

GEOGRAPHY AND PLANNING

GPHY 346: GIS and Modelling for Environmental Applications



Contact Time	Two-hour lecture and two-hour lab per week	
Format	Lectures, labs, discussions, presentations and a final project	
Class Assessment	Lab assignments	40%
	Quizzes	25%
	Final Project Report	20%
	Seminar and project proposal presentations	10%
	Class participation and discussion	5%

COURSE OVERVIEW

This course covers a set of spatial and process-based modeling techniques and their applications in solving physical and environmental problems. It combines lectures with a substantial practical component. The lectures cover technical issues related to physical and environmental application, including data representation and data models, spatial interpolation, raster-based analysis and modeling in GIS, surface models and terrain analysis, data visualization, dynamic analysis, and process-based models. The practical component, involving lab assignments and a class project, will give students hands-on experience in using ArcGIS Pro and STELLA software packages, to handle geo-spatial information. For the class project, students will be required to apply techniques and methods in more depth to environmental physical/environmental/biological applications.

LEARNING OUTCOMES

Those who successfully complete the course will be able to

- understand a set of GIS and process-based techniques for geo-spatial environmental data analysis and visualization;
- gain hands-on experience in the application of ArcGIS Pro and STELLA software in support of environmental analysis and modeling.

COURSE TOPICS

Environmental data, data representation, data modeling, data sampling, spatial interpolation, surface analysis, hydrology modeling, suitability modeling, process-based modeling

COURSE READINGS

- Longley, P.A., M.F. Goodchild, D.J. Maquire, D.W. Rhind, (2011) Geographic Information Systems and Science, John Wiley & Sons. (<https://www.vitalsource.com/referral?term=9780470948095>)
- Lo, C.P., A.K.W. Yeung, (2002). Concepts and Techniques of Geographic Information Science. Prentice Hall. 492p. Ford, A. (2009). Modeling the Environment. Island Press. 488p (<https://www.islandpress.org/book/modeling-the-environment-second-edition>)
- Gray, W.G., G.A. Gray 2017. Introduction to Environmental Modeling. Cambridge University Press. 425p.
- Pourghasemi, H.R., C. Gokceoglu. (2021). Spatial modeling in GIS and R for Earth and Environmental Sciences. Elsevier. 798p.
- Smith, Jo., P. Smith. (2007). *Environmental Modelling: An introduction*. Oxford University Press, 180p.
- Skidmore, A. (2002). Environmental Modeling with GIS and Remote Sensing. Taylor & Francis. 286p.
- Grant, W.E., T.M. Swannack. 2007. Ecological Modeling: A common-sense approach to theory and practice. Wiley, 176p.