MV0216. Soil Water Processes in Agro-ecosystems, 15 hp autumn 2020 (HT2020)

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

The course MV0216, HT 2020 will be held at the Ultuna campus

- The course introduction (compulsory) will be digital and will take place the same day as the roll call for the new Master students, i.e. on Monday the 31st August in the afternoon (14.15-15.30).
- Lectures (non compulsory) and exercises (including computer labs, compulsory) will be done on campus but larger rooms are booked in order to provide the possibility of physical distancing between course participants. Also at least 30 min break between two teaching activities is applied.
- Online quizzes will support distance learning outside campus.
- Mini-projects (module 3) will run at distance and students will be provided with the software to run / work on their models from home.
- Zoom = digital meeting

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? Why we care? (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)
- **Lecture10:** Solute transport II (2h)
- **In-class calculation** examples with water potentials, phase relations and water contents (4h)
- **7 online Quizzes** (Home work)
- **Mini-workshop** 'Agroecosystems and climate change' (3d):
    - Student homework (2d)
    - Introduction (1h)
    - keynotes (2-4h)
    - Student presentations (2h)
- **Research presentations** by teachers (3h)
- **Exam preparation** (2h)
- **Written Exam** (3h)

2-modelling exercises

- **STELLA intro** (2h)
- **Stella exercise 1:** Capillary rise (5h)
- **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** (8d)
- **Oral Presentation & Opposition** (5h)

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

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	Teachers
36	Mond.	31-Aug*	10.00-12.00*	*Roll call Master program 'Soil and Environment'* https://student.slu.se/en/studies/new-student/uppsala/welcome-activities-and-roll-call-in-uppsala/		
			14.00-15.30*	Zoom	Introduction to the course	EC, NJ
	Tuesd.	1-Sept	9.00-10.15	Zoom	Lecture 1: What is soil? Why we care?	EC
		1-Sept	13.00-15.00	C212	Lecture 2: Phase relations & Water potentials (Chaps. 1-6)	NJ
	Wednesd.	2-Sept	10.30-12.30	C212	Lecture 3: Soil water flow Part 1 (Chaps. 6-8)	NJ
	Thursd.	3-Sept*	10.30-15.00*	C212	Exercises: In-class calculation examples with water potentials, phase relations and water contents	NJ
	Frid.	4-Sept	Home study			
37	Mond.	7-Sept	10.30-12.30	C212	Lecture 4: Soil water flow Part 2 (Chap.8)	NJ
		7-Sept	Home study			
	Tuesd.	8-Sept	10.30-12.30	C212	Lecture 5: Soil water flow Part 3 (Chap.8, 14-15,17)	NJ
		8-Sept	Home study ** Complete Quiz1 on water potentials and water flows**			
	Wednesd.	9-Sept	10.30-12.30	C212	Lecture 6: Introduction to simulation models	NJ
	Thursd.	10-Sept*	10.30-12.30* 13.00-17.00*	D1	Introduction to Stella modelling software Stella ex. 1: Capillary rise (Chaps. 8, 18)	NJ, KM NJ, JF
	Frid.	11-Sept*	10.30-15.00*	D1	Stella ex. 2: Steady infiltration (Chaps. 8, 14)	NJ, FK
		11-Sept	Home study			
38	Mond.	14-Sept	Home study **Complete STELLA quiz 1**			
	Tuesd.	15-Sept	9.00-10.00	C212	Lecture 7: Potential evapotranspiration Water/energy balances and (Chap. 20)	NJ
		15-Sept	10.30-12.30	C212	Lecture 8: Plant water uptake and plant response to drought (Chaps. 19- 21)	NJ
		15-Sept	Home study			
	Wednesd.	16-Sept	Home study ** Complete Quiz2 on PET & water and energy balance**			
	Thursd.	17-Sept*	10.30-17.30*	D1	Stella ex. 3: Plant water uptake (Chap. 19)	NJ, KM
	Frid.	18-Sept	Home study ** Complete STELLA quiz 2**			

W	Day	Date	Time	Room	Subject	Teachers
39	Mond.	21-Sept*	10.30-17.30*	D1	Stella ex. 4: Water balance of a soil profile (Chaps. 8, 19-20)	NJ, KM
	Tuesd.	22-Sept	Home study ** Complete STELLA quiz 3**			
	Wednesd.	23-Sept	10.30-12.30	C212	Lecture 9: Solute transport I (Chap.9)	NJ
	Thursd.	24-Sept	10.30-12.30	C212	Lecture 10: Solute transport II (Chap.9)	NJ
		24-Sept	Home study ** Complete Quiz3 on solute transport**			
	Frid.	25-Sept*	10.30-17.30*	D2	Introduction Stella ex. 5 & 6 Solute transport (Chap.9)	NJ, JF
40	Mond.	28-Sept	10.30-12.30	C212	Invited lecture: water management and sustainable agriculture	JB
	Mond.	28-Sept*	13.30-15.00*	C212	Introduction Mini-workshop on agroecosystems and climate change	AV
	Tuesd.	29-Sept*	15.30-17.30*	D2Ull	Run-through Stella ex. 5 & 6: Solute transport (Chap.9)	NJ, JF
	Wednesda.	30-Sept	Home study ** Complete STELLA quiz 4**			
	Thursd.	1-Oct	10.30-17.30*	D1	Exercise: uncertainty and sensitivity analysis	NJ
	Frid.	2-Oct	**Mini-workshop 1- Preparation individual: scientific publication reading **			
41	Mond.	5-Oct*	am	**Mini-workshop 1- Preparation individual: scientific publication reading **Submit individual report at 12.0		
			pm	**Mini-workshop 2- group discussion and preparation of oral presentation**		
	Tuesd.	6-Oct*	am	**Mini-workshop 2- group discussion and preparation of oral presentation**		
	Tuesd.		13.00-15.00*	C212	Mini-workshop 3-Group presentations and discussion	AV, KM, EC
	Wednesda.	7-Oct	10.30-15.00	C212	Teachers presentations on current research	All
	Thursd.	8-Oct*	10.30-12.30*	Zoom	Introduction to mini-projects and contact with supervisors	NJ, KM, OA, ML, JK
	Thursd.	8-Oct*	Mini-projects start			
	Frid.	9-Oct*	Mini-projects, continued			
42	Monday 12-Oct* to Friday 16-Oct* Mini-projects, continued					
43	Mond.	19-Oct*	" "			
	Tuesd.	20-Oct*	Final version of Mini-project report to supervisors at 15.00			
	Wednesda.	21-Oct*	***Group Preparation – presentation and opposition Mini-project***			
	Thursd.	22-Oct*	***Group Preparation – presentation and opposition Mini-project***			
	Frid.	23-Oct	10.30-17.30*	C212	Presentation of Mini-projects and opposition	NJ, KM, OA, ML, JK
44	Mond.	26-Oct	Home study			
	Tuesd.	27-Oct	Home study			
	Wednesda.	28-Oct	10.30-12.30	C212	Questions to teachers before Exam	NJ
	Thursd.	29- Oct	Home study			
	Frid.	30- Oct*	**13.00-16.00***	?	**Final Written Examination**	

MV0216, autumn 2020: student assignments (A)

W	Day	Date	Time	A	Subject	How?
36	Wednesd.	2-sept	-	1	Introduce yourself to the classroom	CANVAS
	Thursd.	3-sept	10.30-15.00	2	Calculation exercises	Attend
37	Tuesd.	8-sept	-	3	Complete Lecture - Quiz 1	CANVAS
	Thursd.	10-sept	10.30-12.30	4	Introduction to STELLA software	Attend ➢ Upload your Lokta-Volterra model
	Thursd.	10-sept	13.00-17.30	5	STELLA exercise 1	Attend ➢ Upload your capillary rise model
	Frid.	11-sept	10.30-15.00	6	STELLA exercise 2	Attend ➢ Upload your infiltration model
38	Mond.	14-sept	-	7	Complete STELLA - Quiz 1	CANVAS
	Wednesd.	16-sept	-	8	Complete Lecture - Quiz 1	CANVAS
	Thursd.	17-sept	10.30-17.30	9	STELLA exercise 3	Attend ➢ Upload your water uptake model
	Frid.	18-sept	-	10	Complete STELLA - Quiz 2	CANVAS
39	Mond.	21-sept	10.30-17.30	11	STELLA exercise 4	Attend ➢ Upload your water balance model
	Tuesd.	22-sept	-	12	Complete STELLA - Quiz 3	CANVAS
	Thursd.	24-sept	-	13	Complete Lecture - Quiz 3	CANVAS
	Frid.	25-sept	10.30-17.30	14	STELLA exercise 5	Attend ➢ Upload your modelled curves below
41	Mond.	28-sept	13.00-15.00	15	Intro to Mini-workshop	Attend
	Tuesd.	29-sept	10.30-17.30	16	STELLA exercise 6	Attend ➢ Upload your transient leaching model below
	Wednesd.	30-sept	-	17	Complete STELLA - Quiz 4	CANVAS
	Thursd.	1-oct	10.30-17.30	18	Model sensitivity analysis	Attend
42	Mond.	5-oct	12.00	19	Individual Report Mini-workshop	CANVAS
	Tuesd.	6-oct	13.00-15.00	20	Group presentation & discussion Mini-workshop	Attend
	Thursd.	8-oct	10.30-12.30	21	Mini-projects introduction	Attend
44	Tuesd.	20-oct	15.00	22	Submit mini-project report (group)	CANVAS
	Frid.	23-oct	10.30-17.30	23	Group presentation & opposition Mini-project	Attend
45	**Frid.**	**30-oct**	**13-16**	**24**	**Final written examination**	**Attend**

MV0216, autumn 2020

Course starts: Monday 31st of August 2020 at 14.00

Course ends: Friday 30st of October 2020 at 16.00

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

Friday the 30th of October 2020 13.00 to 16.00 (room to be decided)

- The **first re-examination** is preliminary planned on **Wednesday 25th of November 2020** afternoon (more info to come about time and room)
- The **second re-examination** is preliminary planned on **January 2021** (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)

- Katharina Meurer (KM): katharina.meurer@slu.se (Soil and Environmental Physics & Soil Mechanics and Soil Management)
- Jumpei Fukumasu (JF): jumpei.fukumasu@slu.se (Soil and Environmental Physics)

Mini-workshop on Climate change

- Ana Villa Solis (AV): ana.villa@slu.se (Soil and Environmental Physics)

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

- Omran Alshihabi (OA): omran.alshihabi@slu.se (Precision Agriculture)
- Johannes Koestel (JK): john.koestel@slu.se (Soil and Environmental Physics)
- 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)

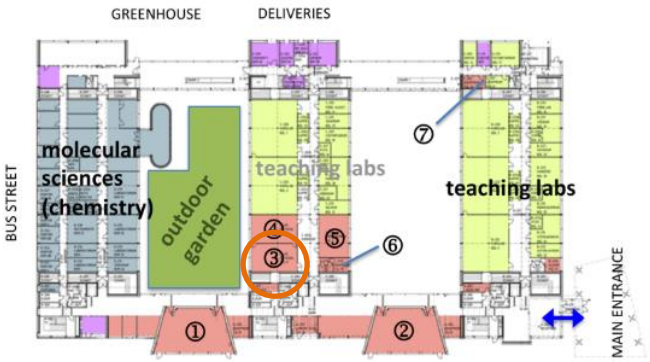
Room finder

❖ Biocenter:

- https://www.slu.se/en/faculties/nj/this-is-the-nj-faculty/cluster/uppsala-biocenter/
- Room C212 (Entrance level)

SLU Biocenter room booking

Ground floor (2nd floor)



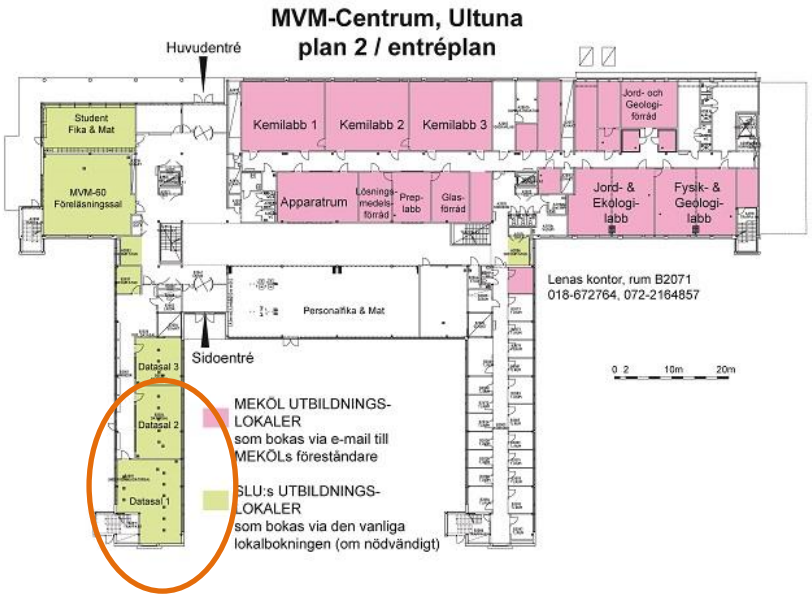
Book using TimeEdit:

1 Lennart Kennes sal (A281, 90 persons)
2 A241 (60 persons)
3 C212 (30 persons)
4 C213 (30 persons)
5 C216 (30 persons)
6 group room C211D (6 persons)
7a group room E202 (6 persons)
7b group room E203 (6 persons)

Outdoor garden (book here, for parties for instance)

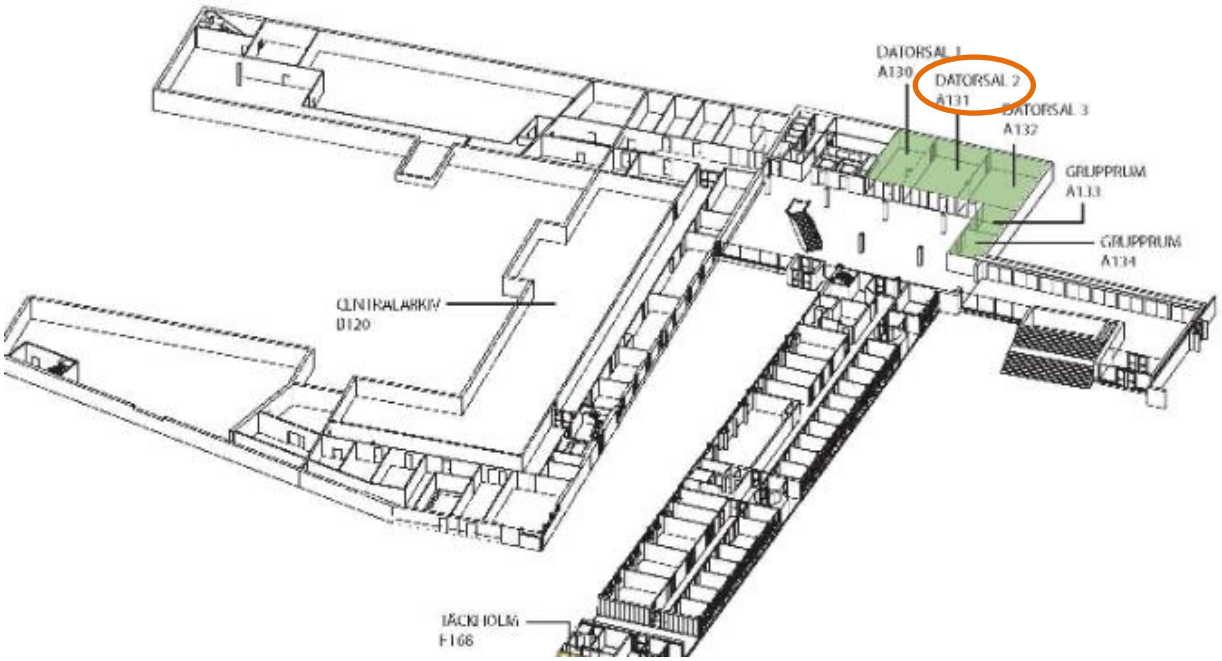
❖ MVM-huset:
https://internt.slu.se/en/support-services/campus-and-buildings/mvm-building/

- Computer rooms D1 (Datorsal 1; B2019), D2 (Datorsal 2; B2024) in Level 2 (Entrance level)



- Ulls Hus

https://www.slu.se/ullshus
Datorsal 2 in plan 1 (one stair down from the entry) D2Ull



- Service center (Ulls Hus)

https://internt.slu.se/en/support-services/basic-services/servicecenter/
Phone: +46(0)18-67 10 00
E-mail: servicecenter@slu.se

- Library / Bibliotek (Undervissningshuset)

https://www.slu.se/en/subweb/library/

Campus Ultuna