MV0216. Soil Water Processes in Agro-ecosystems, 15 hp autumn 2023 (HT2023)

Course modules: **1-theory (5 hp), 2-modelling exercises (5 hp), 3-mini-projects (5 hp)**

Course components

Chapters refer to the course Book *Introduction to Environmental Soil Physics, Daniel Hillel*

1-Theory

- **Course intro** (1h30)
- **Lecture 1:** What is soil? (2h)
- **Lecture 2:** Soil constituents and phase relations & Water potentials (2h)
- **Lecture 3:** Water Flow part I (2h)
- **Lecture 4:** Water Flow part II (2h)
- **Lecture 5:** Water Flow part III (2h)
- **Lecture 6:** Introduction to simulation models and introduction to STELLA software (3h)
- **Lecture 7:** Water/energy balances and potential evapotranspiration (1h)
- **Lecture 8:** Plant water uptake and plant response to drought (2h)
- **Lecture 9:** Solute transport I (2h)
- **Lecture10:** Solute transport II (2h)
- **In-class calculation** examples with water potentials, phase relations and water contents (3h)
- **7 online Quizzes** (Home work)
- **Mini-workshop** 'Agroecosystems and climate change' (3d):
  - Student homework (2d)
  - Guest lecture (2h30)
  - Student presentations (3h)
- **Research presentations** by teachers (3h)
- **Exam preparation** (2h)
- **Written Exam** (3h)

2-modelling exercises

- **Stella exercise 1:** Capillary rise (5h)
- **Stella exercise 2:** Steady infiltration (3h)
- **Stella exercise 3:** Plant water uptake (5h)
- **Stella exercise 4:** Water balance of a soil profile (5h)
- **Stella exercise 5:** Solute transport I: breakthrough curves (in the laboratory) (5h)
- **Stella exercise 6:** Solute transport II: Transient leaching under field conditions (5h)
- Uncertainty and sensitivity analysis with theoretical introduction (5h)

3-STELLA mini-projects

- **Introduction** (2h)
- **Group work** (9d)
- **Oral Presentation & Opposition** (6h)

Projects:

1. Pesticide leaching to groundwater: comparison with experimental data
2. Irrigation management in the salt-affected soils of the Marismas (SW Spain)
3. Using Salix as a biofilter for trace metals
4. Climate change impacts on pesticide leaching
5. Rain water harvesting
6. Water balance and grassland production in a changed climate

Days with compulsory attendance are marked with *; i.e. you have to be there to pass the course!
We apply the academic quarter; *i.e.* all lectures & exercices starts a quarter past time announced.

W	Day	Date	Time	Room	Subject	Teach.
35	Mon.	28-Aug*	11.30-12.30	Q	*ROLL CALL for Master program: compulsory for students of the Soil Water & Environment program*	
			14.00-15.30*	P	Introduction to the course	EC, NJ
	Tue	29- Aug	10.00-12.00	P	Lecture 1: What is soil? And Introduction to mini-workshop on CC & agroecosystems	EC
			13.00-15.00	P	Lecture 2: Phase relations & Water potentials (Chaps. 1-6)	NJ
	Wed.	30- Aug	10.00-12.00	P	Lecture 3: Soil water flow Part 1 (Chaps. 6-8)	NJ
	Thu.	31-Aug *	10.00-12.00	Home Preparation Exercises		
			13.00-16.00*	P	Exercises: In-class calculation examples with water potentials, phase relations and water contents	NJ (AL)
	Fri.	01-Sept	10.00-12.00	P	Lecture 4: Soil water flow Part 2 (Chap.8)	NJ
			13.00-15.00		Lecture 5: Soil water flow Part 3 (Chap.8, 14-15,17)	NJ
36	Mon.	04-Sept	08.00-10.00	*Complete Quiz1A on water potentials and water flows*		
			11.00-12.00	P	Potential Questions on Quiz 1A	NJ
			13.00-14.00		Lecture 6: simulation models	NJ
			14.00-16.00*	D1	Introduction to Stella modelling software	NJ, EC
	Tue.	05-Sept	09.00-12.00*	D1	Stella ex. 1: Capillary rise (Chaps. 8, 18)	AL, EC
			13.00-15.30*	D3	Stella ex. 1: continues	
			15.30-17.00	Extra time to complete ex 1		
	Wed.	06-Sept	09.00-12.00	*Complete Stella Quiz1B on capillary rise*		
	Thu.	07-Sept	09.00-12.00*	D2	Stella ex. 2: Steady infiltration (Chaps. 8, 14)	NJ, AL
			13.00-15.00	*Complete Stella Quiz2B on infiltration*		
	Fri.	08-Sept	09.00-10.00	X	Lecture 7: Potential evapotranspiration Water/energy balances and (Chap. 20)	NJ
			10.00-12.00		Lecture 8: Plant water uptake and plant response to drought (Chaps. 19- 21)	NJ
			13.00-15:00		Information from SLU library	Jonas Petersson
			15.00-17.00	*Complete Quiz2A on PET & water and energy balance*		

W	Day	Date	Time	Room	Subject	Teach.
37	Mon.	11-Sept	09.00-12.00*	Bib_1	Stella ex. 3: Plant water uptake (Chaps. 8, 18)	AL, EC
			13.00-15.30*		Stella ex. 3: continues	
			15.30-17.00	Extra time to complete ex 3		
	Tue.	12-Sept	09.00-12.00*	Ulls_2	Stella ex. 4: Water balance of a soil profile (Chaps. 8, 19-20)	AL, EC
			13.00-15.30*		Stella ex. 4: continues	
			15.30-17.00	Extra time to complete ex 4		
	Wed.	13-Sept	*Complete STELLA quiz 3B on water uptake & water balance*			
	Thu.	14-Sept*	10.00-12.00	P	Lecture 9: Solute transport I (Chap.9)	NJ
			13.00-15.00		Lecture 10: Solute transport II (Chap.9)	NJ
			15.00-17.00	*Complete STELLA quiz 3A on solute transport*		
	Fri.	15-Sept*	09.00-12.00*	D1	Stella ex. 5: Solute transport 1 (Chap.9)	NJ, AL
			13.00-15.30*		Stella ex. 5: continues	
			15.30-17.00	Extra time to complete Ex 5		
38	Mon.	18-Sept*	09.00-12.00*	D1	Stella ex. 6: Solute transport 2 (Chap.9)	NJ, AL
			13.00-15.00*		Stella ex. 6: continues	
			15.30-17.00	Extra time to complete Ex 6		
	Tis.	19-Sept*	10.00-12.00*	D2	Exercise: uncertainty and sensitivity analysis	NJ
			13.00-15.00*		Exercise: uncertainty and sensitivity analysis continues	
			15.00-17.00	Extra time to complete Exercise on sensitivity		
	Wed.	20-Sept	*Complete STELLA quiz 3B on solute transport*			
	Thu.	21-Sept	10.00-12.00	P	Teachers presentations on their research	All
			13.00-15.00		Guest lecture on Water management and sustainable agriculture	JB
	Fri.	22-Sept	*Mini-workshop – Prep. individual: scientific publication reading **			

W	Day	Date	Time	Room	Subject	Teach.
39	Mon.	25-Sept*	09.00-12.00*	*Mini-workshop 1- Prep. individual: scientific publication reading**Submit individual report at 12.00*		
			13.00-16.00*	**Mini-workshop 2- Group work to prepare oral presentation*		
	Tue.	26-Sept*	09.00-12.00*	**Mini-workshop 2- Group work to prepare oral presentation*		
			13.00-16.00*	P	Mini-workshop 3-Group presentations and discussion	EC
	Wed.	27-Sept*	10.00-12.00*	P	Introduction to mini-projects and contact with supervisors	All
	Thu.	28-Sept*	Mini-projects start			
	Fri.	29-Sept*	Mini-projects, continued			
40	Monday 02-Oct* to Friday 06-Oct* Mini-projects, continued Schedule at least one meeting with your supervisor during that week					
41	Monday 09-Oct* to Friday 13-Oct* Mini-projects, continued Send preliminary report to your supervisor at the latest on Tuesday 11-Oct at 12.00 Final version of Mini-project report to supervisors on Friday 13-Oct at 15.00					
42	Mon.	16-Oct*	***Group preparation – presentation and opposition of mini-projects***			
	Tue.	17-Oct*	***Group preparation – presentation and opposition of mini-projects***			
	Wed.	18-Oct*	***Group preparation – presentation and opposition of mini-projects***			
	Thu.	19-Oct*	09.00-15.00*	R	Presentation of Mini-projects and opposition	All
	Fri.	20-Oct	Home study			
43	Mon.	23-Oct	Home study			
	Tue.	24-Oct	Home study			
	Wed.	25-Oct	10.00-12.00	R	Questions to teachers before Exam	NJ (EC, AL)
	Thu.	26- Oct	Home study			
	Fri.	27- Oct*	**13.00-16.00 Final written examination** Tentamenssal 2			

MV0216, autumn 2023: student assignments (A)

Course modules:

1-theory (5 hp, blue), 2-modelling exercises (5 hp, orange), 3-mini-projects (5 hp, green)

W	Day	Date	A	Subject	How?
35	Monday	28-Aug	Ass0	Introduce yourself to the classroom	CANVAS
	Thursday	31-Aug	Ass1	Calculation exercises	Attend
36	Monday	04-Sept	Ass2	Quiz 1A (lectures 1-5)	CANVAS
			Ass3	Introduction to STELLA software	Attend
	Tuesday	05-Sept	Ass 4	STELLA exercise 1	Attend
	Wednesday	06-Sept	Ass 5	Quiz 1B, ex.1	CANVAS
	Thursday	07-Sept	Ass 6	STELLA exercise 2	Attend
			Ass 7	Quiz 2B, ex.2	CANVAS
	Friday	08-Sept	Ass 8	Quiz 2A (lectures 7-8)	CANVAS
37	Monday	11-Sept	Ass 9	STELLA exercise 3	Attend
	Tuesday	12-Sept	Ass 10	STELLA exercise 4	Attend
	Wednesday	13-Sept	Ass 11	Quiz 3B, ex.3	CANVAS
			Ass 12	Quiz 4B, ex.4	CANVAS
	Thursday	14-Sept	Ass 13	Quiz 3A (lectures 9-10)	CANVAS
	Friday	15-Sept	Ass 14	STELLA exercise 5	Attend
38	Monday	18-Sept	Ass 15	STELLA exercise 6	Attend
	Tuesday	19-Sept	Ass 16	Model sensitivity analysis	Attend
	Wednesday	20-Sept	Ass 17	Quiz 5B, ex.5 & 6	Attend
39	Monday	25-Sept	Ass 18	Individual report mini-workshop	CANVAS
	Tuesday	26-Sept	Ass 19	Oral presentations mini-workshop	Attend
	Wednesday	27-Sept	Ass 20	Mini-projects introduction	Attend
40 **41**	Thursday 28-Sept to Friday 13-Oct		Group work on mini-projects continues		
41	Friday	13-Oct	Ass 21	Submit mini-project report (group)	To supervisor
42	Thursday	19-Oct	Ass 22	Group presentation & opposition of mini-projects	Attend
43	Friday	27-Oct	**Ass 23**	**Final written examination**	**Attend**

MV0216, autumn 2023

Course starts: Monday 28th of August 2023 at 15.00

Course ends: Friday 27th of October 2023 at 16.00

- The course has **one written examination**; it will take place on

Friday the 27th of October 2023 13.00 to 16.00 (Tentamenssal 2, Undervisningshuset)

- **The** first re-examination **is planned on 6th of December 2023 13:00-16:00**
- The **second re-examination** is preliminary planned on **January 2024** (more info to come about time and room)

All participants in an examination organized by the Department of Soil and Environment should register at least 10 days before the date of the exam. The registration to the examination is possible from the start of the course and the registration to a re-examination is possible from four weeks before the examination date.

Registration should be done via Studentwebb / LADOK student. If you have any question or request about this registration, please contact the course secretariat mark-kurssekretariat@slu.se

Teachers and guest lecturers

Department of Soil and Environment, SLU, Uppsala

- Nicholas Jarvis (Examiner, NJ): Nicholas.jarvis@slu.se (Soil and Environmental Physics, head)
- Elsa Coucheney (Course leader, EC): elsa.coucheney@slu.se (Soil and Environmental Physics)

Computer exercises (together with Nick and Elsa)

- Anna Lindhal (AL) : Anna.Lindahl@slu.se (Soil and Environmental Physics)

Supervisors on Mini-projects (together with Nick, Anna and Elsa)

- Omran Alshihabi (OA): omran.alshihabi@slu.se (Precision Agriculture)
- Mats Larsbo (ML): mats.larsbo@slu.se (Soil and Environmental Physics & Soil Mechanics and Soil Management)

Guest lecture on Sustainable agricultural water management

- Jennie Barron (JB): jennie.barron@slu.se (Agricultural Water Management, head)

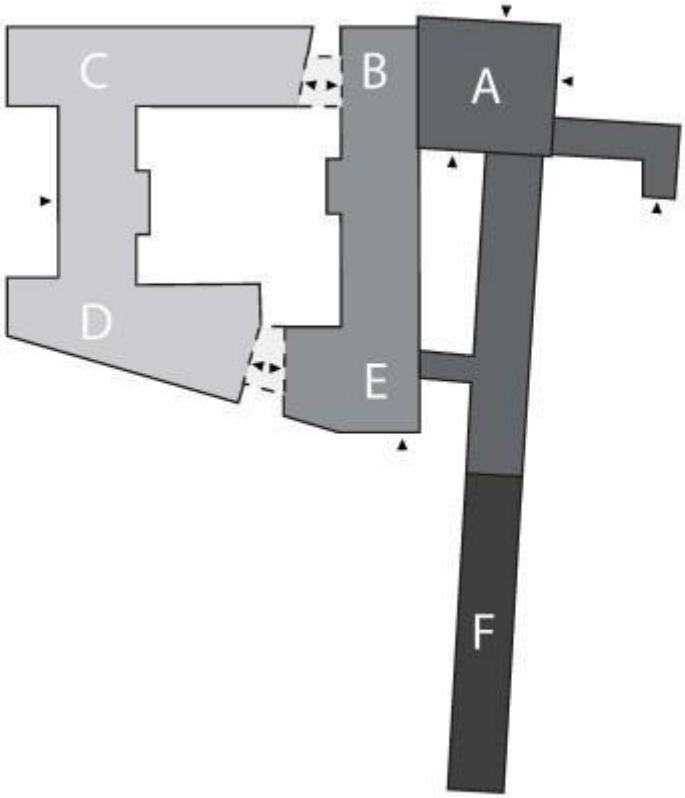
Room finder

SLU Campus Ultuna

Ulls Hus https://www.slu.se/ullshus

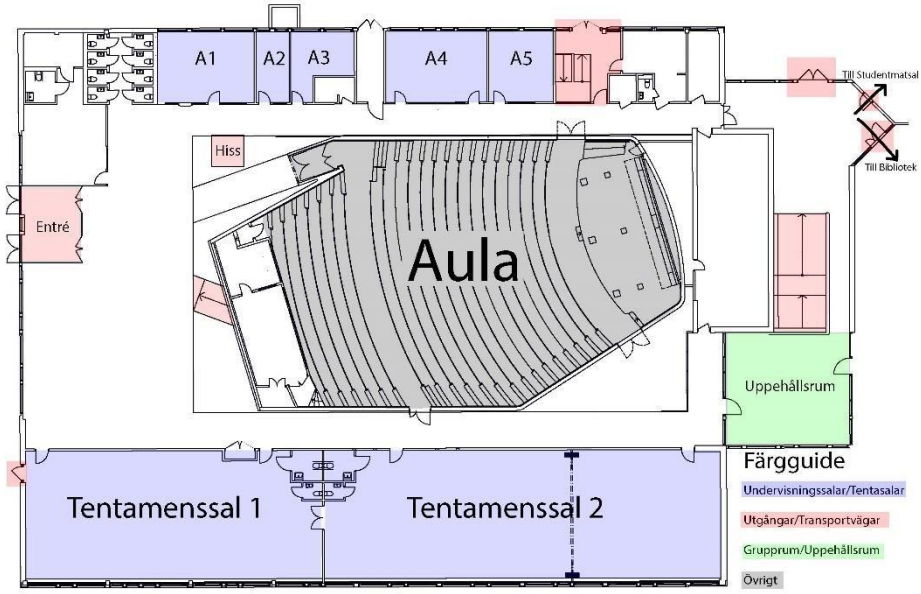
Room P (B-block), Room X (Block D), room R (Block B)

Computer room 2, Ulls_2 (A block)



Undervisningshuset

Tentamenssalarna 1 & 2 are located on the ground floor.



Student library (‘Bibliotek’) located in ’Undervisningshuset’

Computer rooms 1: bib_1

MVM huset: https://internt.slu.se/en/support-services/campusand-buildings/mvm-building/

Computer rooms (Datorsal) are all located on the ground floor

Datorsal 1 D1
Datorsal 2 D2.
Datorsal 3 D3.