Agrohydrology and computer modelling

COURSE IDENTIFICATION

CODE	SEM	HT	HP	HA	SCT	PREREQUISITES	COURSE LEVEL OR CATEGORY	RESPONSABLE UNIT
AG100535	Summer	1	0	2,1	2	Postgraduate inscription	Elective	Postgraduate School

One SCT credit point is equivalent to 25 student learning hours.

COURSE DESCRIPTION

This course presents advanced and applicable knowledge on applied agrohydrology and computer modelling at different scale levels affecting plant production and the environment.

LEARNING STRATEGIES

Lectures, theoretical exercises, group discussions and student presentations.

COURSE COMPETENCIES (Type: B=Basic, G=Generic, E=Specific)

At the conclusion of this class, students will be able to:

- Identify and analyze the most important agrohydrological factors in relation to their primary focus, interpret the results of their analysis and draw the relevant conclusions (E).
- Understand the applications of agrohydrological models (E).
- Integrate knowledge about the water dynamics in agricultural systems (G).
- Understand new concepts and technologies and their potential applications to solve agricultural water management problems (G).

LEARNING RESOURCES

Lectures. Case studies. Computer models.

COURSE OUTLINE

Chapter	Content
Applied Agrohydology	Water in soil (hydraulic properties), soil structure and water flow in soil. Pedotransfer function models. Transport of nitrogen and phosphorus on soils.
Agrohydological models	Model classification: deterministic, stochastic, and hybrid approaches. Model applications at different scale levels: soil column, plot, field and watershed. Model comparison: DAISY, DRAINMOD and AQUACROP.
Model calibration, validation and application	Model parametrization. Model input and output. Warm-up period. Calibration vs validation. Statistical measures. Model application: future scenarios.
Uncertainty and sensitivity analysis	Source of errors. Spatial soil variability. Uncertainty analysis. Sensitivity analysis.

Reading Materials

- Abrahamsen, P., Hansen. S. 2000. Daisy: an open soil-crop-atmosphere system model. Environmental Modelling & Software 15, 313-330.
- Arheimer, B., Lidén, R. 2000. Nitrogen and phosphorus concentrations from agricultural catchments - Influence of spatial and temporal variables. Journal of Hydrology 227, 140-159.
- Beven, K., Freer, J., 2001. Equifinality, data assimilation, and uncertainty estimation in mechanistic modeling of complex environmental systems using the GLUE methodology. Journal of Hydrology 249 (1-4), 11-29.

- Hansen, S., Abrahamsen, P., Petersen, C.T., Styczen, M., 2012. DAISY: model use, calibration, and validation. Transactions of the ASABE 55, 1315-1333.
- Moriasi, D.N., Arnold, J.G., Van Liew, M.W., Bingner, R.L., Harmel, R.D., Veith, T.L., 2007. Model evaluation guidelines for systematic quantification of accuracy in watershed simulations. Transactions of the ASABE 50, 885−900.
- Obropta, C.C, Kardos, J.S. 2007. Review of Urban Stormwater Quality Models: Deterministic, Stochastic, and Hybrid Approaches. Journal of the American Water Resources Association 43, 1508-1523.
- Pachepsky, Y.A., Smettem, K.R.J., Vanderborght, J., Herbst M., Vereecken, H., Wösten, J.H.M. 2004. Reality and fiction of models and data in soil hydrology. R.A. Feddes (Ed.), et al., Unsaturated-Zone Modeling, Kluwer Academic Publishers, Dordrecht, the Netherlands.
- Radcliffe, D.E., Freer, J., Schoumans, O. 2009. Diffuse phosphorus models in the United States and Europe: Their usages, scales, and uncertainties. Journal of Environmental Quality 38: 1956-1967.
- Steduto, P., Hsiao, T.C., Raes, D., Fereres, E. 2009. Aquacrop-the FAO crop model to simulate yield response to water: I. concepts and underlying principles. Agronomy Journal 101, 426-437.
- Youssef, M.A., Skaggs, R.W., Chescheir, G.M., Gilliam, J.W. 2005. The nitrogen simulation model, DRAINMOD-N II. Transactions of the ASAE 48, 611-626.

Web sites

https://www.ars.usda.gov/pacific-west-area/riverside-ca/us-salinity-laboratory/docs/rosetta-model/

https://www.bae.ncsu.edu/agricultural-water-management/drainmod/

https://daisy.ku.dk/

http://www.fao.org/aquacrop/en/

INSTRUCTORS (List non-exclusive)

Instructor	*Department*	*Area or major field*
Osvaldo Salazar	Soil and Engineering, University of Chile	Sustainable soil and water management

GRADING (under review every term)

Activity	*Percentage (%)*
Model presentation	50
Exercise	50