


COURSE INFORMATION

School/Faculty:	Civil Engineering/Engineering	Page:	1 of 6
Program name:	Master of Geotechnical Engineering (Civil-Geotechnics)		
Course code:	MKAJ1083	Academic Session/Semester:	20202021/1
Course name:	ENVIRONMENTAL GEOTECHNICS	Pre/co requisite (course name and code, if applicable):	
Credit hours:	3		

Course synopsis	This course introduces environmental awareness with respect to geotechnical engineering amongst civil engineering students. The topics covered in the course include characterization and regulatory requirements for disposal of hazardous and non-hazardous solid wastes (site selection, geo-environmental/site investigation); Liner types, materials (clay liners, geosynthetics and amended soils or composite materials) and their properties; leakage through liners; design of leachate collection systems; contaminant transport modeling; effects of pollutants on soil properties and behavior; and remediation methods for contaminated soils.			
Course coordinator (if applicable)	DR. SITI NORAFIDA JUSOH			
Course lecturer(s)	Name	Office	Contact no.	E-mail
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Mapping of the Course Learning Outcomes (CLO) to the Programme Learning Outcomes (PLO), Teaching & Learning (T&L) methods and Assessment methods:

No.	CLO	PLO (Code)	Weight (%)	*Taxonomies and **generic skills	T&L methods	***Assessment methods
CLO1	To analyze the effects of contaminants on soil properties and select appropriate remediation methods for contaminated soil	PL01	25	C4	Online Lecture & Online Active Learning	Online Quiz. Presentation, Online Final Exam
CLO2	To develop different modelling methods (physical and numerical) related to contaminant transport	PL02	20	C5	Online Lecture & Online Active Learning	Online Quiz. Assignment/ Presentation, Online Final Exam
CLO3	To explain legislations, regulations governing waste disposal and factors affecting selection of waste disposal site	PL01	30	C2	Online Lecture & Online Active Learning	Online Quiz. Assignment/

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						Presentation, Online Final Exam
CLO4	To design criteria of compacted soil liner and geosynthetics to be used in landfill system	PLO1	15	C5	Online Lecture & Online Active Learning	Online Quiz. Assignment/ Presentation, Online Final Exam

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CLO5	To design or evaluate leachate collection system and anchor trench for geosynthetic liners.	PLO2	15	C5	Online Lecture & Online Active Learning	Online Quiz. Assignment/ Presentation, Online Final Exam
Refer *Taxonomies of Learning and **UTM's Graduate Attributes, where applicable for measurement of outcomes achievement ***T – Test; Q – Quiz; HW – Homework; A – Assignment; PR – Project; Pr – Presentation; F – Final Exam etc.						

Details on Innovative T&L practices:

No.	Type	Implementation
1	Active Learning	Conducted through in-class activities

Class Meeting Schedule:

Topic	Details	Online T&L Practice
Topic 1 (3 Hours)	Introduction to Environmental Engineering <i>Review on Basic Properties and Behavior of Soils</i> What is contaminant Effects of pollutants to soil properties and behaviour	<ul style="list-style-type: none"> Webinar Forum discussion (What is contaminant)
Topic 2 (3 Hours)	Contaminant Transport and Fate Part 1 <ul style="list-style-type: none"> Advection Diffusion Dispersion 	<ul style="list-style-type: none"> Interactive Video + Online Chat Assignment 1 (reading on Contaminant Transport journal(s) and write one page report)
Topic 3 (3 Hours)	Contaminant Transport and Fate Part 2 <ul style="list-style-type: none"> Advection Diffusion Dispersion 	<ul style="list-style-type: none"> Online Quiz Webinar (Contaminant Transport analysis) Forum Discussion (Contaminant Transport)
Topic 4 (3 Hours)	Contaminant Transport and Fate Part 3 <ul style="list-style-type: none"> Sorption Dissolution Volatilization 	<ul style="list-style-type: none"> Interactive Video +Online Chat Assignment 2 (reading on Contaminant fate journal(s) and write one page report)
Topic 5 (3 Hours)	Contaminant Transport and Fate Part 4 <ul style="list-style-type: none"> Biodegradation 	<ul style="list-style-type: none"> Online Quiz + Webinar Forum Discussion (Differences of Phase portioning in contaminant fate and biodegradation)
Topic 6 (3 Hours)	Site Characterization & Remediation of contaminated Soils (Part 1) <ul style="list-style-type: none"> Sampling method Remediation techniques 	<ul style="list-style-type: none"> Interactive Video + Online Chat Preparation for Collaborative Learning Activity (Online poster Presentation)

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Topic 7 (3 Hours)	Site Characterization & Remediation of contaminated soils (Part 2) Presentation #1	<ul style="list-style-type: none"> Webinar Presentation of work (Online Poster remediation techniques)
Topic 8 (3 Hours)	Guidelines and regulations on waste disposal Site investigation and site selection for landfill	<ul style="list-style-type: none"> Webinar Forum discussion (Landfill site selection)
Topic 9 (3 Hours)	Types and components of solid waste landfill Liner classification ~ Composite liners and components	<ul style="list-style-type: none"> Interactive Video +Online Chat
Topic 10 (3 Hours)	Compacted soil liner ~ criteria for compacted soil liner (strength, permeability, shrinkage) Geomembranes and Geosynthetic Clay Liner (GCL)	<ul style="list-style-type: none"> Webinar Forum discussion
Topic 11 (3 Hours)	Vertical barrier walls ~ flow across barrier wall, stability Leakage from liners and covers ~ flow rate through compacted clay liner and geomembrane liner	<ul style="list-style-type: none"> Interactive Video +Online Chat Assignment 3 (Design of landfill)
Topic 12 (3 Hours)	Leakage from liners and covers (cont) Liner efficiency	<ul style="list-style-type: none"> Webinar Forum discussion
Topic 13 (3 Hours)	Design of leachate collection system Design of Anchor trench for geosynthetics Test #1	<ul style="list-style-type: none"> Webinar/ Interactive Video Forum discussion
	Revision and discussion	<ul style="list-style-type: none"> Forum discussion
	ONLINE FINAL EXAMINATION	

Transferable skills (generic skills learned in course of study which can be useful and utilised in other settings):

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Student learning time (SLT) details:

Distribution of student Learning Time (SLT) Course content outline					Teaching and Learning Activities			TOTAL SLT
	Guided Learning (Face to Face)				Guided Learning Non-Face to Face	Independent Learning Non-Face to face		
CLO	L	T	P	O				
CLO1	4h			1h	2h	8h		15h
CLO2	4h			2h	2h	13h		21h
CLO3	2h			2h	2h	10h		16h
CLO4	4h			2h	2h	10h		18h
CLO5	4h			2h	2h	10h		18h
Total SLT	18h			9h	10h	51h		88h

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Continuous Assessment		Status	Percentage	PLO	Online SLT
1	Assignment 1	Individual	5		1h
2	Assignment 2	Individual	5		1h
3	Presentation 1 -individual task - group collaboration	Individual/Group	20		7 h (prep) +3 h
4	Assignment 3	Individual	10		1h
5	Online Test 1	Individual	20		5h (prep)+1 h
Final Assessment			Percentage		Total SLT
1	Final Exam (Online Open Book Exam)	Individual	40		10 h (prep)+ 3h
Grand Total			100		120 h

L: Lecture, T: Tutorial, P: Practical, O: Others

Special requirement to deliver the course (e.g: software, nursery, computer lab, simulation room):

Multimedia PC or Laptop, Online Distance Learning Management System, Webcam with Microphone for Webinar

Learning resources:

Text book and Standards

1. Bagchi, A., (2004), *Design of Landfills and Integrated Solid Waste Management*, 3rd edition, John Wiley and Sons, Inc., New Jersey, USA.
2. Daniel, D. E. (2000), *Geotechnical Practice for Waste Disposal*, 1st Edition, Chapman & Hall.
3. Koerner, R.M., (2005), *Designing with Geosynthetics*, 5th edition, Pearson Prentice Hall, New Jersey, USA.
4. Landra, A (1990), *Geotechnics in Waste fills: Theory and Practice*, ASTM, Philadelphia. USA.
5. Oweis I.S. and Khera, R.P. (1998), *Geotechnology of Waste Management*, 2nd edition, PWS Publishing Company, Boston, USA, London.
6. H. D. Sharma (2001), *Geoenvironmental Engineering*, John Wiley, USA

Online

<https://odl.utm.my/learning-platform/>

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Academic honesty and plagiarism: *(Below is just a sample)*

Assignments are individual tasks and NOT group activities (UNLESS EXPLICITLY INDICATED AS GROUP ACTIVITIES)
Copying of work (texts, simulation results etc.) from other students/groups or from other sources is not allowed. Brief quotations are allowed and then only if indicated as such. Existing texts should be reformulated with your own words used to explain what you have read. It is not acceptable to retype existing texts and just acknowledge the source as a reference. Be warned: students who submit copied work will obtain a mark of **zero** for the assignment and disciplinary steps may be taken by the Faculty. It is also unacceptable to do somebody else's work, to lend your work to them or to make your work available to them to copy.

Other additional information (Course policy, any specific instruction etc.):

1. Students must attend lectures more than 80% of the lecture hours.
2. Students will be prohibited from attending any lecture and assessment activities upon failure to comply the 80% attendance requirement. Zero point will be given to the course grade.

Disclaimer:

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