

Course syllabus

Department of Civil Engineering, Indian Institute of Technology Madras

CE6033-GIAN 171003C05:Spatial Modelling and Analysis of Environmental Systems using open source tools

Credit Distribution: C:6 L:2 T:0 P:0 E:0 O:4 TH:0

Course Type:Theory

Description:This course is aimed at post-graduate students and researchers who want to advance their understanding of geographic information science and technology, including introduction to the R environment for (spatial) statistical computing and visualization, and the QGIS open-source GIS. This will be especially useful for students/researchers involved in projects that use spatial information for applications in natural resource management, hydrology, ecology, and soil science. In the final two days st

Course Content:Lectures: Typology of spatial analysis; The R environment for (geo)statistical computing; review of non-spatial regression and extension to spatial regression; review of GIS principles; Projections, Datums and Coordinate systems; Spatial correlation and prediction; CART and Random Forests for spatial data; Area-Based spatial analysis; Point Pattern analysis; Time series; Spatio-temporal analysis; Uncertainty, data quality, and metadata; Spatial sampling Practical exercises (computer laboratories) Basic use of R for exploratory data analysis and regression; geostatistics with R/gstat (variograms, kriging); spatial regression; CART and Random Forests: R/rpart and RandomForest, Spatio-temporal geostatistics: Area spatial data analysis: R/spdep and GeoDa; Point-pattern analysis: R/spatstat

Text Books:-NIL

Reference Books:

1. Bivand, R. S., Pebesma, E. J., & Gmez-Rubio, V. (2013). Applied spatial data analysis with R (2nd ed.). Springer.
2. R Development Core Team. (2017). An Introduction to R: Notes on R: A Programming Environment for Data Analysis and Graphics (Version 3.4.1 (2017-06-30)). Vienna: The R Foundation for Statistical Computing. Retrieved from <http://cran.r-project.org/doc/manuals/R-intro.pdf>
3. Fox, J. (2016). Applied regression analysis and generalized linear models (3rd ed). Los Angeles: SAGE.
4. Fox, J., Weisberg, S., & Fox, J. (2011). An R companion to applied regression (2nd ed). Thousand Oaks, Calif: SAGE Publications.
5. Malone, B. P., Minasny, B., & McBratney, A. B. (2017). Using R for Digital Soil Mapping. Springer International Publishing.
https://doi.org/10.1007/978-3-319-44327-0_1

Prerequisites:-Nil