H	H	H	H	H	H	H	H	H	93.3 %
5.	16030654007	QURROTU AININ SHOLIKHAH	H	H	H	A	H	H	H	H	H	H	H	H	H	H	H	93.3 %
6.	16030654008	AGUSTINA SRI ANDAYANI	H	H	H	A	H	H	H	H	H	H	H	H	H	H	H	93.3 %
7.	16030654010	LINA PUSPITA FEBRIANI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
8.	16030654011	REFIDA KHOIRUN HIDAYATI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
9.	16030654013	SEPTI TRI NURHAENY	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
10.	16030654014	ISMAWATI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
11.	16030654015	DESTANIA ALFINA PUTRI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
12.	16030654022	DEYA HETRI SAFIRA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
13.	16030654033	ALIFIA SURYATIN RAMADANI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
14.	16030654034	DITA KUSUMA CAHYANIPUTRI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
15.	16030654036	ROFI' MAUIDHOTUL ULYA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
16.	16030654039	VALENCYA RISMA AGATHA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
17.	16030654050	SHAVIRA MITHA FEBRIZA SANTOSO	H	H	H	A	H	H	H	H	H	H	H	H	H	H	H	93.3 %
18.	16030654051	LUVI FESTY ZARAFAYANA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
19.	16030654052	ARIF HIDAYAT	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
20.	16030654054	DINY NARISTA AZIZAH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
21.	16030654055	GERIN RISMA KHARTANINGTYAS	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
22.	16030654056	BIMA PRAYOGA WASKITO	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
23.	16030654064	DINDA RAFFIDAH AYUNING SUFIANINGRUM	H	H	H	A	H	H	H	H	H	H	H	H	H	H	H	93.3 %
24.	16030654065	PUTRI AINUR ROHMAH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
25.	16030654066	DINA MILLANA MAJIDAH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
26.	16030654067	LAILA FAHIRA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
27.	16030654068	CELINA NUANDA BASUKI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
28.	16030654069	GANDHA TIRTA BAGUS RENATHA	H	H	H	A	H	H	H	H	H	H	H	H	H	H	H	93.3 %
Tanda Tangan Dosen / Asisten																		

https://siakadu.unesa.ac.id/bf574bda-c4de-3d16-83c4-962ee2368e9b.aspx?print=b1e60673-a236-3bf8-974f-6b09fb92a810&jns=absen 1/1

b. Course Log Book

KEMENTERIAN RISET, TEKNOLOGI, DAN PENDIDIKAN TINGGI
UNIVERSITAS NEGERI SURABAYA

Kampus Ketintang
Jalan Ketintang, Surabaya 60231
T: +6231-8293484
F: +6231-8293484
laman: unesa.ac.id
email : bakpk@unesa.ac.id

Nama Matakuliah : Pengetahuan Bumi dan Antariksa
Kelas : 2016A
Jadwal & Ruang : C12.03.01 (13.00 - 16.20) R.

Dosen : WAHONO WIDODO (196809101993031003)
AN NURIL MAULIDA FAUZIAH (198505012010122006)
MUHAMAD ARIF MAHDIANNUR (198901282019031015)

Aktivitas Perkuliahan

No.	Tanggal	Pertemuan	Topik	Peserta	Status	Dosen
1	**22-08-2019**	Pertemuan ke 1	1. Lapisan Litosfer Bumi 2. Gunung Meletus 3. Gempa Bumi 4. Tsunami	28	Terjadwal	Wahono Widodo
2	**29-08-2019**	Pertemuan ke 2	• Hidrosfer • Siklus Hidrosfer • Bencana alam yang dapat mempengaruhi lapisan hidrosfer • kegiatan manusia yang dapat mencemari hidrosfer • upaya penanggulangan dan pencegahan terhadap hidrosfer yang terdampak bencana alam dan kegiatan manusia	28	Terjadwal	An Nuril Maulida Fauziah
3	**05-09-2019**	Pertemuan ke 3	1. Atmosfer 2. lapisan atmosfer 3. Bencana alam yang dapat mempengaruhi lapisan atmosfer 4. kegiatan manusia yang dapat mencemari lapisan atmosfer 5. upaya penanggulangan dan pencegahan terhadap atmosfer yang terdampak bencana alam dan kegiatan manusia	28	Terjadwal	Wahono Widodo

4	**12-09-2019**	Pertemuan ke 4	Gejala alam yang terjadi di bumiMitigasi bencana	21	Terjadwal	An Nuril Maulida Fauziah
5	**19-09-2019**	Pertemuan ke 5	• Asal usul tata surya • Karakteristik terjadinya tata surya • Bulan	28	Terjadwal	An Nuril Maulida Fauziah
6	**26-09-2019**	Pertemuan ke 6	• Asal usul tata surya • Karakteristik terjadinya tata surya • Bulan	28	Terjadwal	Muhamad Arif Mahdiannur
7	**03-10-2019**	Pertemuan ke 7	• Revolusi • Rotasi • Fase- fase bulan	28	Terjadwal	An Nuril Maulida Fauziah
8	**10-10-2019**	Pertemuan ke 8	• bumi dan bagian-bagian penyusunya, serta gejala alam yang terjadi pada tiap bagian-bagian bumi • asal-usul tata surya dan karakteristiknya • rotasi dan revolusi bumi dan bulan • fase-fase bulan	28	Terjadwal	Muhamad Arif Mahdiannur
9	**17-10-2019**	Pertemuan ke 9	Bintang dan kosmologi bintang	28	Terjadwal	Wahono Widodo
10	**17-10-2019**	Pertemuan ke 10	Bintang dan kosmologi bintang	28	Terjadwal	An Nuril Maulida Fauziah
11	**31-10-2019**	Pertemuan ke 11	Bintang dan kosmologi bintang	28	Terjadwal	An Nuril Maulida Fauziah
12	**07-11-2019**	Pertemuan ke 12	Bintang dan kosmologi bintang	28	Terjadwal	An Nuril Maulida Fauziah
13	**14-11-2019**	Pertemuan ke 13	• Bumi beserta bagian-bagian penyusunnya • Asal-usul tata surya • Bulan dan fase-fasenya • Bintang dan perbintangan	28	Terjadwal	Muhamad Arif Mahdiannur
14	**21-11-2019**	Pertemuan ke 14	• Bumi beserta bagian-bagian penyusunnya • Asal-usul tata surya • Bulan dan fase-fasenya	28	Terjadwal	Muhamad Arif Mahdiannur

			• Bintang dan perbintangan			
15	**28-11-2019**	Pertemuan ke 15	• Bumi beserta bagian-bagian penyusunnya • Asal-usul tata surya • Bulan dan fase-fasenya • Bintang dan perbintangan	28	Terjadwal	An Nuril Maulida Fauziah

c. Sample of Test

KEMENTERIAN RISET, TEKNOLOGI DAN PENDIDIKAN TINGGI
UNIVERSITAS NEGERI SURABAYA
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
JURUSAN ILMU PENGETAHUAN ALAM

Kampus Ketintang
Jalan Ketintang Gedung C12
Surabaya 60231
T. +6231-8280009
F. +6231-8296427
fmipa.unesa.ac.id

Management System ISO 9001:2015
TÜVRheinland CERTIFIED
www.tuv.com ID 9108650021

UJIAN SUB SUMATIF SEMESTER GASAL TAHUN AKADEMIK 2019 / 2020

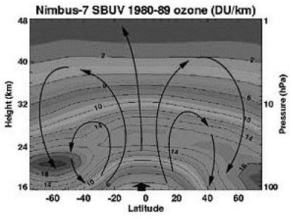
Mata Kuliah	: PBA	Angkatan	: 2016 A dan 2016 B
Jurusan	: IPA	Hari/Tanggal	: Kamis 10-10-2019
Program Studi	: S-1 Pendidikan Sains	Waktu	: 100 menit

PETUNJUK

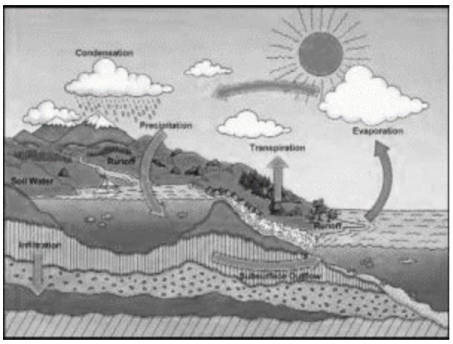
a. **Bacalah soal dengan teliti dan cermat, kemudian jawablah pertanyaan dengan baik dan benar di lembar jawaban yang telah disediakan!**
b. **Kerjakan sendiri, dilarang berdiskusi, dan bertindak curang dalam mengerjakan soal!**

Pertanyaan.

1. Lapisan ozon lebih tinggi di dataran tinggi di daerah tropis, dan berada di ketinggian di bawah daerah tropis, terutama di daerah kutub. Berikan penjelesan anda tentang hal tersebut!



2. Untuk mengatasi potensi gempa walikota Surabaya telah meningkatkan koordinasi dengan sejumlah ahli, termauk dari BMKG. Salah satu langkah untuk mengurangi potensi gempa adalah memperbanyak sumur. "Kami akan ikuti itu termasuk dengan cara alamiah seperti lingkungan dengan membuat banyak sumur-sumur, taman, bikin embung sebagai salah satu upaya untuk itu (mengurangi resiko bencana)," kata Risma. (Kompas.com, 18-10-2018).
   Mengapa dengan memperbanyak sumur merupakan cara alamiah dalam mengurangi potensi gempa?
3. Berikan penjelasan siklus hidrologi gambar di bawah, dan sebutkan fator yang dapat mempengaruhi atau menghambat siklus tersebut!



d. Sample of Students' Assignment (Mid-semester Test)

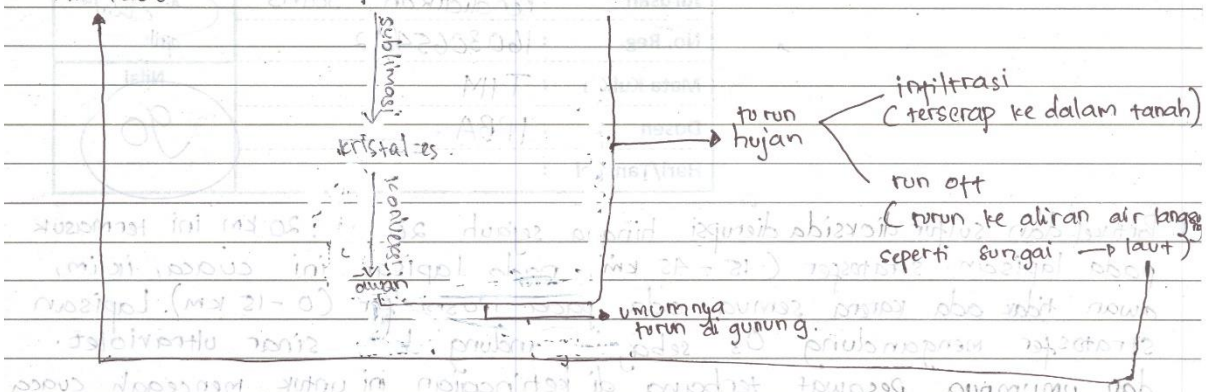
UTS/UAS FAKULTAS MIPA - UNESA

Nama	: Putri Apriliyani	Tanda Tangan
Jurusan	: Pendidikan Sains	
No. Reg.	: 160306540l2	
Mata Kuliah	: TIM	Nilai
Dosen	: IPBA	90
Hari/Tanggal	:	

1. Partikel dan sulfur dioksida dierupsi hingga sejauh 20 km : 20 km ini termasuk pada lapisan stratosfer (15 - 45 km). pada lapisan ini cuaca, iklim, awan tidak ada karena semua ada pada troposfer (0 - 15 km). Lapisan stratosfer mengandung O_3 sebagai pelindung dari sinar ultraviolet. dan umumnya pesawat terbang di ketinggian ini untuk mencegah cuaca yang buruk. Jika erupsi gunung pinatubo dapat mengakibatkan perubahan iklim yang harusnya di troposfer, jawabannya bisa terjadi. Pertama. setelah erupsi gas dan partikulat padat menutupi atmosfer selama 3 minggu membuat suhu troposfer menjadi turun akibat sinar matahari yang tembus pada troposfer sedikit, sehingga terjadi perubahan iklim. Artinya gas dan partikulat padat akan lama kelamaan turun ke troposfer dan terjadi perubahan iklim misalnya kemarau berkepanjangan akibat awan membawa sedikit uap air (dan dibuktikan suhu turun) sehingga sulit terjadi hujan, setelah erupsi. 70

2. Indonesia terletak di 3 lempeng yaitu eurasia, pasifik dan indo australia, sehingga dikenal dengan ring of fire.
Ketika berbicara gempa bumi di kota surabaya kita harus tau segi geologi wilayah tersebut. Gempa bumi dapat terjadi akibat tektonik, vulkanik atau reruntuhan yang ada di dalam bumi. Kemungkinan terbesar yang Surabaya akan hadapi adalah tektonik. Tektonik membuat lempeng - lempeng di dalam bumi bergerak, pergerakan ini disebut gempa tektonik. Gempa tektonik berskala besar dapat menimbulkan potensi tsunami. Tsunami terjadi ketika antar lempeng terjadi gerakan misalnya divergen (membuka) air dilaut akan masuk dan lempeng bergerak kembali menjadi konvergen (menumbuk) maka akan timbul gelombang besar sehingga laut yang tiba - tiba menyusut pada beberapa waktu berikutnya datang ke daratan dengan ketinggian tertentu. Untuk mengurangi resiko tersebut dilakukan kegiatan antisipasi seperti membuat waduk/resapan sumur. yang dapat menampung air dalam jumlah banyak, saluran irigasi yang banyak dan lainnya. agar mengurangi kemungkinan jatuhnya korban meninggal. 70

3. Air laut —evaporasi→ uap air —kondensasi→ awan

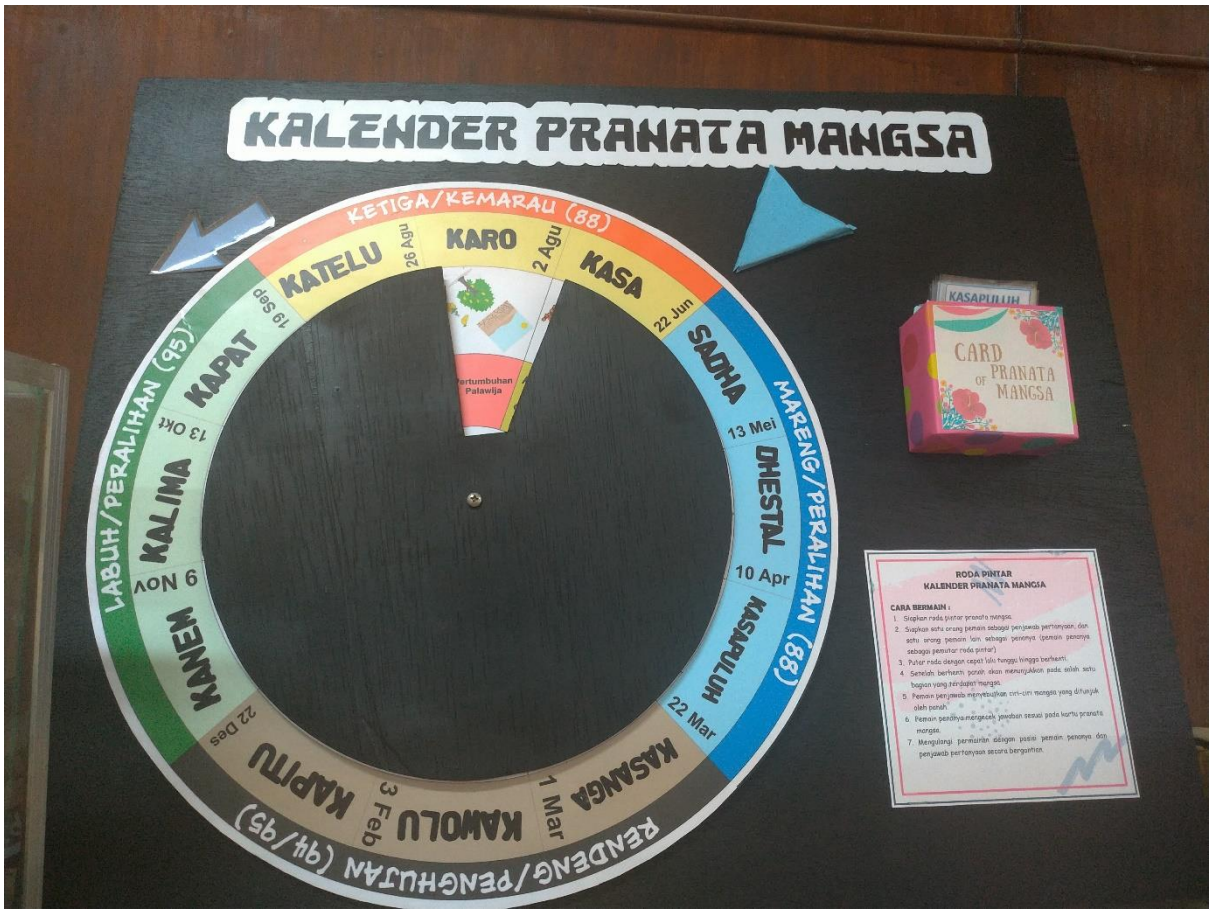


Pada siklus panjang air laut berubah menjadi uap air dari hasi evaporasi (penguapan) selanjutnya uap air terkumpul membentuk awan dengan cara kondensasi. Awan satu dengan awan lainnya berkumpul membentuk awan dengan massa air yang banyak (presipisasi) terjadi turun hujan. Hujan yang turun ke daratan bisa melalui dua jalur run off (turun dan mengalir melalui aliran air seperti selokan → sungai → laut) atau infiltrasi (terserap ke dalam tanah). air yang mengalir ke sungai dan laut kembali mengalami siklus hidrologi. Hanya yang perlu ditekankan uap air tidak hanya langsung terkondensasi menjadi awan juga bisa membentuk kristal es dari proses sublimasi yang terkonveksi membentuk awan yang umumnya turun di gunung. selanjutnya sama turun ke daratan dalam bentuk infiltrasi / run off dan kembali ke laut.

30

e. Sample of Official Examination (Test) Statement Report

f. Sample of Students' Project Results



2. Students Assessment Dataset in the Academic Year 2018/2019

No.	Kode Mahasiswa	Nilai				NA	Huruf
		Partisipasi	Rerata Tugas	UTS	UAS		
1	MHS-PBA-001	75	88	90	54	75,6	B+
2	MHS-PBA-002	80	86	95	48	75,2	B+
3	MHS-PBA-003	70	86	60	53	67,7	B-
4	MHS-PBA-004	70	86	80	52	71,4	B
5	MHS-PBA-005	77	86	60	57	70,3	B
6	MHS-PBA-006	78	87	70	48	70,1	B
7	MHS-PBA-007	70	89	75	57	72,8	B
8	MHS-PBA-008	70	88	75	57	72,5	B
9	MHS-PBA-009	75	86	85	51	73,1	B
10	MHS-PBA-010	70	86	70	55	70,3	B
11	MHS-PBA-011	70	86	70	55	70,3	B
12	MHS-PBA-012	70	88	85	52	73	B
13	MHS-PBA-013	78	88	70	47	70,1	B
14	MHS-PBA-014	70	85	95	60	76,5	B+
15	MHS-PBA-015	75	86	80	54	73	B
16	MHS-PBA-016	70	88	80	54	72,6	B
17	MHS-PBA-017	90	88	55	49	70,1	B
18	MHS-PBA-018	70	86	95	54	75	B+
19	MHS-PBA-019	70	89	75	55	72,2	B
20	MHS-PBA-020	77	86	55	50	67,2	B-
21	MHS-PBA-021	70	86	95	56	75,6	B+
22	MHS-PBA-022	75	85	70	54	70,7	B
23	MHS-PBA-023	70	88	65	56	70,2	B
24	MHS-PBA-024	70	85	90	55	74	B
25	MHS-PBA-025	83	89	50	57	70,4	B
26	MHS-PBA-026	70	89	70	55	71,2	B
27	MHS-PBA-027	70	88	60	66	72,2	B
28	MHS-PBA-028	75	85	55	63	70,4	B
29	MHS-PBA-029	70	85	90	51	72,8	B
30	MHS-PBA-030	80	88	65	59	73,1	B
31	MHS-PBA-031	75	86	55	63	70,7	B
32	MHS-PBA-032	75	88	70	63	74,3	B
33	MHS-PBA-033	70	86	90	64	77	B+
34	MHS-PBA-034	70	86	95	65	78,3	B+
35	MHS-PBA-035	70	85	70	65	73	B
36	MHS-PBA-036	70	85	80	73	77,4	B+
37	MHS-PBA-037	75	86	70	64	74	B
38	MHS-PBA-038	100	86	70	64	79	B+
39	MHS-PBA-039	70	85	85	64	75,7	B+
40	MHS-PBA-040	70	86	80	74	78	B+
41	MHS-PBA-041	70	85	75	65	74	B

No.	Kode Mahasiswa	Nilai				NA	Huruf
		Partisipasi	Rerata Tugas	UTS	UAS		
42	MHS-PBA-042	70	85	70	58	70,9	B
43	MHS-PBA-043	70	86	75	69	75,5	B+
44	MHS-PBA-044	70	86	65	63	71,7	B
45	MHS-PBA-045	70	86	85	65	76,3	B+
46	MHS-PBA-046	70	85	70	60	71,5	B
47	MHS-PBA-047	75	88	70	62	74	B
48	MHS-PBA-048	80	88	65	66	75,2	B+
49	MHS-PBA-049	70	86	30	58	63,2	C+
50	MHS-PBA-050	70	85	65	66	72,3	B
51	MHS-PBA-051	70	86	60	65	71,3	B
52	MHS-PBA-052	80	86	60	60	71,8	B
53	MHS-PBA-053	70	86	50	58	67,2	B-
54	MHS-PBA-054	70	86	65	58	70,2	B
55	MHS-PBA-055	70	85	80	64	74,7	B
56	MHS-PBA-056	70	86	75	64	74	B
57	MHS-PBA-057	75	88	50	67	71,5	B
58	MHS-PBA-058	83	83	60	55	70	B
59	MHS-PBA-059	70	88	55	68	71,8	B
60	MHS-PBA-060	70	88	40	64	67,6	B-
61	MHS-PBA-061	75	88	65	55	70,9	B
62	MHS-PBA-062	70	88	45	56	66,2	B-
63	MHS-PBA-063	70	83	65	54	68,1	B-
64	MHS-PBA-064	78	83	55	62	70,1	B
65	MHS-PBA-065	75	83	90	66	77,7	B+
66	MHS-PBA-066	70	88	55	70	72,4	B
67	MHS-PBA-067	78	88	60	55	70,5	B
68	MHS-PBA-068	70	86	65	64	72	B
69	MHS-PBA-069	75	86	65	64	73	B
70	MHS-PBA-070	80	88	55	65	72,9	B
71	MHS-PBA-071	80	88	75	66	77,2	B+
72	MHS-PBA-072	75	83	50	56	66,7	B-
73	MHS-PBA-073	80	88	55	67	73,5	B
74	MHS-PBA-074	85	86	65	66	75,6	B+
75	MHS-PBA-075	75	86	75	66	75,6	B+

3. Students Assessment Dataset in the Academic Year 2019/2020

No.	Kode Mahasiswa	Nilai				NA	Huruf
		Partisipasi	Rerata Tugas	UTS	UAS		
1	MHS-PBA-001	78	85	70	85	80,6	A-
2	MHS-PBA-002	83	83	70	82	80,1	A-
3	MHS-PBA-003	80	80	68	82	78,2	B+
4	MHS-PBA-004	78	78	68	87	78,7	B+
5	MHS-PBA-005	80	88	70	82	81	A-
6	MHS-PBA-006	78	80	68	81	77,5	B+
7	MHS-PBA-007	80	82	70	85	80,1	A-
8	MHS-PBA-008	78	80	68	82	77,8	B+
9	MHS-PBA-009	80	83	70	84	80,1	A-
10	MHS-PBA-010	80	84	70	87	81,3	A-
11	MHS-PBA-011	78	80	78	87	81,3	A-
12	MHS-PBA-012	80	80	78	84	80,8	A-
13	MHS-PBA-013	82	84	68	87	81,3	A-
14	MHS-PBA-014	78	84	68	80	78,4	B+
15	MHS-PBA-015	80	82	70	80	78,6	B+
16	MHS-PBA-016	78	82	68	80	77,8	B+
17	MHS-PBA-017	78	80	68	80	77,2	B+
18	MHS-PBA-018	78	80	68	80	77,2	B+
19	MHS-PBA-019	80	78	68	84	78,2	B+
20	MHS-PBA-020	78	88	70	82	80,6	A-
21	MHS-PBA-021	78	82	70	81	78,5	B+
22	MHS-PBA-022	78	80	68	80	77,2	B+
23	MHS-PBA-023	78	86	68	84	80,2	A-
24	MHS-PBA-024	82	85	68	82	80,1	A-
25	MHS-PBA-025	78	82	78	85	81,3	A-
26	MHS-PBA-026	78	80	68	84	78,4	B+
27	MHS-PBA-027	78	80	73	81	78,5	B+
28	MHS-PBA-028	80	80	68	83	78,5	B+
29	MHS-PBA-029	78	85	73	82	80,3	A-
30	MHS-PBA-030	82	84	68	85	80,7	A-
31	MHS-PBA-031	80	82	70	85	80,1	A-
32	MHS-PBA-032	80	84	68	85	80,3	A-
33	MHS-PBA-033	82	82	70	85	80,5	A-
34	MHS-PBA-034	78	88	73	80	80,6	A-
35	MHS-PBA-035	78	85	68	85	80,2	A-
36	MHS-PBA-036	78	85	70	85	80,6	A-
37	MHS-PBA-037	78	82	68	80	77,8	B+
38	MHS-PBA-038	85	84	70	85	81,7	A-
39	MHS-PBA-039	85	82	68	85	80,7	A-
40	MHS-PBA-040	80	82	70	85	80,1	A-
41	MHS-PBA-041	85	82	70	85	81,1	A-

No.	Kode Mahasiswa	Nilai				NA	Huruf
		Partisipasi	Rerata Tugas	UTS	UAS		
42	MHS-PBA-042	88	82	70	80	80,2	A-
43	MHS-PBA-043	85	80	73	85	81,1	A-
44	MHS-PBA-044	78	84	70	85	80,3	A-
45	MHS-PBA-045	85	82	70	82	80,2	A-
46	MHS-PBA-046	80	82	70	85	80,1	A-
47	MHS-PBA-047	78	88	73	80	80,6	A-
48	MHS-PBA-048	80	84	70	85	80,7	A-
49	MHS-PBA-049	80	85	73	82	80,7	A-
50	MHS-PBA-050	82	88	70	80	80,8	A-
51	MHS-PBA-051	78	80	70	80	77,6	B+
52	MHS-PBA-052	80	85	70	82	80,1	A-
53	MHS-PBA-053	85	82	68	90	82,2	A-
54	MHS-PBA-054	85	82	90	85	85,1	A
55	MHS-PBA-055	78	80	68	83	78,1	B+
56	MHS-PBA-056	85	82	68	88	81,6	A-
57	MHS-PBA-057	85	80	73	88	82	A-
58	MHS-PBA-058	85	82	73	88	82,6	A-
59	MHS-PBA-059	85	82	73	88	82,6	A-
60	MHS-PBA-060	88	80	68	88	81,6	A-
61	MHS-PBA-061	85	82	68	85	80,7	A-
62	MHS-PBA-062	85	80	68	90	81,6	A-
63	MHS-PBA-063	85	88	73	90	85	A
64	MHS-PBA-064	85	82	73	88	82,6	A-
65	MHS-PBA-065	88	88	73	90	85,6	A
66	MHS-PBA-066	85	82	73	85	81,7	A-
67	MHS-PBA-067	85	88	73	90	85	A
68	MHS-PBA-068	85	88	78	89	85,7	A
69	MHS-PBA-069	90	88	73	90	86	A
70	MHS-PBA-070	85	80	68	88	81	A-
71	MHS-PBA-071	85	82	73	83	81,1	A-
72	MHS-PBA-072	85	82	73	83	81,1	A-
73	MHS-PBA-073	85	88	73	90	85	A
74	MHS-PBA-074	85	82	73	80	80,2	A-