

Safe Nutrient recycling, 15 credits (MX0131)

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Bold letters indicate compulsory activities

Green marked indicate laboratory related activities

Purple marked indicate QMRA project related activities

Orange marked indicate computer exercise

w	Date	Day	Time	Content	Room	Litterture
45	2020-11-02	Mon	11.15-12.00	L1 Course introduction (AN)	https://slu-se.zoom.us/j/8815372893	
			13.15-16.00	L2 Organic wastes: Quantities, composition and present treatment (BV)	https://slu-se.zoom.us/j/61487297026	● Biological Waste Treatment in Europe (2008), Swe, Eng; ● Urban solid waste management in low-income countries of Asia (Zurbrugg, 2002): pp 1-13; ● Sustainable development goals
	2020-11-03	Tue	09.15-12.00	L3 Systems Analysis (JMC)	https://slu-se.zoom.us/j/67754729210	
			13.00-17.30	Laboration start-up (AN, VW)	BÖL 1	Laboration instructions
	2020-11-04	Wed	10.15-12.00	L4 Biogas process: technology and microbiology (AS)	digital	● Microbiology of the biogas process Snurer and Jarvis 2018:pp 8-40.
				pH analysis and TS read	BÖL 1	
			13.15-16.00	L5 Microbiological metabolisms and biological waste processes - focus on composting (MP)	https://slu-se.zoom.us/j/66700559523	● Principles and Applications of Soil Microbiology (Sylvia, 1999): pp 59-63; 149-157; 189-199
	2020-11-05	Thu	13.00-15.00	VS and microorganisms read (AN,VW)	BÖL1	
			15.15-17.00	L6 QMRA what is it + project intro (AN)	Sal Q	● Definitions of risk analysis terms related to food safety (World Health Organization)● Intro to QMRA, ● QMRA wiki,
	2020-11-06	Fri	10.15-12.00	L7 Biogas Technology 1 (ÅN)	https://slu-se.zoom.us/j/67690421388	● Microbiology of the biogas process Snurer and Jarvis 2018:pp 41-60.

46	2020-11-09	Mon	09.15-12.00	L8 Biogas technology 2 (+ calculation excercise) (ÅN)	https://slu-se.zoom.us/j/63268658187	
			13.15-15.00	L9 Biogas membrane technology (AU)	https://slu-se.zoom.us/j/66653618327	
	2020-11-10	Tue	09.15-12.00	L10 Composting: Degradability and maturity (EE)	https://slu-se.zoom.us/j/67272165998	<ul style="list-style-type: none"> ● Practical Handbook of Compost Engineering (Haug 1993): Ch 10 335-383; Oxygen consumption calculations; ● Composting of source-separated household organics at different oxygen levels (Beck-Friis et al. 2003): pp 41-50
			13.00-16.00	Laboration: sampling and monitoring (AN)	BÖL1	
	2020-11-11	Wed	09.15-12.00	L11 Converting waste to animal feed using invertebrates (CL)	https://slu-se.zoom.us/j/69313706034	<ul style="list-style-type: none"> ● Using BSF as a value-added tool for the management of swine manure (Newton Dowe 2005) ● The use of fly larvae for organic waste treatment (Cickova Kozanek 2015) ● The science of vermiculture: The use of earthworms in organic waste management (Edwards 2006)
		13.00-14.00	TS reading (AN, VW)	BÖL1		
		14.00-15.00	Stydy visit BSF composting facility (CA, VW)	BSF facility		
	2020-11-12	Thur	9.15-11.00	L12 BSF calculation excercise(CL)	https://slu-se.zoom.us/j/61277649075	
			13.00-15.00	VS read and microorganisms (AN)	BÖL1	
	2020-11-13	Fri	10.15-12.00	L13 Pathogens in waste and wastewater (AN)	https://slu-se.zoom.us/j/65231169507	<ul style="list-style-type: none"> ● Bad Bug Book: Introduction Foodborne Pathogenic Microorganisms and Natural Toxins Handbook (US FDA); Read about: Campylobacter, Vibrio, Salmonella, Shigella, EHEC, Entamoeba, Cryptosporidium, Giardia, Ascaris, Trichuris and viruses, ● Sources of Pathogenic Microorganisms and Their Fate during Land Application of Wastes. (Gerba 2005): pp 42-47
			13.15-15.00	L14 Antibiotic resistance and waste recycling (SB)	digital	
47	2020-11-16	Mon	09.15-10.00	L15 Wastewater: flows and comp (SD)	https://slu-se.zoom.us/j/61508901361	<ul style="list-style-type: none"> ● Composition of urine, faeces, grey water and biowaste for utilisation in the URWARE model. Jönsson et al. (2005): pp 1-44 ● On site wastewater treatment systems manual. (US EPA 2002). Chapters 4.1, 4.6, Specific fact sheet 1

		10.15-12.00	L16 Source separating wastewater systems (BV)	https://slu-se.zoom.us/j/68534947674	<ul style="list-style-type: none"> Urine Diversion: One Step Towards Sustainable Sanitation (Kvarnström et al. 2006): pp viii-9, 36-48, 50, 56-64 	
		16.00	Decide pathogen to QMRA			
	2020-11-17	Tue	10.15-12.00	L17 Composting; Engineering Energy & Aeration requirements (EE)	https://slu-se.zoom.us/j/65929823667	
			13.00-16.00	Laboration: sampling and monitoring (AN)	BÖL1	
	2020-11-18	Wed	09.15-12.00	ORWARE 1 (EE, LL)	Datorsal 2 MVM	<ul style="list-style-type: none"> ORWARE a simulation model for organic waste handling systems. Part 1: Model description (Dalemo et al.1997)• Support Document (attached)• [SV] Svensk avfallshantering 2018 • [EN] Swedish Waste Management 2018 • What a Waste 2.0: Overview (pages 1-12)
			13.15-16.00	L18 Solid waste management in developing countries and the SDGs (CZ)	https://slu-se.zoom.us/j/62872423758	<ul style="list-style-type: none"> Solid Waste Management in Developing Countries (Zurbrugg, 2002)
	2020-11-19	Thu	13.00-15.00	VS read and microorganisms AN)	BÖL 1	
			15.30-16.30	L19 Materials and their composition (AN)	Sal Q	
	2020-11-20	Fri	09.15-12.00	L20 On site treatment - infiltration, attached growth processes etc + calculations (SD)	https://slu-se.zoom.us/j/69060890423	<ul style="list-style-type: none"> US EPA (2002): Glossary, chapter 4, errata, fact sheet 1,2,3,6,7,10,12,13, Specific fact sheet 3
			13.15-16.00	ORWARE exercise, part 2 (EE, LL)	Datorsal 2 MVM	
48	2020-11-23	Mon	10.15-12.00	L21 Faecal sludge management (CZ)	https://slu-se.zoom.us/j/61356126442	<ul style="list-style-type: none"> Faecal waste - the next Sanitation challenge (IWA, 2014)
			13.15-15.15	Students short presentaton Hazard ID (Students, AN)	https://slu-se.zoom.us/j/62491051241	
	2020-11-24	Tue	13.00-17.30	Finishing treatment laboration (AV, VW)	BÖL1	
	2020-11-25	Wed	09.15-11.00	L22 Odour (CL)	https://slu-se.zoom.us/j/69831213655	<ul style="list-style-type: none"> Odour in composting processes at pilot scale: monitoring and biofiltration (Guiteres et al. 2014); • Practical Handbook of Compost Engineering (Haug 1993): Ch 18.
			11.15-12.00	TS reading (AN, VW)	BÖL 1	

			13-15.00	L23 Recycled products - urine, faeces, compost and sludge as fertiliser (HJ)	https://slu-se.zoom.us/j/67625020113	<ul style="list-style-type: none"> Guidelines on the Use of Urine and Faeces in Crop Production (Jönsson et al. 2006): pp 1-32, Composition of urine, faeces, greywater and biowaste
2020-11-26	Thu	10.15-12.00	L24 Ponds: principles and dimensioning (SD)	https://slu-se.zoom.us/j/6282270025	<ul style="list-style-type: none"> (US EPA 2002): Fact sheets 5 and 7, Waste stabilisation ponds, Constructed wetland Decentralised Waste Water Treatment in Developing Countries (DEWATS). Sasse L. (1998) pp75-83, 95-104 	
		13.00-15.00	VS read and microorganisms, Instructions to flipped classroom exc.(AN)	BÖL 1		
		17.00	Hand in ORWARE report			
2020-11-27	Fri	10.15-12.00	L25 Sanitation methods 1 (AN)	https://slu-se.zoom.us/j/69679813111	<ul style="list-style-type: none"> Biosecurity and arable use of manure and biowaste — Treatment alternatives (Albihn 2007): pp 232-239 	
		13.15-14.15	L26 Sanitation methods 2 (AN)	Same as in the morning		
		16.00	Hand in draft of laboration report			
49	2020-11-30	Mon	09.15-12.00	Calculating sanitation + excersise w/solution (AN)	https://slu-se.zoom.us/j/6241825252	<ul style="list-style-type: none"> Sanitation and Hygiene in Manure Management (Vinnerås 2013), Practical Handbook of Compost Engineering (Haug 1993): Ch 5: pp 162-201, Formula sheet
2020-12-01	Tue	10.15-12.00	Lab discussion led by students (Students, AN)	https://slu-se.zoom.us/j/64395045468		
		13.15-15.00	L27 QMRA real life applications JO)	https://slu-se.zoom.us/j/64165568121		
	2020-12-03	Thu		Self-studies		
	2020-12-04	Fri		Self-studies		
50	2020-12-07	Mon		Self-studies		
	2020-12-08	Tue		Self-studies		
	2020-12-09	Wed	10.15-12.00	Students short presentation Treatment effect	https://slu-se.zoom.us/j/62317238158	
	2020-12-10	Thu	16.00	Hand in of Laboration report		
	2020-12-11	Fri		Self-studies		
51	2020-12-14	Mon	10.15-12.00	Feed back: Laboration reports (AN)	https://slu-se.zoom.us/j/67864355959	
	2020-12-15	Tue		Self-studies		

	2020-12-16	Wed		Self-studies	
	2020-12-17	Thu	16.00	Hand in QMRA report draft	
	2020-12-18	Fri		Self-studies	
52	2020-12-21	Mon	16.00	Submission corrected lab report	
	2020-12-22	Tue		Self-studies	
	2020-12-23	Wed		Self-studies	
53	2020-12-28	Mon		Self-studies	
	2020-12-29	Tue		Self-studies	
	2020-12-30	Wed		Self-studies	
1	2021-01-04	Mon		Self-studies	
	2021-01-05	Tue	16.00	Hand in QMRA report final version	
	2021-01-07	Thu		Self-studies	
	2021-01-08	Fri		Self-studies	
2	2021-01-11	Mon	09.00-14.00	Exam	Not yet decided
	2021-01-12	Tue		Prepare for presentation	
	2021-01-13	Wed	13.15-16.00	Going trough the exam	https://slu-se.zoom.us/j/63564451087
	2021-01-14	Thu	10.30-17.30	Student presentations QMRA project + course evaluation	Sal Q
	2021-01-15	Fri	14.15-16.00	Feed back: QMRA reports (group wise) (AN)	https://slu-se.zoom.us/j/67298260115

Lecturers

AN	Annika Nordin, Researcher ET, Annika.C.Nordin@slu.se (kursansvarig)
VW	Victoria Wicklicky, research engineer, ET
BV	Björn Vinnerås, Professor ET, bjorn.vinneras@slu.se
JMC	Jennifer McConville, Associate professor, ET
AS	Anna Schnürer, Professor, Department of Microbiology SLU
MP	Mikael Pell, Professor, Department of Microbiology SLU
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SB Stefan Börjesson, National Veterinary Institute, SVA