Name of the subject: Technology and waste management
Subject key:76972
Type of subject: Optative
No. of credits approved:
Last date of curricular review: September 2020
Subject matter and subject code requirement: None

A) NAME OF THE COURSE: TECHNOLOGY AND WASTE MANAGEMENT

Synthetic Program									
Technology and waste management									
General information									
Type of proposal to curriculum :	New	x	Restructuring				Adjustment		
Type of matter :	Mandatory		Optative	x	Complementary		Other		
Matter shared with another EP or academic entity	(x) No ( ) Yes What PE is shared? _____ What semester? _____ What academic entity? _____								
Produced by:	Carolin Antoni								
Reviewed by:	Gadjah Mada University, Indonesia								

Semester	**Hours of theory per week**	**Hours of practice per week**	**Hours additional work student per week**	**Credits**
	3	1	1	6

Overall objective	To provide an understanding of the importance of waste management to address environmental and social challenges and the provision of economic opportunities in urban areas

Synthetic Program		
Specific professional competence (s) that the subject develops	• The students : • They will perform tasks and solve specific problems related to waste management. • They will make arguments, discussions and defend points of view in oral presentations. • They can solve assessment tests. • They will analyze scientific, academic and dissemination literature. • They will use information and communication technology in the learning process as a tool to access the globalized world. • They will realize the value of use and the correct management of knowledge.	
Performance tasks of the specific professional competence to those which contribute to develop the subject	• Students will understand the evolution of the concepts and approaches of waste management and, also, the dynamics and typology of waste management in urban environments. • Students will gain organizational and project management skills. • They will seek to adapt sustainable waste management strategies to public attitudes and behaviors, including social, economic and environmental aspects in relation to waste management in cities.	
Transversal professional competence (s) that contribute to the development of the subject	• Students will participate in actions in favor of equal opportunities that improve the quality of urban situations. • Solutions with different actors will be communicated and found through various methods to improve urban sustainability.	
Units	**Units**	**Contents**
	1. Introduction to waste management	Students recognize the international and national history of the problem of waste management. In addition, the impacts of different waste to the elements of the environment.
	2. Legislation	Students will understand global, regional and local politics and their connection in the waste management system.
	3 . Waste management	Students will learn the meaning of waste management through the chain between the generation of garbage to the garbage procession.

Synthetic Program			
	4 . Participation	Students can identify the different actors included in waste management. In addition, they will understand the importance of social participation	
Method and practice	**Method**	Presentation of topics through videos, power point presentations and conferences. The course will be developed mainly as a seminar-workshop. The main attraction of this method is the possibility of a collective reflection on each of the topics analyzed during the program. The content of the class will be delivered through readings and presentations in class and at home. The course will be dynamic and participatory, based on discussions. Each student has to deliver an essay on a self-selected topic on Urban Agriculture. In preparation for classes, each student should read a specific article and develop an essay (maximum 1 page), where they must express their OWN opinion, experiences, doubts and / or thoughts. This text must be delivered the night before the next class. The teacher also provides theoretical presentations and introduces new topics.	
	Practices	Visit of a recycling dump and copy	
Evaluation method	**Midterm exam**	20%	Unit 1 Exam
		20%	Examination of the unit 2
		20%	Unit 3 Exam
		20%	Unit 4 Exam
		20%	Research work
	Final exam	The ordinary final grade will correspond to the weighted average of the three partial evaluations (20% each) and a research paper (40%): 100%	

Synthetic Program		
	Other activities	

References and digital resources	**References**	Aleluia, J.; et al., Characterization of urban waste management practices in developing Asian countries: A new analystical framework based on waste characteristics and urban dimension, Waste Management, Vol 58:415-426 Beigl, P., et al., 2008, Modelling municipal solid waste generation: A review Caniato, M., et al., Understanding the perception, roles and interactions of stakeholder networks managing health-care waste: A caste study of the Gaza Strip, Waste Management, Vol. 35:255-264 De Vega, 2006, Waste Management in Mexico: key variables in play The case of the Autonomous University of Baja California; tesis Giusti, L., 2009, A review of waste management practices and their impact on human health, Waste management, 29:2227-2239 Harvey, U.J. et al., 2016, An analysis of solid waste transportation and disposal alternatives, Information System and Operational Research, Vol. 11: Hornsby, C., et al., 2017, A roadmap towards integrated assessment and participatory strategies in support of decisión.making processes. The case of urban waste management, Journal of Cleaner Production, Vol, 142:157-172 ISWA, 2012, Globalization and Waste Management Johnson, A.; The Development if Waste Management Law, https://www.iswa.org/uploads/tx_iswaknowledgebase/538338_Paper.pdf Ley General Para La Prevención Y Gestión Integral De Los Residuos

Synthetic Program		
		Marello, M., et al, 2018, Solid Waste Management and Social Inclusion of Wastepickers, Latin American Perspectives, Vol. 45(1): 108-129 Meyland, G., et al., 2014, Identifying Stakeholders´ View on the eco-efficiency assessment of a municipal solid waste management system NOM-161-SEMARNAT-2011 Nurul, N.A., et al., 2018, Discrimination of Residual and Recyclabe Household Waste for Automatic Waste Separation System Pires, A., et al., 2018, Technology Status of Waste Collection Systems, in Sustainable Solid Waste Collection and Management, p. 25-44 Pongrác, E., et al., 2004, Evolving the Theory of Waste Management: Defining key concepts, Waste management and the environment, Proceedings of the Second International Conference on Waste Management and the Environment, Rhodes, Greece Pongrác, E.; 2002, Re-defining the concepts of waste and waste management, Department of Process and Environmental Engineering, University of Oulu, Thesis Ragaert, K., et al., 2017, Mechanical and chemical recycling of solid plastic waste, Waste Management, Vol. 69:24-58 REGLAMENTO DE LA LEY GENERAL PARA LA PREVENCIÓN Y GESTIÓN INTEGRAL DE LOS RESIDUOS Rodriguez, A., et al, 2015, Management of Municipal Solid Waste in Mexico, Fifteenth International Waste Management and Landfill Symposium

Synthetic Program		
		Rodriguez, S., et al., 2016, Waste collection systems. Part A: a taxonomy, Journal of Cleaner Production, Vol. 113:374-387 Sakai, S.et all., 2011, International comparative study, J Mater Cycles Waste Manag, Vol 13:86-102 Soltani, A., et al., 2015, Multiple stakeholders in multi-creteria decision-making in the context of Municipal Solid Waste Mangement: A review, Vol. 35:318-328 World Bank 2018, Waste Generation, https://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387-1334852610766/Chap3.pdf Zaman, A.U., 2016, Performance evaluation and benchmarking of global waste management systems; Resources, Conservation and Recycling, Vol. 114:32-41 Zaman, A.U., 2016; A comprehensive study of the environmental and economic benefits of resources recovery from global waste management systems; Journal of Cleaner Production, Vol 123:41-50
	Digital resources	World Bank 2018, Waste Generation, https://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387-1334852610766/Chap3.pdf

B) CONTENTS AND METHODS BY UNITS AND TOPICS

Unidad 1. Introducción al manejo de residuos		**10h**
Topic 1.1 History and current situation of waste management		**6h**
Subtopic	1.1.1 International 1.1.2 Mexico	
Tema 1.2 Definition and concepts		**4h**
Subtopic	1.2.1 The different types of waste	

	1.2.2 Environmental impacts

References and digital resources	**References**	**1.1.1 International** ISWA, 2012, Globalization and Waste Management Zaman, A.U., 2016; A comprehensive study of the environmental and economic benefits of resources recovery from global waste management systems; Journal of Cleaner Production, Vol 123:41-50 Zaman, A.U., 2016, Performance evaluation and benchmarking of global waste management systems; Resources, Conservation and Recycling, Vol. 114:32-41 **1.1.2 Mexico** De Vega, 2006, Waste Management in Mexico: key variables in play The case of the Autonomous University of Baja California; tesis Marello, M., et al, 2018, Solid Waste Management and Social Inclusion of Wastepickers, Latin American Perspectives, Vol. 45(1): 108-129 Rodriguez, A., et al, 2015, Management of Municipal Solid Waste in Mexico, Fifteenth International Waste Management and Landfill Symposium **1.2.1 The different types of waste** Pongrác, E.; 2002, Re-defining the concepts of waste and waste management, Department of Process and Environmental Engineering, University of Oulu, Thesis Pongrác, E., et al., 2004, Evolving the Theory of Waste Management: Defining key concepts, Waste management and the environment, Proceedings of the Second International Conference on Waste Management and the Environment, Rhodes, Greece **1.2.2 Environmental impacts**

		Giusti, L., 2009, A review of waste management practices and their impact on human health, Waste management, 29:2227-2239
	Digital resources	
Teaching methods	The course will be established primarily as a seminar; The main objective of this method lies in the possibility of a collective reflection on each of the topics included in the program, based on certain key concepts derived from class readings and presentations. The experience of personal reading is reinforced by the synergy of collective reflection.	
Learning activities	Readings Interactive discussion Presentation	

Unit 2. Legislation.		**10h**
Tema 2.1 International politics		**4h**
Subtopic	2.1.1 General overview of policy in the world 2.1.2. International Policy and Legislation	
Topic 2 .1 International politic		**6h**
Subtopic	2.2.1 General of national policy 2.2.2 National policy and legislation 2.2.3 Challenges of national policy	

References and digital resources	**References**	**2.1 International policy** Johnson, A.; The Development if Waste Management Law, https://www.iswa.org/uploads/tx_iswaknowledgebase/538338_Paper.pdf Sakai, S.et all., 2011, International comparative study, J Mater Cycles Waste Manag, Vol 13:86-102 **2.2. National policy** Ley General Para La Prevención y Gestión Integral de los Residuos NOM-161-SEMARNAT-2011 Reglamento de la Ley General para la Prevención y Gestión Integral de los Residuos
	Digital resources	
Teaching methods	The course will be established primarily as a seminar; The main objective of this method lies in the possibility of a collective reflection on each of the topics included in the program, based on certain key concepts derived from class readings and presentations. The experience of personal reading is reinforced by the synergy of collective reflection.	
Learning activities	Readings Interactive discussion Presentation	

Unit 3. Waste management		**14h**
Topic 3.1 Generation points of waste		**8h**
Subtopic	3.1.1 Sources of waste generation 3.1.2 Problem of inappropriate waste management	
Topic 3.2 Phases of waste management		**10h**
Subtopic	3.2.1 Collection 3.2.2 Transport 3.2.3 Separation and recycling	

References and digital resources	**References**	**3.1 Generation points of waste** Beigl, P., et al., 2008, Modelling municipal solid waste generation: A review **3.2.1 Collection** Pires, A., et al., 2018, Technology Status of Waste Collection Systems, in Sustainable Solid Waste Collection and Management, p. 25-44 Rodriguez, S., et al., 2016, Waste collection systems. Part A: a taxonomy, Journal of Cleaner Production, Vol. 113:374-387 **3.2.2 Transport** Harvey, U.J. et al., 2016, An analysis of solid waste transportation and disposal alternatives, Information System and Operational Research, Vol. 11 **3.2.3 Separation and recycling** Aleluia, J.; et al., Characterization of urban waste management practices in developing Asian countries: A new analytical framework based on waste characteristics and urban dimension, Waste Management, Vol 58:415-426 Nurul, N.A., et al., 2018, Discrimination of Residual and Recyclabe Household Waste for Automatic Waste Separation System Ragaert, K., et al., 2017, Mechanical and chemical recycling of solid plastic waste, Waste Management, Vol. 69:24-58
	Digital resources	**3.1 Generation points of waste** World Bank 2018, Waste Generation, https://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387-1334852610766/Chap3.pdf
Teaching methods	The course will be established primarily as a seminar; The main objective of this method lies in the possibility of a collective reflection on each of the topics included in the program, based on certain key concepts derived from class readings and presentations. The experience of personal reading is reinforced by the synergy of collective reflection.	

Learning activities	Readings Interactive discussion Presentation

Unit 4. Participation of actors			**14h**
Topic 4.1 Actors analysis			**6h**
Subtopic	4.1.1 Public sector 4.1.2 Private sector		
Topic 4.2 Participation			**8h**
Subtopic	4.2.1 Participation escalated 4.2.2 Networks and interactions between the actors 4.2.3 Importance of participation in different sector		
References and digital resources	**References**	**Topic 4.1 Actors analysis** Caniato, M., et al., Understanding the perception, roles and interactions of stakeholder networks managing health-care waste: A caste study of the Gaza Strip, Waste Management, Vol. 35:255-264 Meyland, G., et al., 2014, Identifying Stakeholders´ View on the eco-efficiency assessment of a municipal solid waste management system **Topic 4.2 Participation** Hornsby, C., et al., 2017, A roadmap towards integrated assessment and participatory strategies in support of decisión.making processes. The case of urban waste management, Journal of Cleaner Production, Vol, 142:157-172 Soltani, A., et al., 2015, Multiple stakeholders in multi-creteria decision-making in the context of Municipal Solid Waste Mangement: A review, Vol. 35:318-328	
	Digital resources		

Teaching methods	The course will be established primarily as a seminar; The main objective of this method lies in the possibility of a collective reflection on each of the topics included in the program, based on certain key concepts derived from class readings and presentations. The experience of personal reading is reinforced by the synergy of collective reflection.
Learning activities	Readings Interactive discussion Presentation

B) TEACHING AND LEARNING STRATEGIES

The course will be organized as a seminar, through guided reading, presentation of the topics by the teachers and the collective discussion of the different topics. It is also sought that the student proposes readings and documents (written or audiovisuals, for example) that support the discussion of the topics

D) EVALUATION AND ACCREDITATION

Preparation and / or presentation of:	**Periodicity**	**Covers**	**Weight of each period in relation to the course**
First partial exam: Oral essay presentation	At the end of Unit 1	Unit 1	20%
Second partial exam: Written essay presentation	At the end of Unit 2	Unit 2	20%
Third partial exam: Written essay presentation	At the end of Unit 3	Unit 3	20%
Fourth partial exam: Final essay presentation	At the end of Unit 4	Uni4 4	20%
Research work	-	-	20%
		TOTAL	100%
Ordinary Exam	The ordinary final grade will correspond to the weighted average of the three partial evaluations (20% each) and a research paper (40%): 100%		
Other required academic activities	Non-mandatory special activities will not have a value in the partial exams. This consists of attending special events on the subject or participation as organizers in		

	events of the discipline, whether from the Faculty or outside it as dissemination and training activities

E) REFERENCES AND DIGITAL RESOURCES

Main texts

Aleluia, J.; et al., Characterization of urban waste management practices in developing Asian countries: A new analystical framework based on waste characteristics and urban dimension, Waste Management, Vol 58:415-426

Beigl, P., et al., 2008, Modelling municipal solid waste generation: A review

Caniato, M., et al., Understanding the perception, roles and interactions of stakeholder networks managing health-care waste: A caste study of the Gaza Strip, Waste Management, Vol. 35:255-264

De Vega, 2006, Waste Management in Mexico: key variables in play The case of the Autonomous University of Baja California; tesis

Giusti, L., 2009, A review of waste management practices and their impact on human health, Waste management, 29:2227-2239

Harvey, U.J. et al., 2016, An analysis of solid waste transportation and disposal alternatives, Information System and Operational Research, Vol. 11:

Hornsby, C., et al., 2017, A roadmap towards integrated assessment and participatory strategies in support of decisión.making processes. The case of urban waste management, Journal of Cleaner Production, Vol, 142:157-172

ISWA, 2012, Globalization and Waste Management

Johnson, A.; The Development if Waste Management Law, https://www.iswa.org/uploads/tx_iswaknowledgebase/538338_Paper.pdf

Ley General Para La Prevención Y Gestión Integral De Los Residuos

Marello, M., et al, 2018, Solid Waste Management and Social Inclusion of Wastepickers, Latin American Perspectives, Vol. 45(1): 108-129

Meyland, G., et al., 2014, Identifying Stakeholders´ View on the eco-efficiency assessment of a municipal solid waste management system

NOM-161-SEMARNAT-2011

Nurul, N.A., et al., 2018, Discrimination of Residual and Recyclabe Household Waste for Automatic Waste Separation System

Pires, A., et al., 2018, Technology Status of Waste Collection Systems, in Sustainable Solid Waste Collection and Management, p. 25-44

Pongrác, E., et al., 2004, Evolving the Theory of Waste Management: Defining key concepts, Waste management and the environment, Proceedings of the Second International Conference on Waste Management and the Environment, Rhodes, Greece

Pongrác, E.; 2002, Re-defining the concepts of waste and waste management, Department of Process and Environmental Engineering, University of Oulu, Thesis

Ragaert, K., et al., 2017, Mechanical and chemical recycling of solid plastic waste, Waste Management, Vol. 69:24-58

Reglamento De La Ley General Para La Prevención Y Gestión Integral De Los Residuos

Rodriguez, A., et al, 2015, Management of Municipal Solid Waste in Mexico, Fifteenth International Waste Management and Landfill Symposium

Rodriguez, S., et al., 2016, Waste collection systems. Part A: a taxonomy, Journal of Cleaner Production, Vol. 113:374-387

Sakai, S.et all., 2011, International comparative study, J Mater Cycles Waste Manag, Vol 13:86-102

Soltani, A., et al., 2015, Multiple stakeholders in multi-creteria decision-making in the context of Municipal Solid Waste Mangement: A review, Vol. 35:318-328

Zaman, A.U., 2016, Performance evaluation and benchmarking of global waste management systems; Resources, Conservation and Recycling, Vol. 114:32-41

Zaman, A.U., 2016; A comprehensive study of the environmental and economic benefits of resources recovery from global waste management systems; Journal of Cleaner Production, Vol 123:41-50

Web Sites

World Bank 2018, Waste Generation, https://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387133485261076 6/Chap3.pdf