MV0216. Soil Water Processes in Agro-ecosystems, 15 hp autumn 2024 (HT2024)

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)
- **Lecture10:** 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	02-sept				*ROLL CALL for Master program: compulsory for students of the Soil Water & Environment program*	
			14.00 - 16.00	**x**	Framtiden, mvm	**Introduction** to the course	EC, NJ
	Tuesday	03-sept			Watch TED talks and reflect over a few questions to be discussed in lecture 1		
			13.00 - 15.00		A132, Ulls	**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	04-sept	08.00 - 10.00		O1, Und	**Lecture 3:** Soil water flow Part 1 (Chaps. 6-8)	NJ
	Thursday	05-sept			Home Preparation Exercises		
			13.00 - 16.00	**x**	A132, Ulls	**Exercises:** In-class calculation examples with water potentials, phase relations and water contents	NJ (/EC)
	Friday	06-sept	10.00 - 12.00		O1, Und	**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
				x	Complete Quiz1A on water potentials and water flows		

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 5th September
- Complete Quiz 1A on canvas

Week	Day	Date	Time		Room	Subject	Teachers
37	Monday	09-sept	10.00 - 11.00		A132, Ulls	Run through Quiz 1A	NJ
			11.00 - 12.00			**Lecture 6:** simulation models	
			13.00 - 15.00	**x**	D1, mvm	Introduction to Stella modelling software	EC, NJ
	Tuesday	10-sept	09.00 - 12.00	**x**	D2, mvm	**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	11-sept		**x**	Complete Stella Quiz1B on capillary rise		
	Thursday	12-sept	09.00 - 12.00	**x**	D1, lib	**Stella exercise 2:** Steady infiltration (Chaps. 8, 14)	NJ, AL
			13.00 - 14.00		O1, Und.	***Information*** *from SLU library*	JP
				x	Complete Stella Quiz2B on infiltration		
	Friday	13-sept	09.00-10.00		A132, Ulls	**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:

- In-class participation to STELLA introduction and exercises 1 and 2 on the 9th, 10th and 12th September
- Complete STELLA Quizzes 1B and 2B on canvas
- Complete Quiz 2A on canvas

Week	Day	Date	Time		Room	Subject	Teachers
38	Monday	16-sept	09.00 - 12.00	**x**	Hugin, VHC	**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	17-sept	09.00 - 12.00	**x**	D1, Ulls	**Stella exercise 4:** Water balance of a soil profile (Chaps. 8, 19-20)	EC, NJ
			13.00 - 15.30	**x**		**Stella exercise 4:** continues…	
			15.30 - 17.00			Extra time to complete exercise 4	
	Wednesday	18-sept		**x**	Complete STELLA quiz 3B on water uptake & water balance		
	Thursday	19-sept	10.00 - 12.00		P, Ulls	**Lecture 9:** Solute transport I (Chap.9)	NJ
			13.00 - 15.00		T, Ulls	**Lecture 10:** Solute transport II (Chap.9)	NJ
				x	Complete STELLA quiz 3A on solute transport		
	Friday	20-sept	09.00 - 12.00	**x**	D1, lib	**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 16th, 17th and 20th September
- Complete STELLA Quizzes 3B on canvas
- Complete Quiz 3A on canvas

Week	Day	Date	Time		Room	Subject	Teachers
39	Monday	23-sept	09.00 - 12.00	**x**	D1, Lib	**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	24-sept	09.00 - 12.00	**x**	D2, 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	
	Wednesday	25-sept		**x**	Complete STELLA quiz 4B on solute transport		
	Thursday	26-sept	10.00 - 12.00		A132, Ulls	Teachers presentations on their research	all
			13.00 - 15.00		T, Ulls	**Guest lecture** on Water management and sustainable agriculture	JB
	Friday	27-sept		**x**	Mini-workshop – Preparation individual: scientific publication reading		

Student assignments (compulsory), week 39:

- In-class participation to STELLA exercise 6 and exercise on uncertainty on the 23rd, 24th September
- Complete STELLA Quiz 4B on canvas
- Read publication to mini-workshop and prepare summary

Week	Day	Date	Time		Room	Subject	Teachers
40	Monday	30-sept	09.00 - 12.00	**x**	Mini-workshop 1- Prep. individual: scientific publication reading Submit individual report at 12.00		
			13.00 - 16.00	**x**	Mini-workshop 2- Group work to prepare oral presentation		
	Tuesday	01-oct	09.00 - 12.00	**x**	Mini-workshop 2- Group work to prepare oral presentation		
			13.00 - 16.00	**x**	S, Ulls	Mini-workshop 3-Group presentations and discussion	EC
	Wednesday	02-oct	10.00 - 12.00	**x**	A132, Ulls	Introduction to mini-projects and contact with supervisors	all
	Thursday	03- oct		**x**	D2, mvm	Mini-projects start	
	Friday	04- oct		**x**	D2, mvm	Mini-projects, continued	
41	Monday -7 Oct* to Friday – 11 Oct* Mini-projects, continued Computer rooms: Mon: D1, mvm ; Tue: D2, mvm ; Wed-Thu: D1, Ulls ; Fri: Hugin, VHC Schedule at least one meeting with your supervisor during that week						
42	Monday -14 Oct* to Friday -18 Oct* Mini-projects, continued Computer rooms: Mon: D3, mvm ; Tue: Hugin, VHC ; Wed: Munin / D1, lib ; Thu: D1. Ulls; Fri: D1, mvm Send preliminary report to your supervisor at the latest on Tuesday 15-Oct at 12.00 Final version of Mini-project report to supervisors on Friday 18-Oct at 15.00						

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

- Submit individual report on article reading (mini-workshop 1) on the 30th September
- In-class participation to mini-workshop oral presentations (mini-workshop 2) on the 1st October
- In-class participation to mini-projects introduction on the 2nd October
- Mini-projects in weeks 41-42: computer room are booked, regular contact with your supervisor
- Submit final version of your report on the 18th October (send preliminary version to your supervisor at the latest on the 15th October)

Week	Day	Date	Time		Room	Subject	Teachers
43	Monday	21-oct	Group preparation – presentation and opposition of mini-projects				
	Tuesday	22-oct	Group preparation – presentation and opposition of mini-projects				
	Wednesday	23-oct	Group preparation – presentation and opposition of mini-projects				
	Thursday	24-oct	09.00 - 15.00	**x**	A132, Ulls	Presentation of Mini-projects and opposition	all
	Friday	25-oct	Home study – exam preparation				
44	Monday	28-oct	10.00 - 15.00	**x**	O1, Und	Questions to teachers before Exam	NJ, EC
	Tuesday	29-oct	Home study – exam preparation				
	Wednesday	30-oct	Home study – exam preparation				
	Thursday	31-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 24th October
- Examination on Thursday 31st October

MV0216, autumn 2024

Course starts: Monday 2nd September

Course ends: Thursday 31st October

- The course has **one written examination**; it will take place on Thursday 31st October
- **The** first re-examination **is planned on 11th December**
- The **second re-examination** is preliminary planned on 26th **February 2025** (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)
- 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)

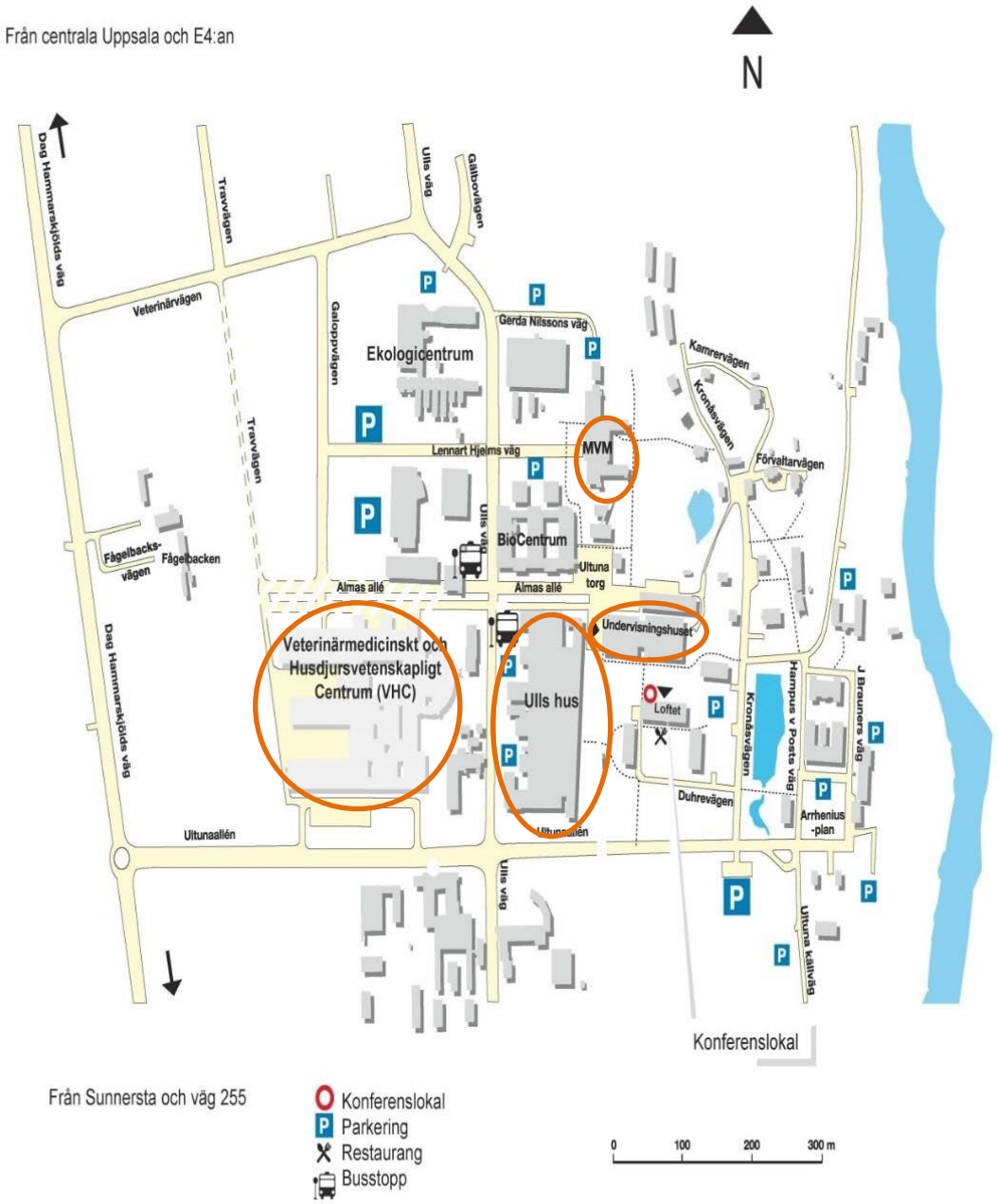
Guest lecture on Sustainable agricultural water management

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

Jonas Petterson (JP) from the Library

Room finder

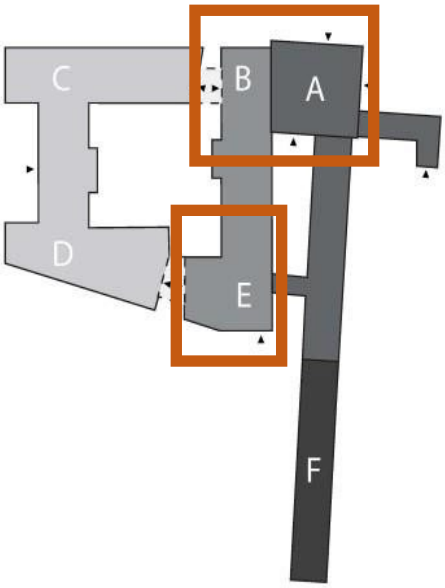
SLU Campus Ultuna

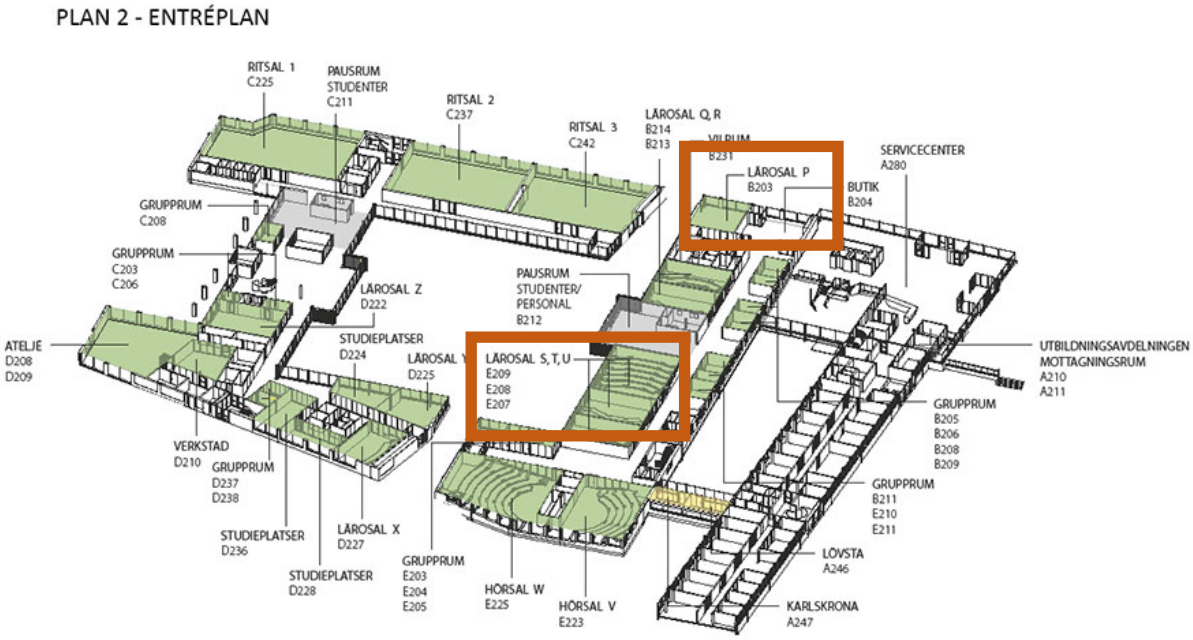


Ulls Hus

https://www.slu.se/ullshus

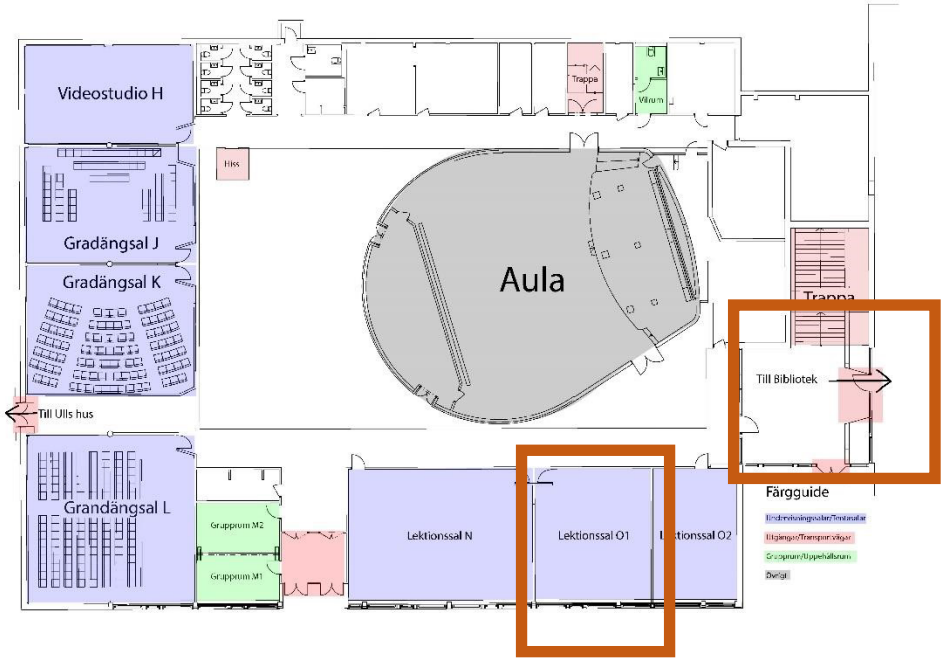
- Room A132 (A-block) downstairs (the entrance level)
- Computer room D1, Ulls (A block) downstairs (the entrance level)
- Lecture rooms T and S are located in block E and room P in block B





Undervisningshuset and Library

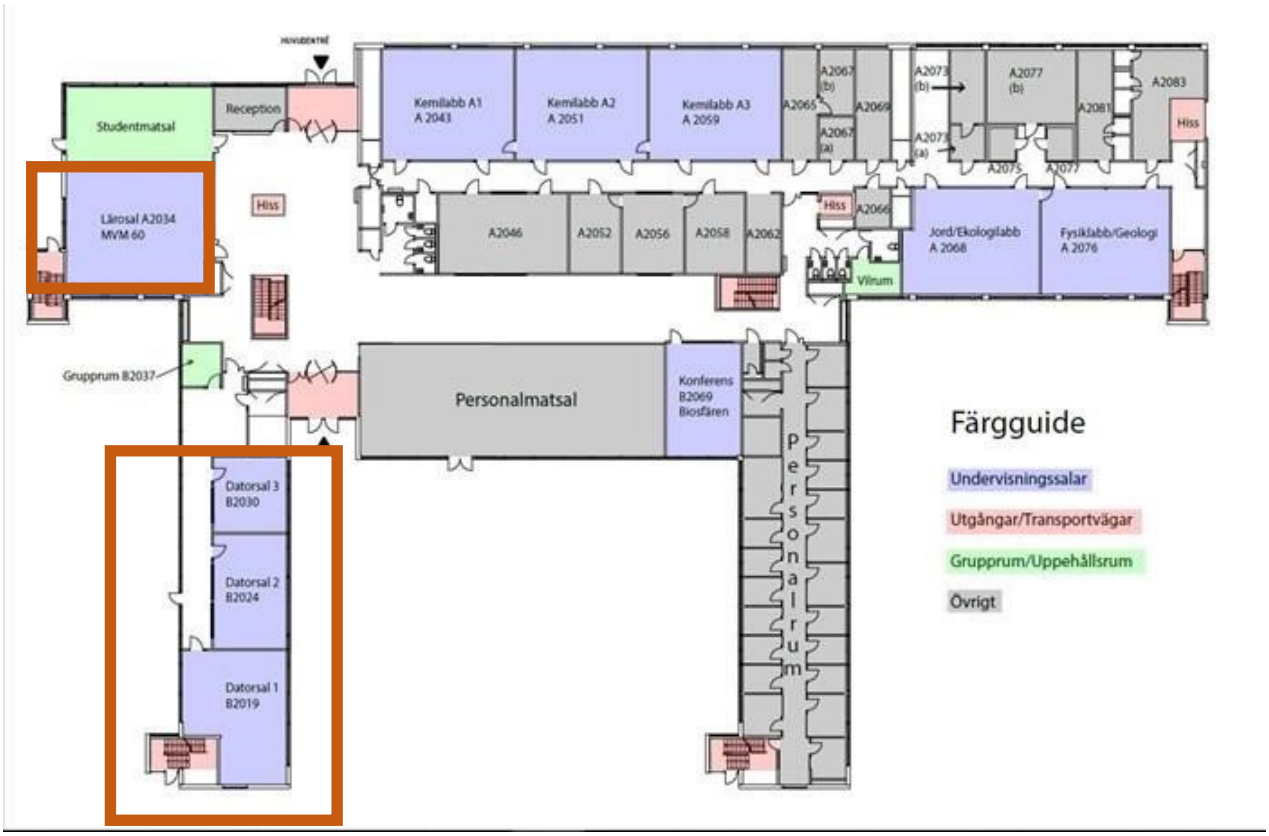
- Room O1, Und is located downstairs
- Computer rooms in the library: D1, lib



MVM huset:

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

- Framtiden (A2034) is located behind the student kitchen
- Computer rooms (Datorsal) are all located on the ground floor
- Datorsal 1 D1
- Datorsal 2 D2



VHC hus

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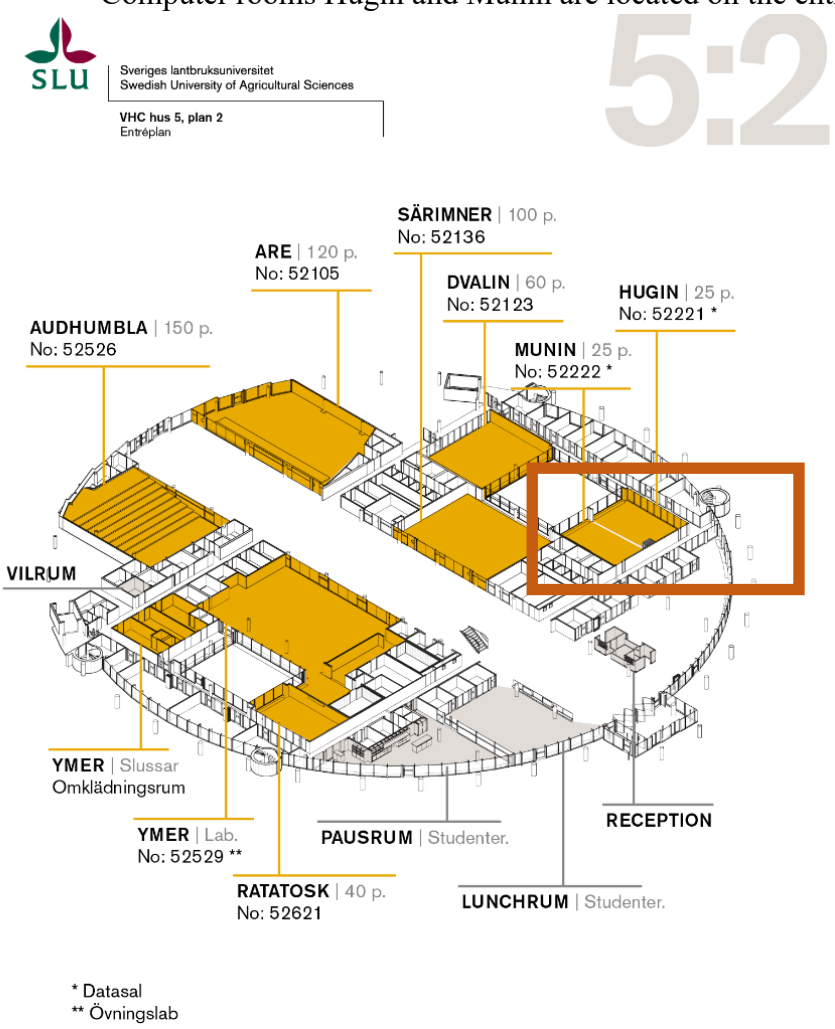
- Computer rooms Hugin and Munin are located on the entrance floor



* Datasal
** Övningslab