MODUL

SOLID WASTE AND HAZARDOUS WASTE MANAGEMENT

MASTER PROGRAM OF ENVIRONMENTAL SCIENCE
SCHOOL OF POSTGRADUATED STUDIES
DIPONEGORO UNIVERSITY

Modul Description :

Modul design	Solid and Hazardous Waste Management
Modul level, if applicable	
Code, if applicable	P-CIL-8-212
Subtitles, if any	
Course, if applicable	
Semester(s) in which the modul is taught	Semester 2
Modul responsible*	
Teaching Lecturer	1. Dr. Ir. Syafrudin CES., MT 2. Dr. Eng. Maryono, ST, MT
Language	*Indonesian and English*
Relationship with curriculum	
Type of teaching, hours of contact	*Studying:1 x 120 minutes x 16 meetings = 32 hours/week* *Q&A:1x 20 minutes 16 meetings = 5.3 hours/week* *Discussion:1x 20 minutes 16 meetings = 5.3 hours/week* *Presentation:1x 20 minutes 16 meetings = 5.3 hours/week* *Individual assignments: 36 minutes/day = 3 hours/week* *Total work for 1 semester = 100 hours = 4 ECTS*
Workload	*(Estimated) workload, divided into contact hours (lectures, exercises, laboratory sessions, etc.) and personal study, including test preparation, specified in hours,[1]and overall.*
credit points	*2 credits / 4 ECTS*
Requirements according to the exam regulations	*Lecture attendance of at least 75%*
Recommended prerequisites	

Modul the desired learning objectives/outcomes	Students can understand and explain the need for solid waste management and can understand and explain the need for B3 waste management
Fill	The Solid Waste and Hazardous Waste Management course aims to equip students with knowledge, understanding and application of various methods of treating solid and hazardous waste. Lectures discuss various types of solid waste, B3 waste, solid waste management systems, B3 waste management systems with various aspects. Learning activities include lectures with various approaches and methods that involve students a lot, such as discussions, observation activities in the field to learn to identify problems and their solutions, learn to identify problems and their solutions.
Study and examexam requirements and forms	• *Open the book and close the book* • *Multiple choice, case studies, interviews, practicals*
Media used	*Powerpoint, youtube, website*
Reference	1. Arif Zulkifli, 2014, Sustainable Waste Management, Graha Ilmu, Jogjakarta. 2. Fikri Elanda. 2022. Monograph of Hazardous and Toxic Waste Management. Eureka Media Script. Purbalingga 3. Sembel Dantje. 2015. Environmental Toxicology. ANDI Publisher. Yogyakarta 4. Trihadiningrum Yulinah. 2016. B3 Hazardous and Toxic Waste Management. Technoscience – Graha Science. Yogyakarta

SEMESTER STUDY PLAN

Study program: Master of Environmental Science				**Faculty: School of Postgraduated Studies**			
Subject:	**Solid and Hazardous Waste Management**	**Code:** P-CIL-8-212		**Credit:2 (4 ECTS)**		**Smt:2**	
Supporting lecturer:	**1. Prof. Dr. Ir. Syafrudin CES., MT** **2. Dr. eng. Maryono, ST, MT**						
Learning Outcomes Subject:	• Students can understand and explain the need for solid waste management • Students can understand and explain the need for solid waste management • Students can understand and explain the need for B3 waste management • Students can understand and explain the need for B3 waste management						
Short Description of Courses:	This Solid Waste Treatment Engineering course aims to equip students with knowledge, understanding and application of various solid and hazardous waste treatment methods. The lectures discussed various types of solid waste, B3 waste, solid waste management systems, and B3 waste management systems with various aspects. Learning activities include lectures with various approaches and methods that involve students a lot, such as discussions, observation activities in the field to learn to identify problems and solutions, learn to identify problems and their solutions.						

1	2	3	4	5	6	7	
Week	**Final Ability of each learning stage**	**Study Materials/ Subjects**	**Learning methods**	**Workload**	**Student Learning Experience**	**Evaluation**	
						Criteria & Indicators	**Weight (%)**
1.	Introduction/ Lecture contract	Understand the preparation before face-to-face lectures and the obligation to report face-to-face lectures	Lectures, questions and answers, and discussions	216minutes (0.25 ECTS) • *Lecture = 1x 120 minutes* • *Q&A =1 x 20 minutes* • *Discussion = 1 x 20 minutes* • *Presentation = 1 x 20 minutes* • *Individual Tasks (Self Work) = 1 x 36 minutes/day (16*	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Accuracy and Completeness and the truth explanation as well accuracy understanding	2.5

				weeks)			
2.	Students are able to explain the basics of engineering and waste management	• Presentation on the basics of waste management and engineering	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) ◦ *Lecture = 1x 120 minutes* ◦ *Q&A =1 x 20 minutes* ◦ *Discussion = 1 x 20 minutes* ◦ *Presentation = 1 x 20 minutes* ◦ *Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)*	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Accuracy and Completeness and the truth explanation as well accuracy understanding	2.5
3.	Students are able to explain the design of waste management system planning	• Presentation on the design criteria for planning infrastructure and facilities for the waste management system. • Assignment to make a resume regarding recycling of organic waste in development	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) ◦ *Lecture = 1x 120 minutes* ◦ *Q&A =1 x 20 minutes* ◦ *Discussion = 1 x 20 minutes* ◦ *Presentation = 1 x 20 minutes* ◦ *Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)*	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Accuracy and Completeness and the truth explanation as well accuracy understanding	5
4.	Students are able to explain related to waste management at the source	• Presentation on the handling and segregation of waste at the source	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) ◦ *Lecture = 1x 120 minutes* ◦ *Q&A =1 x 20 minutes* ◦ *Discussion = 1 x 20 minutes* ◦ *Presentation = 1 x 20 minutes*	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Completeness and the truth explanation as well accuracy understanding	5

				◦ *Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)*			
5.	Students are able to explain the transportation and management of waste	• Presentation on transportation in waste management and transportation costs	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) ◦ *Lecture = 1x 120 minutes* ◦ *Q&A =1 x 20 minutes* ◦ *Discussion = 1 x 20 minutes* ◦ *Presentation = 1 x 20 minutes* ◦ *Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)*	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Completeness and the truth explanation as well accuracy understanding	5
6.	Students are able to explain related to B3 waste management and its handling	• Presentation on the management of hazardous and toxic waste materials • Assignments related to the classification of B3 waste & its handling in the surrounding environment	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) ◦ *Lecture = 1x 120 minutes* ◦ *Q&A =1 x 20 minutes* ◦ *Discussion = 1 x 20 minutes* ◦ *Presentation = 1 x 20 minutes* ◦ *Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)*	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Completeness and the truth explanation as well accuracy understanding	5
7.	Students are able to explain strategies in managing B3 waste	• Presentation on B3 waste management strategies • Assignments related to B3	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) ◦ *Lecture = 1x 120 minutes* ◦ *Q&A =1 x 20 minutes* ◦ *Discussion = 1 x 20 minutes*	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Completeness and the truth explanation as well accuracy understanding	5

		waste management		• *Presentation = 1 x 20 minutes* • *Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)*			
8.	Students are able to explain related to B3 waste management in industry	• Presentation on industrial waste management • Assignments related to industrial B3 waste management	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) • *Lecture = 1x 120 minutes* • *Q&A =1 x 20 minutes* • *Discussion = 1 x 20 minutes* • *Presentation = 1 x 20 minutes* • *Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)*	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Completeness and the truth explanation as well accuracy understanding	5
9.	Students are able to explain related to the minimization of B3 waste	• Presentation on the minimization of B3 waste • Assignments related to B3 waste, MSDS	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) • *Lecture = 1x 120 minutes* • *Q&A =1 x 20 minutes* • *Discussion = 1 x 20 minutes* • *Presentation = 1 x 20 minutes* • *Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)*	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Completeness and the truth explanation as well accuracy understanding	5
10	**Mid Term Examination (UTS)**	**Meeting Material 1- 9**	**Written test**	**216 minutes of processing time or the equivalent of 0.25 ECTS**	**Students working on UTS questions**	**Completeness and the truth explanation as well accuracy**	**5**

						understanding	
11	Students are able to explain related to infrastructure planning in managing solid waste and B3	• Presentation on infrastructure planning in solid waste and B3 . management • Assignments related to quantitative analysis of waste management infrastructure information	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) ◦ *Lecture = 1x 120 minutes* ◦ *Q&A =1 x 20 minutes* ◦ *Discussion = 1 x 20 minutes* ◦ *Presentation = 1 x 20 minutes* ◦ *Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)*	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Completeness and the truth explanation as well accuracy understanding	5
12	Students are able to explain about the B3 processing system	• Presentation on the B3 processing system • Assignment to make a resume related to waste management abroad and in the city of origin	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) ◦ *Lecture = 1x 120 minutes* ◦ *Q&A =1 x 20 minutes* ◦ *Discussion = 1 x 20 minutes* ◦ *Presentation = 1 x 20 minutes* ◦ *Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)*	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Completeness and the truth explanation as well accuracy understanding	5
13	Students are able to explain related to calculating the pollutant load on water sources	• Presentation on calculating pollutant load and water pollutant load capacity in water sources • Assignment to write articles on B3 waste	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) ◦ *Lecture = 1x 120 minutes* ◦ *Q&A =1 x 20 minutes* ◦ *Discussion = 1 x 20 minutes* ◦ *Presentation = 1 x 20 minutes* ◦ *Individual Tasks (Self*	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Completeness and the truth explanation as well accuracy understanding	5

		management (Fly ash & bottom ash, batteries waste, household hazardous waste, laboratory waste, etc.)		*Work) = 1 x 36 minutes/day (16 weeks)*			
14	Students are able to explain related to potential generation, hazards, regulations, and management in handling B3 waste	• Student presentations and presentations on B3 waste (potential generation, hazards & risks, regulations, management in other countries, proposed alternative management)	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) ◦ *Lecture = 1x 120 minutes* ◦ *Q&A =1 x 20 minutes* ◦ *Discussion = 1 x 20 minutes* ◦ *Presentation = 1 x 20 minutes* ◦ *Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)*	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Completeness and the truth explanation as well accuracy understanding	5
15	Students are able to explain the impact of potential generation, hazards, regulations, and management in handling B3 waste	• Student presentations and presentations on B3 waste (potential generation, hazards & risks, regulations, management in other countries, proposed alternative management)	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) Consist of: ◦ *Lecture = 1x 120 minutes* ◦ *Q&A =1 x 20 minutes* ◦ *Discussion = 1 x 20 minutes* ◦ *Presentation = 1 x 20 minutes* ◦ *Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)*	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Completeness and the truth explanation as well accuracy understanding	5

16	**Final Examination (UAS)**	**Meeting Materials 1-15 (resume material)**	**Written test**	**216 minutes of processing time or the equivalent of 0.25 ECTS**	**Students working on UAS questions**	**Completeness and the truth explanation as well accuracy understanding**	**15**
8.Reference List:		1. Arif Zulkifli, 2014, Sustainable Waste Management, Graha Ilmu, Jogjakarta. 2. Christensen, TH, R. Cossu, and R. Stegmann, 1998, Landfilling of Waste: Leachate, Barriers, Biogas (3 volume set), Chapman & Hall. 3. Tchobanoglous, G., 1993, Integrated Solid Waste Management: Engineering Principles, McGraw-Hill Book Company, New York. 4. Wilson, DC, 1981, Waste Management: Planning, Evaluation, Technologies, Clarendon Press, Oxford. 5. Weinstein, NJ, and RF Toro, 1976, Thermal Processes of Municipal Solid Waste for Resource and Energy Recovery, Ann Arbor Science, Michigan 6. UU no. 18 of 2006 concerning Waste Management. 7. Tammemagi, HY, 1999, The Waste Crisis: Landfills, Incinerators, and the Search for a Sustainable Future, ISBN 0-19-512898-2.					