GEOGRAPHIC INFORMATION SYSTEMS

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PRE-REQUISITES : Current students of engineering, post graduate science students and PhD students should have basic knowledge of computers

INTENDED AUDIENCE : Under and post-graduate engineering, post graduate and doctoral students

INDUSTRIES APPLICABLE TO : Geoinformatics companies, e.g NIIT, ESRI India, Leica Geoinformatics, MapmyIndia, ISRO, etc.

COURSE OUTLINE :

The proposed course provides detailed understanding about Geographic Information Systems and their applications in Civil Engineering and Earth Sciences. All aspects starting from data input to modelling would be discussed in this course. Further, in the proposed course various datasets including DEMs, their source, generation techniques, derivatives, errors and limitations would be discussed extensively. Surface Hydrologic Modelling using DEMs, modelling derivatives and their applications would also be discussed.

ABOUT INSTRUCTOR :

Prof. Arun K. Saraf is Ph. D. (Remote Sensing) from University of Dundee, United Kingdom. Presently he is working as Professor in the Department of Earth Sciences, Indian Institute of Technology, Roorkee, and teaches courses on Geographic Information Systems (GIS), Advanced GIS, Remote Sensing, Geomorphology etc. to under- and post-graduate students of Geological Technology and Applied Geology. He was also Head of Department of Earth Sciences between Jan. 2012-Feb. 2015. He was first in the country to introduce GIS course to post-graduate students in the year 1990. In 1986, he was awarded National Fellowship to Study Abroad by Govt. of India for his doctoral degree.

COURSE PLAN :

Week 1: What is Geographic Information Systems?, Essential components of GIS, Different types of vector data, Concept of topology, Demonstration through GIS software
Week 2: Raster data model and comparisons with vector, TIN data model and comparisons with raster, Non-spatial data (attributes) and their types, Vector Data Compression Techniques, Demonstration through GIS software
Week 3: Raster Data Compression Techniques-01, Raster Data Compression Techniques-02, Georeferencing, Pre- processing of spatial datasets-01, Demonstration through GIS software
Week 4: Pre-processing of spatial datasets-02, Pre-processing of spatial datasets-03, Spatial Interpolation Techniques-01, Spatial Interpolation Techniques-02, GIS Analysis- 01
Week 5: GIS Analysis-02, GIS Analysis-03, GIS Analysis- 04, GIS Analysis-05, Demonstration through GIS software
Week 6: GIS Analysis-06, GIS Analysis-07, Attributes Classification Methods, Spatial Database systems and their types-01, Demonstration through GIS software
Week 7: Spatial Database systems and their types-02, Concept of NoData in Raster, Different map projections, Concept of digital elevation model (DEM) and how it is represented, Demonstration through GIS software
Week 8: Various techniques to generate digital elevation models-1, Various techniques to generate digital elevation models-2, Various techniques to generate digital elevation models-3, Digital Elevation Models and different types of resolutions, Demonstration through GIS software
Week 9: How to assess quality of a DEM, Integration of DEMs with satellite data, Common derivatives of DEMs - Slope and aspect-01, Common derivatives of DEMs - Slope and aspect-02, Demonstration through GIS software
Week 10: Common derivatives of DEMs - Slope and aspect-03, DEMs derivatives-1, DEMs derivatives-2, DEMs derivatives-3, DEMs derivatives-4
Week 11: Triangulated Irregular Network (TIN) and its derivatives, Shaded relief models and their applications, DEM based Surface Hydrologic Modelling-1, DEM based Surface Hydrologic Modelling-2, DEMs and Dam Simulation and its application in groundwater hydrology
Week 12: DEMs Sources, limitations and future of Digital Elevation Models, Applications of DEMs in Viewshed and Flood Hazard Mapping, Applications of DEMs in solar and wind energy potential estimations, Errors in GIS and key elements of maps, Limitations and Rules of GIS