

# MV0216. Soil Water Processes in Agro-ecosystems, 15 hp autumn 2022 (HT2022) – preliminary 13-05-2022

**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** (2h)
- **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 (2h)
- **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)
- **Lecture 10:** 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)
  - Introduction (1h)
  - Student presentations (3h)
- **Research presentations** by teachers (3h)
- **Exam preparation** (2h)
- **Written Exam** (3h)

### 2-modelling exercises

- **STELLA intro** (2h)
- **Stella exercise 1:** Capillary rise (6h)
- **Stella exercise 2:** Steady infiltration (3h)
- **Stella exercise 3:** Plant water uptake (7h)
- **Stella exercise 4:** Water balance of a soil profile (6h)
- **Stella exercise 5:** Solute transport I: breakthrough curves (in the laboratory) (6h)
- **Stella exercise 6:** Solute transport II: Transient leaching under field conditions (6h)
- **EXCEL Exercise:** uncertainty and sensitivity analysis (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 & exercises starts a quarter past time announced.

W	Day	Date	Time	Room	Subject	Teach.
35	Mon.	29-Aug*		<i>ROLL CALLS</i>		
			14.00-15.30*		Introduction to the course	EC, NJ
	Tue.	30- Aug	10.00-12.00		Lecture 1: What is soil?	EC
		30- Aug	13.00-15.00		Lecture 2: Phase relations & Water potentials (Chaps. 1-6)	NJ
	Wed.	31- Aug	10.00-12.00		Lecture 3: Soil water flow Part 1 (Chaps. 6-8)	NJ
	Thu.	01-Sept*	10.00-12.00 13.00-16.00*		Home Preparation Exercises Exercises: In-class calculation examples with water potentials, phase relations and water contents	NJ, EC
	Fri.	02-Sept	10.00-12.00 13.00-15.00		Lecture 4: Soil water flow Part 2 (Chap.8) Lecture 5: Soil water flow Part 3 (Chap.8, 14-15,17)	NJ NJ
36	Mon.	05-Sept	Home study ** Complete Quiz1 on water potentials and water flows**			
	Tue.	06-Sept	10.00-12.00		Lecture 6: Introduction to simulation models	NJ
			13.00-15.00*		Introduction to Stella modelling software	NJ, EC
	Wed.	07-Sept	09.00-12.00*		Stella ex. 1: Capillary rise (Chaps. 8, 18) Part 1/2	NJ, EC
	Thu.	08-Sept*	09.00-12.00* 13.00-17.00*		Stella ex. 1: Capillary rise (Chaps. 8, 18) Part 2/2 Stella ex. 2: Steady infiltration (Chaps. 8, 14)	NJ, EC NJ, DN?
	Fri.	09-Sept	Home study **Complete STELLA quiz 1**			

W	Day	Date	Time	Room	Subject	Teach.
37	Mon.	12-Sept	9.00-10.00		Lecture 7: Potential evapotranspiration Water/energy balances and (Chap. 20)	NJ
			10.30-12.30		Lecture 8: Plant water uptake and plant response to drought (Chaps. 19- 21)	NJ
		12-Sept	Home study - afternoon ** Complete Quiz2 on PET & water and energy balance**			
	Tue.	13-Sept	10.00-17.00*		Stella ex. 3: Plant water uptake (Chap. 19)	NJ, EC
	Wed.	14-Sept	Home study - morning ** Complete STELLA quiz 2**			
	Thu.	15-Sept*	10.00-17.00*		Stella ex. 4: Water balance of a soil profile (Chaps. 8, 19-20)	NJ, KM
38	Fri.	16-Sept	Home study ** Complete STELLA quiz 3**			
	Mon.	19-Sept	10.00-12.00		Lecture 9: Solute transport I (Chap.9)	NJ
			13.00-15.00		Lecture 10: Solute transport II (Chap.9)	NJ
			Home study ** Complete Quiz3 on solute transport**			
	Tue.	20-Sept	10.00-17.00*		Stella ex. 5: Solute transport 1 (Chap.9)	NJ, DN ?
	Wed.	21-Sept				
39	Thu.	22-Sept	10.00-17.00*		Stella ex. 6: Solute transport 2 (Chap.9)	NJ, DN ?
	Fri.	23-Sept	Home study ** Complete STELLA quiz 4**			
	Mon.	26-Sept	10.00-12.00		Invited lecture: water management and sustainable agriculture	JB?
			13.00-14.00*		Introduction Mini-workshop on agroecosystems and climate change	EC
	Tue.	27-Sept*	10.00-16.00*		Exercise: uncertainty and sensitivity analysis	NJ
	Wed.	28-Sept	09.00-12.00		Teachers presentations on current research	All
	Thu.	29-Sept	**Mini-workshop – Prep. individual: scientific publication reading **			
	Fri.	30-Sept	**Mini-workshop 1- Prep. individual: scientific publication reading** **Submit individual report at 12.00**			

W	Day	Date	Time	Room	Subject	Teach.
40	Mon.	03-Oct*	am	**Mini-workshop 2- group discussion and preparation of oral presentation**		
	Tue.	04-Oct*	09.00-12.00*		Mini-workshop 3-Group presentations and discussion	EC, KM
	Wed.	05-Oct*	10.00-12.00*		Introduction to mini-projects and contact with supervisors	All
	Thu.	06-Oct*	Mini-projects start			
	Fri.	07-Oct*	Mini-projects, continued			
41	Monday 10-Oct* to Friday 14-Oct* Mini-projects, continued					
42	Mon.	17-Oct*	Mini-projects, continued			
	Tue.	18-Oct*	Final version of Mini-project report to supervisors at 15.00			
	Wed.	19-Oct*	**Group Preparation – presentation and opposition Mini-project**			
	Thu.	20-Oct*	**Group Preparation – presentation and opposition Mini-project**			
	Fri.	21-Oct*	10.00-17.00*		Presentation of Mini-projects and opposition	All
43	Mon.	24-Oct	Home study			
	Tue.	25-Oct	Home study			
	Wed.	26-Oct	10.00-12.00		Questions to teachers before Exam	NJ, EC
	Thu.	27- Oct	Home study			
	Fri.	28- Oct*	13.00-16.00*		Final Written Examination	

## MV0216, autumn 2022: student assignments (A)

### Course modules:

**1-theory (5 hp),**

**2-modelling exercises (5 hp),**

**3-mini-projects (5 hp)**

W	Day	Date	Time	A	Subject	How?
35	Fri	2-sept	-	0	Introduce yourself to the classroom	CANVAS
	Fri.	1-sept	13-16	1	Calculation exercises	Attend
36	Mon.	5-sept	-	2	Complete Lecture - Quiz 1	CANVAS
	Tue.	6-sept	13-15	3	Introduction to STELLA software	Attend
	Wed.	7&8-sept	9-12	4	STELLA exercise 1	Attend
	Thu.	8-sept	13-17	5	STELLA exercise 2	Attend
	Fri.	9-sept	-	6	Complete STELLA - Quiz 1	CANVAS
37	Mon.	12-sept	-	7	Complete Lecture - Quiz 1	CANVAS
	Tue.	13-sept	10-17	8	STELLA exercise 3	Attend
	Wed.	14-sept	-	9	Complete STELLA - Quiz 2	CANVAS
	Thu.	15-sept	10-17	10	STELLA exercise 4	Attend
	Fri.	16-sept	-	11	Complete STELLA - Quiz 3	CANVAS
38	Mon.	19-sept	-	12	Complete Lecture - Quiz 3	CANVAS
	Tues.	20-sept	10-17	13	STELLA exercise 5	Attend
	Thu.	22-sept	10-17	14	STELLA exercise 6	Attend
	Fri.	23-sept	-	15	Complete STELLA - Quiz 4	CANVAS
40	Mon.	26-sept	13-14	16	Intro to Mini-workshop	Attend
	Tue.	27-sept	10-17	17	Model sensitivity analysis	Attend
	Fri.	30-sept	-	18	Individual Report Mini-workshop	CANVAS
41	Tue.	4-oct	9-12	19	Group presentation & discussion Mini-workshop	Attend
	Wed.	5-oct	10-12	20	Mini-projects introduction	Attend
42	6-18-oct		Group work on mini-projects			
43	Tue.	18-oct	15.00	21	Submit mini-project report (group)	CANVAS /supervisor
	Fri.	21-oct	10-17	22	Group presentation & opposition Mini-project	Attend
44	Fri.	28-oct	13-16	23	Final written examination	Attend

## MV0216, autumn 2022

**Course starts:** Monday 29st of August 2022 at 15.00

**Course ends:** Friday 28st of October 2022 at 16.00

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

**Friday the 28<sup>th</sup> of October 2022 13.00 to 16.00** (room to be decided)

- The **first re-examination** is preliminary planned on **Wednesday 7th of December 2022** afternoon (more info to come about time and room)
- The **second re-examination** is preliminary planned on **January 2023** (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-kurssektariat@slu.se](mailto:mark-kurssektariat@slu.se)

## Teachers and guest lecturers

Department of Soil and Environment, SLU, Uppsala

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

Computer exercises (together with Nick and Elsa) & mini-workshop (together with Elsa)

- Katharina Meurer (KM): [katharina.meurer@slu.se](mailto:katharina.meurer@slu.se) (Soil nutrient cycling)

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

- Omran Alshihabi (OA): [omran.alshihabi@slu.se](mailto:omran.alshihabi@slu.se) (Precision Agriculture)
- Johannes Koestel (JK): [john.koestel@slu.se](mailto:john.koestel@slu.se) (Soil and Environmental Physics, Agroscope, Soil Fertility and Protection )
- Mats Larsbo (ML): [mats.larsbo@slu.se](mailto: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](mailto:jennie.barron@slu.se) (Agricultural Water Management, head)

## **Room finder (to be updated)**