

MV0216. Soil Water Processes in Agro-ecosystems, 15 hp autumn 2025 (HT2025)

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, 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)
- **Lecture 10:** Solute transport II (2h)
- **In-class calculation** examples with water potentials, phase relations and water contents (3h)
- **3 online Quizzes** (Home work)
- **Mini-workshop** 'Agroecosystems and climate change' (3d):
 - Student homework (2d)
 - Guest lecture (2h)
 - 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 (5h)
- **Stella exercise 6:** Solute transport II: Transient leaching (5h)
- **Uncertainty and sensitivity analysis** (5h)
- **3 online Quizzes** (Home work)

3-STELLA mini-projects

- **Introduction** (2h)
- **Group work** (3 weeks)
- **Oral Presentation & Opposition** (6h)

Projects:

1. Pesticide leaching to groundwater: comparison with laboratory experiment.
2. Irrigation management in the salt-affected soils of the Marismas.
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 **x**; 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.

Homework is indicated with grey areas.

Week	Day	Date	Time		Room	Subject	Teachers
36	Monday	01-sept	11.30-12.30			<i>ROLL CALL for Master program: compulsory for students of the Soil Water & Environment program</i>	
			14.00 - 16.00	x	Sal Y (Uh)	Introduction to the course	EC, NJ
	Tuesday	02-sept			Watch TED talks and reflect over a few questions to be discussed in lecture 1		
			13.00 - 15.00		Sal V (Uh)	Lecture 1: What is soil? Why do we care?	EC
			15.00 - 17.00			Lecture 2: Phase relations & Water potentials (Chaps. 1-6)	NJ
	Wednesday	03-sept	09.00 - 11.00		Sal K (Uh)	Lecture 3: Soil water flow Part 1 (Chaps. 6-8)	NJ
	Thursday	04-sept			Home Preparation Exercises		
			13.00 - 16.00	x	Sal Z (Uh)	Exercises: In-class calculation examples with water potentials, phase relations and water contents	NJ (/EC)
	Friday	05-sept	09:00 – 10:00		Sal Q (Uh)	Introduktion till Library	JP
			10.00 - 12.00			Lecture 4: Soil water flow Part 2 (Chap.8)	NJ
			13.00 - 14.00		Sal Z (Uh)	Questions time on Lectures 2-4 & calculations	NJ (/EC)
			14.00 - 16.00			Lecture 5: Soil water flow Part 3 (Chap.8, 14-15,17)	NJ

Student assignments (compulsory), week 36:

- Participate in the course introduction and present yourself to the group on CANVAS
- In-class participation to calculation exercises on The 4th September

Week	Day	Date	Time		Room	Subject	Teachers
37	Monday	08-sept	10.00-12.00	x	Complete Quiz1A on water potentials and water flows		
			13.00 - 14.00		D1, mvm	Run through Quiz 1A	NJ
			14.00 - 15.00			Lecture 6: simulation models	
			15.00 - 17.00	x		Introduction to Stella modelling software	EC, NJ
	Tuesday	09-sept	09.00 - 12.00	x	D1-2, Uh	Stella exercise 1: Capillary rise (Chaps. 8, 18)	EC, NJ
			13.00 - 15.30	x		Stella exercise 1: continues...	
			15.30 - 17.00			Extra time to complete exercise 1	
	Wednesday	10-sept		x	Complete Stella Quiz1B on capillary rise		
	Thursday	11-sept	09.00 - 12.00	x	D1, mvm	Stella exercise 2: Steady infiltration (Chaps. 8, 14)	NJ, DNS
				x	Complete Stella Quiz2B on infiltration		
	Friday	12-sept	09.00-10.00		Sal Z (Uh)	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
						x	Complete Quiz2A on PET & water and energy balance

Student assignments (compulsory), week 37:

- Complete Quiz 1A on canvas
- In-class participation to STELLA introduction and exercises 1 and 2 on the 8th, 9th and 11th September
- Complete STELLA Quizzes 1B and 2B on canvas
- Complete Quiz 2A on canvas

Week	Day	Date	Time		Room	Subject	Teachers	
38	Monday	15-sept	09.00 - 12.00	x	D2-3 (mvm)	Stella exercise 3: Plant water uptake (Chaps. 8, 18)	EC, NJ	
			13.00 - 15.30	x		Stella exercise 3: continues...		
			15.30 - 17.00			Extra time to complete exercise 3		
	Tuesday	16-sept	09.00 - 12.00	x	Hugin & Munin, (VHC)	Stella exercise 4: Water balance of a soil profile (Ch.19-20)	NJ, DNS	
			13.00 - 15.30	x		Stella exercise 4: continues...		
			15.30 - 17.00			Extra time to complete exercise 4		
	Wednesday	17-sept		x	Complete STELLA quiz 3B on water uptake & water balance			
	Thursday	18-sept	9.00 - 11.00		Sal N (Un)	Lecture 9: Solute transport I (Chap.9)	NJ	
			13.00 - 15.00		Sal X (Uh)	Lecture 10: Solute transport II (Chap.9)	NJ	
				x	Complete STELLA quiz 3A on solute transport			
	Friday	19-sept	09.00 - 12.00	x	D1-2 (Uh)	Stella exercise 5: Solute transport 1 (Chap.9)	AL, NJ	
			13.00 - 15.30	x		Stella exercise 5: continues...	AL, NJ	
			15.30 - 17.00			Extra time to complete exercise 5		

Student assignments (compulsory), week 38:

- In-class participation to STELLA exercises 3, 4 and 5 on the 15th, 16th and 19th September
- Complete STELLA Quizzes 3B on canvas
- Complete Quiz 3A on canvas

Week	Day	Date	Time		Room	Subject	Teachers
39	Monday	22-sept	09.00 - 12.00	x	Hugin & Munin (VHC)	Stella exercise 6: Solute transport 2 (Chap.9)	AL, NJ
			13.00 - 15.30	x		Stella exercise 6: continues...	
			15.30 - 17.00			Extra time to complete exercise 6	
	Tuesday	23-sept		x	Complete STELLA quiz 4B on solute transport		
				x	Mini-workshop – Preparation individual report		
	Wednesday	24-sept		x	Mini-workshop – Preparation individual report continues – submit report by 16.0		
	Thursday	25-sept	09.00 - 12.00	x	D1 (mvm)	Exercise: uncertainty and sensitivity analysis	NJ
			13.00 - 15.00	x		Exercise: uncertainty and sensitivity analysis continues...	
			15.00 - 17.00			Extra time to complete exercise on uncertainty	
	Friday	26-sept		x	Mini-workshop – Discussion in group and preparation oral preparation		

Student assignments (compulsory), week 39:

- In-class participation to STELLA exercise 6 and exercise on uncertainty on the 22nd, 25th September
- Complete STELLA Quiz 4B on canvas
- Read publication to mini-workshop and submit individual report on the 24th September
- Discuss with your group and prepare oral presentation for mini-workshop on the 26th September

Week	Day	Date	Time		Room	Subject	Teachers
40	Monday	29-sept	09:00 - 12:00		Sal O2 (Un)	Teachers presentations on their research	
			13:30 – 15:30		Sal Z (Uh)	Guest lecture on Water management and sustainable agriculture	JB
	Tuesday	30-sept	13:00-16:00	x	Sal N (Un)	Mini-workshop 3-Group presentations and discussion	EC
	Wednesday	01-oct	09.30 - 12.00	x	Sal N (Un)	Introduction to mini-projects and contact with supervisors	All (JP)
	Thursday	02- oct		x	D3 (mvm)	Mini-projects start	
	Friday	03- oct		x	D2 (Uh)	Mini-projects, continued	
41	Monday -6 Oct* to Friday – 10 Oct* Mini-projects, continued Schedule at least one meeting with your supervisor during that week Computer rooms: Mon: D3 (mvm) ; Tue: D1 (Uh); Wed (from 11): D-A132 (Uh); Thu: Munin (VHC); Fri: D3 (mvm)						
	Wednesday	8-oct	09:00 – 11:00		D1, mvm	Workshop on literature search with Jonas Petterson	
42	Monday -13 Oct* to Friday -17 Oct* Mini-projects, continued Computer rooms: Mon-Tues: D-A132 (Uh); Wed: D3 (mvm); Thu-Fri: D-A132 (Uh) Send preliminary report to your supervisor at the latest on Tuesday 14-Oct at 12.00 Final version of Mini-project report to supervisors on Friday 17-Oct at 15.00						

Student assignments (compulsory), week 40 and weeks 41- 42:

- In-class participation to mini-workshop oral presentations (mini-workshop 2) on the 30th September
- In-class participation to mini-projects introduction on the 1st October
- Mini-projects in weeks 41-42: computer room are booked, regular contact with your supervisor
- Submit final version of your report on the 17th October (send preliminary version to your supervisor at the latest on the 14th October)

Week	Day	Date	Time	Room		Subject	Teachers
43	Monday	20-oct	Group preparation – presentation and opposition of mini-projects				
	Tuesday	21-oct	Group preparation – presentation and opposition of mini-projects				
	Wednesday	22-oct	Group preparation – presentation and opposition of mini-projects				
	Thursday	23-oct	08.15 - 15.30	x	Sal T, Uh	Presentation of Mini-projects and opposition	all
	Friday	24-oct	Home study – exam preparation				
44	Monday	27-oct	10.00 - 12.00	x	Sal U, Uh	Questions to teachers before Exam	NJ, EC
	Tuesday	28-oct	Home study – exam preparation				
	Wednesday	29-oct	Home study – exam preparation				
	Thursday	30-oct	Examination – time and location to be confirmed				

Student assignments (compulsory), week 43 & 44:

- In-class participation to Mini-projects presentation and opposition on the 23rd October
- Examination on Thursday 30th October

MV0216, autumn 2025

Course starts: Monday 1st September 2025

Course ends: Thursday 30th October 2025

- The course has **one written examination on Thursday 30th October 2025**
- **The first re-examination is planned on the 10th December 2025**
- **The second re-examination is planned on the 25th February 2026**

(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

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)
- Anna Lindhal (AL): Anna.Lindahl@slu.se (Soil and Environmental Physics)
- David Nimblad Svensson (DNS): david.nimblad.svensson@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)
- Pascal Benard (PB): pascal.benard@slu.se (Soil Mechanics and Soil Management)

Guest lecture on Sustainable agricultural water management

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

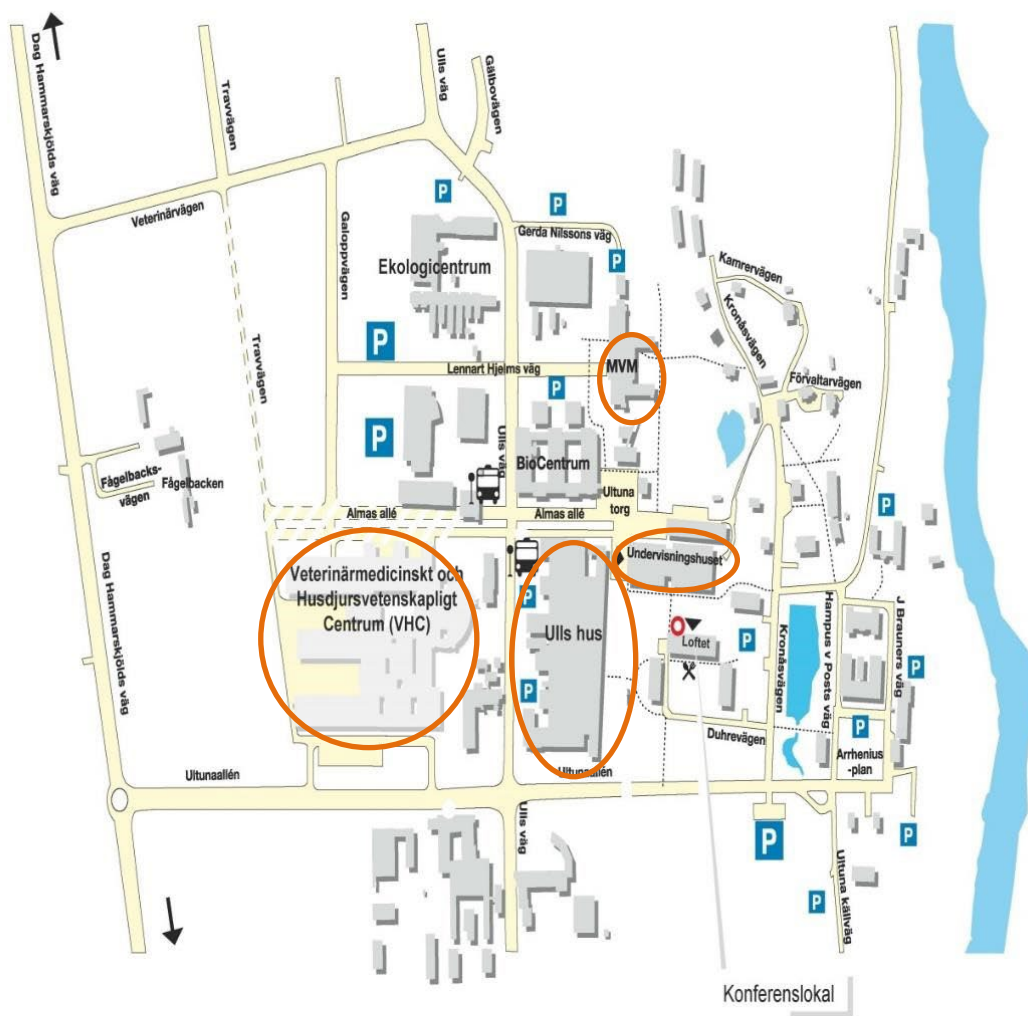
Presentation from SLU library and literature search workshop by Jonas Petterson (JP)

Room finder



Campus Ultuna

Från centrala Uppsala och E4:an



Från Sunnersta och väg 255

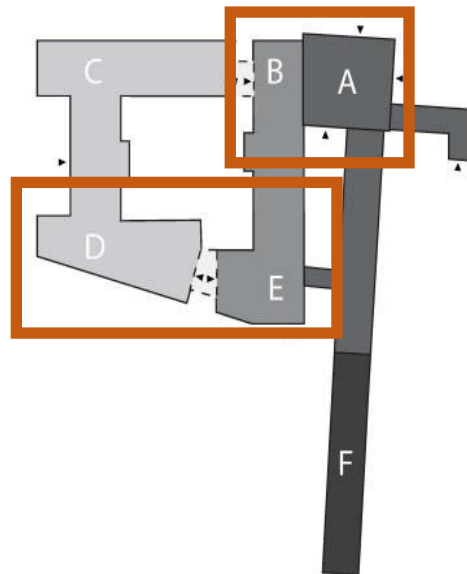
- Konferenslokal
- Parkering
- Restaurang
- Busstopp

0 100 200 300 m

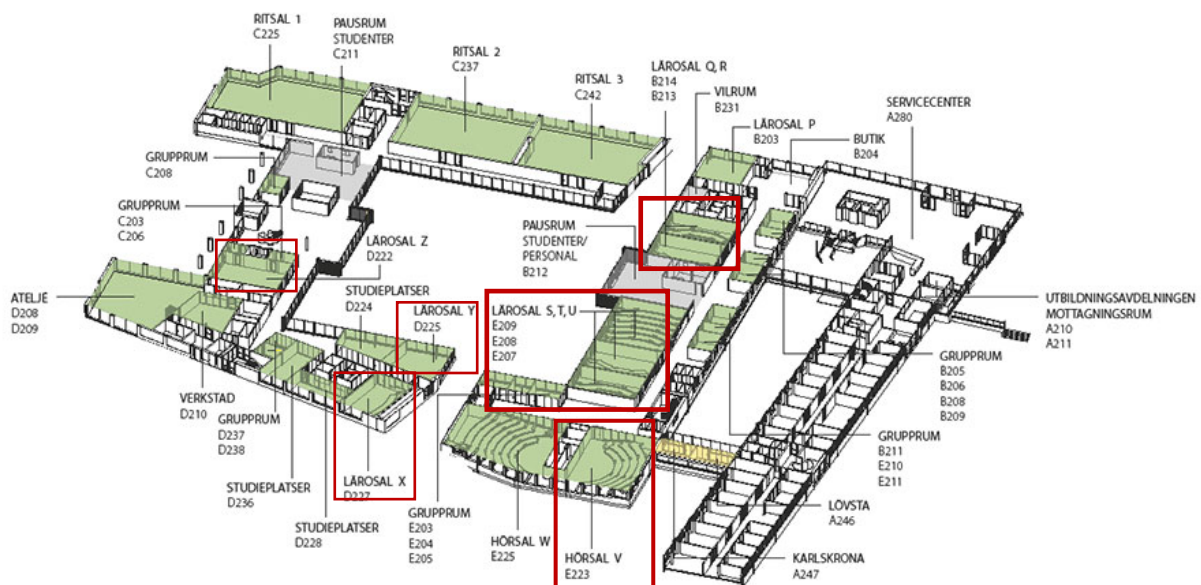
Ulls Hus (Uh)

<https://www.slu.se/ullshus>

- Room A132 (A-block) downstairs
- Computer rooms D1-2 (A-block) downstairs
- Lecture room Q (B-block)
- Lecture rooms X, Y and Z (D-block)
- Lecture rooms T, U and V (E-block)

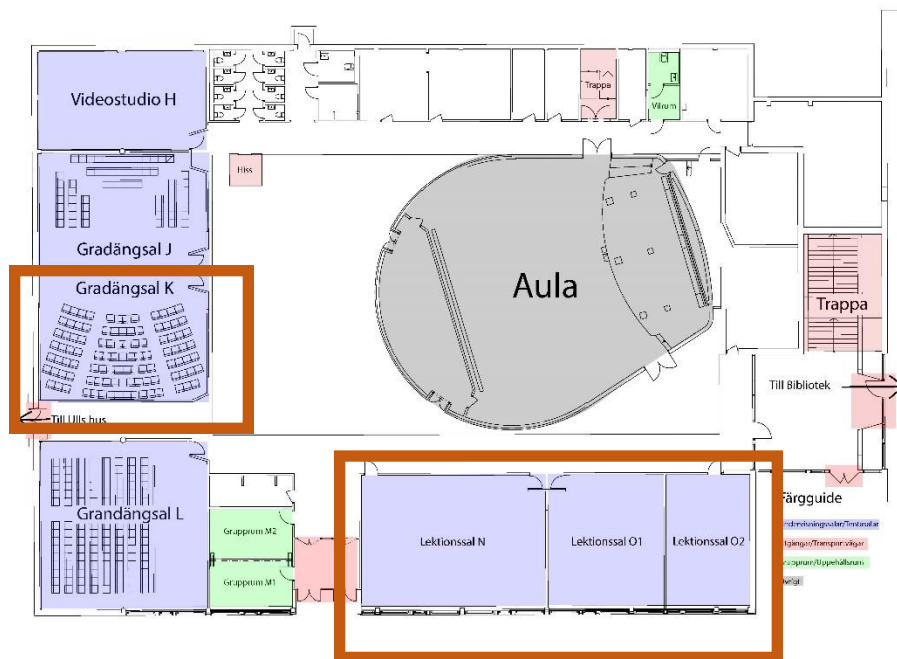


PLAN 2 - ENTRÉPLAN



Undervisningshuset (Un)

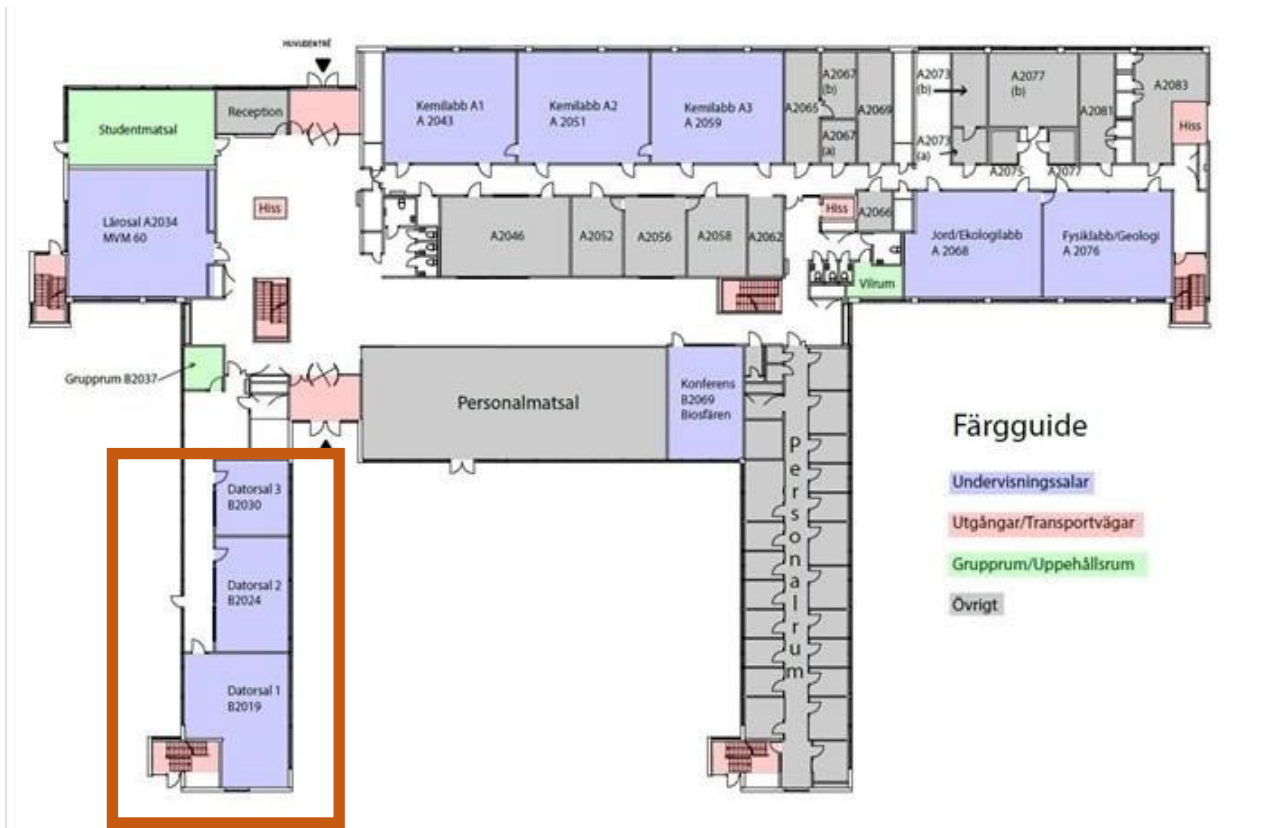
- Room K, O2 and N are located downstairs



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



VHC hus

<https://internt.slu.se/stod-service/lokaler-campus/vhc/om-vhc/hitta-har/>

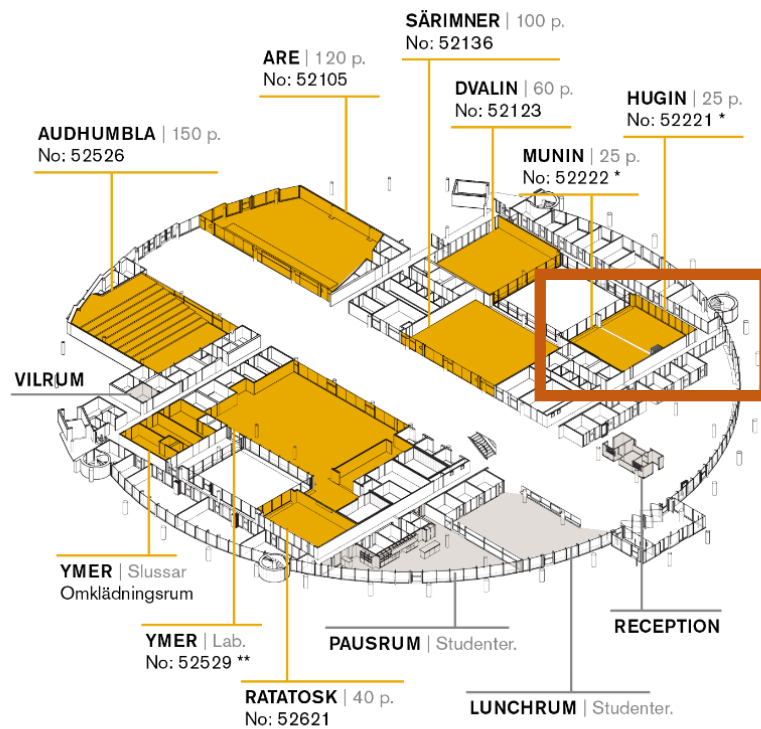
- Computer rooms Hugin and Munin are located on the ground floor



Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

VHC hus 5, plan 2
Entréplan

5:2



* Datasal

** Övningslab