

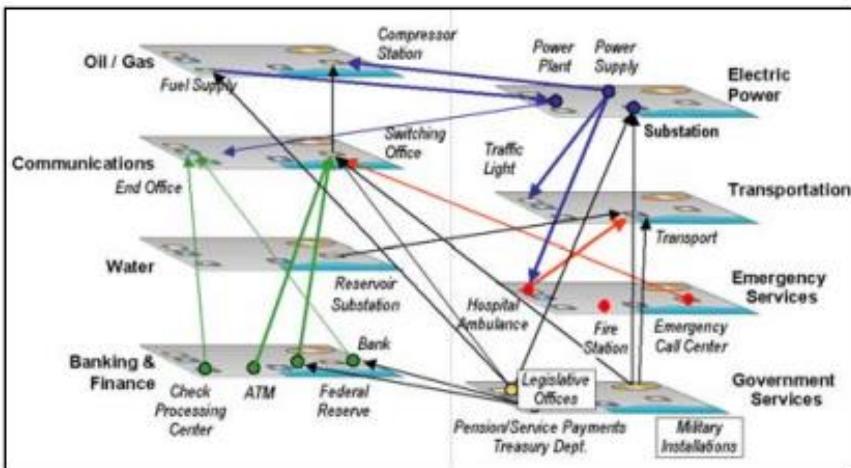
## EDUCATION IN GEOMATICS FOR FIRST LINE EMERGENCY MANAGEMENT IN UKRAINE

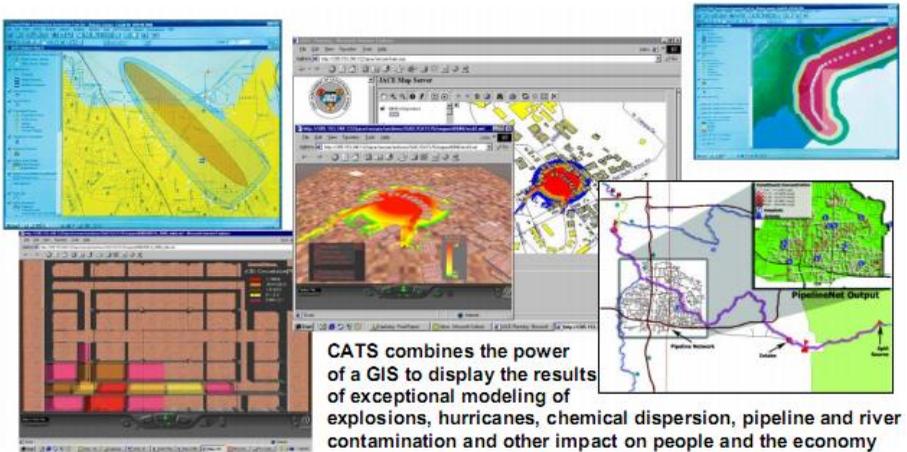
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**Abstract:** The article presents the experience of Taras Shevchenko National University of Kyiv in designing, organising, and teaching courses in geomatics for crisis management practitioners and experts pursuing a career in critical infrastructure protection.

**Keywords:** education, emergency management, resilience, geodesy, geomatics, GIS, Ukraine.

The successful elimination of emergencies, its prevention and correct forecasting depends on full and objective information about the facility of critical infrastructure. The correct decisions in this case depend on the quality of modelling of processes in this emergency facility.





The universal tools for modelling of spatial objects are geographic information systems and technologies. A leading specialised organisation in Ukraine is the The Department of Geodesy and Cartography of Taras Shevchenko National University of Kyiv is a structure for training of specialists in geomatics.

Citizens of Ukraine and foreign students can get bachelor's and masters' degrees in this department. There is also the possibility to get PhD degree in geographic cartography under the leadership of department professors.

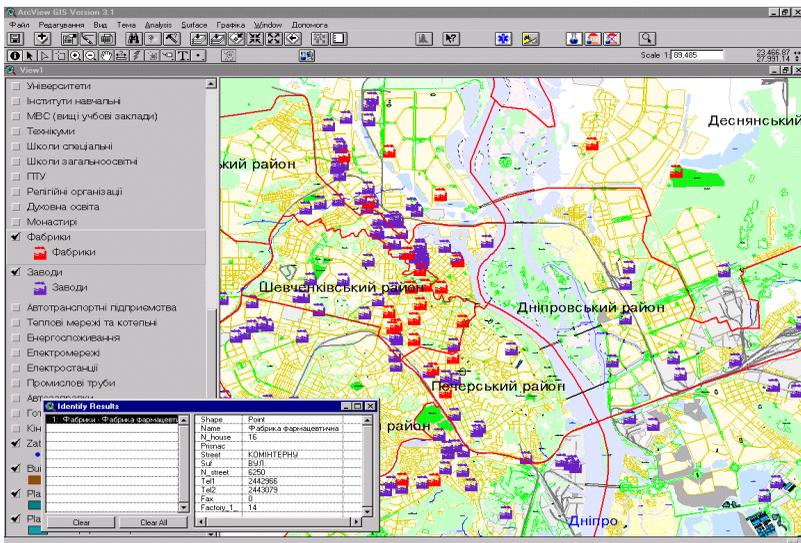
Students study geodesy, topography, photogrammetry, methods of remote sensing of Earth's surface, cartography, geographic information systems and technologies. The education includes both theoretical material and a number of practical exercises on modern technics: digital total stations, satellite geodetic receivers, photogrammetric complexes Delta with software "Digital," ESRI software ArcGIS – the powerful complex for geospatial modelling. The field topogeodetic practice provides geodetic measurements and air route photography from a remotely piloted drone and a camera processing of these results.

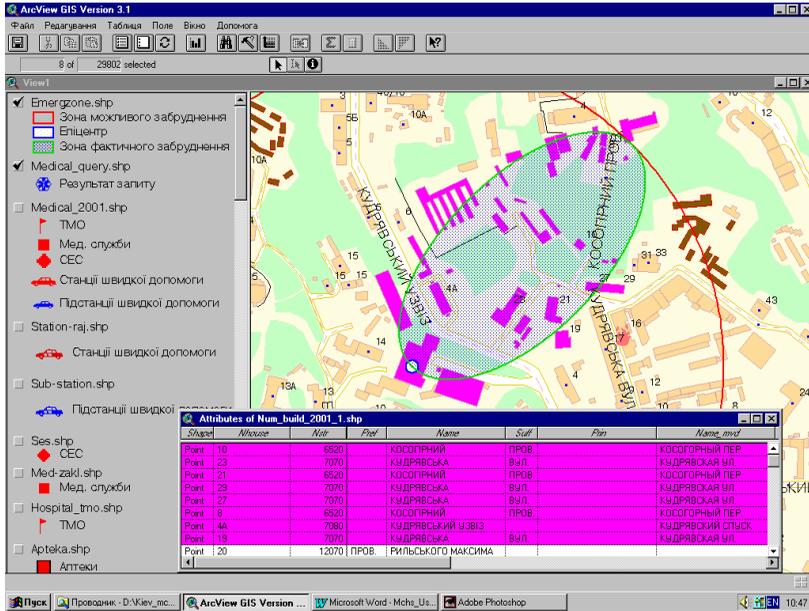
The department has serious scientific traditions and date of its creation is 1838. Next year, the Department of Geodesy and Cartography will celebrate 180th anniversary. Employees of the department repeatedly participated in various scientific projects related with the modelling of emergencies, monitoring and forecasting the behaviour of critical infrastructure facilities. Here are some of them:

1. Development of methodology, design concept and creation of multifunctional municipal geoinformation systems. As the result, the GIS of forecasting and monitoring emergencies for Kyiv City State Administration was developed and implemented.



The basis of this system was a geocoding database with potentially dangerous city objects and ArcGIS software for forecasting and geospatial modelling of emergencies.





## 2. Creation of Information system for regional crisis management centres.



This system is analysing the localization of crisis elements in the country and generalizing this information by districts.

3. Creation of three-dimensional models of terrain to support the decision-making for anti-terrorist operation.

However, it should be noted, that the main task of department is teaching the students. They study methods of geospatial data processing to support the adoption of various management decisions.

Since 2013 our department takes part in the international educational project “Laying the Foundation for a Spatial Data Infrastructure: Building Capacity within the Ukrainian Government to Support Sustainable Economic Growth.” More details can be found here: <https://socialsciences.viu.ca/spatial-data-infrastructure/ukraine-program-overview>

Project Partners are Canada Ministry of Foreign Affairs, Vancouver Island University (Canada), Taras Shevchenko National University of Kyiv and National Technical University “Kiev Polytechnic Institute.”

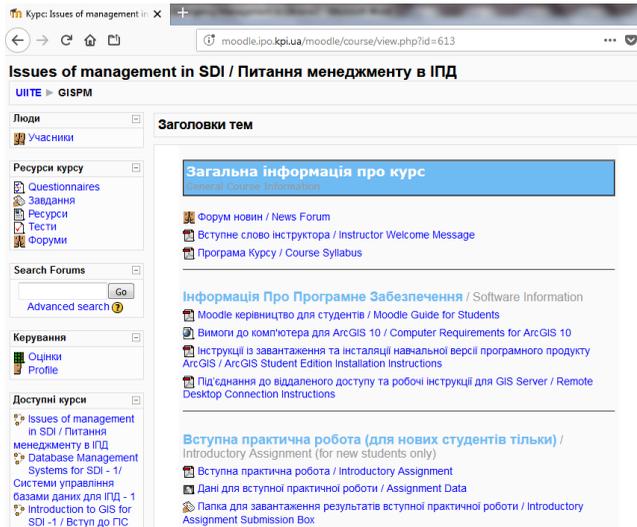
A training centre was established at the Taras Shevchenko National University of Kyiv. For four years our teachers have been teaching the following courses remotely:

- UKR01: Introduction to GIS for Spatial Data Infrastructure (SDI);
- UKR02: Database Management Systems for SDI;
- UKR03: Spatial Cadastral Information Systems for SDI;
- UKR04: GIS Project Management for SDI;
- UKR05: Spatial Modeling and Applications for SDI;
- UKR06: Web GIS and Geoportals for SDI.

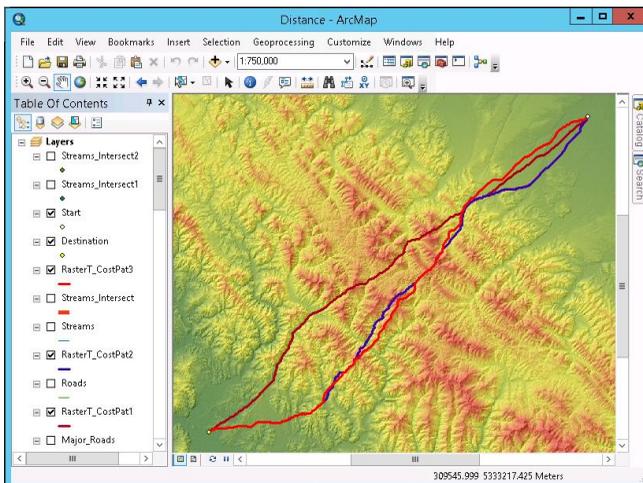
Two servers were created for distance training: the first contains a training shell, and the second – licensed program ArcGIS.

Each student has a login and a password to identify and log on to the server. On the left side of the figure below one can see the list of available courses. These are all courses listed above.

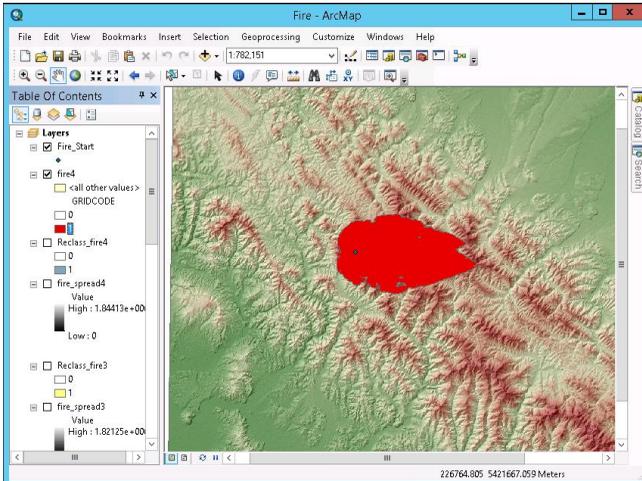
Each course lasts 10-12 weeks and includes 9-10 modules. One module contains theoretical material and a practical task. There are initial testing, at the beginning of course, and two exams in the form of tests, limited in time: in the middle and at the end of the course. Initial test is conducted to determine the general level of trainees. The course is evaluated on a 100-point system. Unclear issues are discussed at the forum. The completed assignment is sent to the teacher on time in this folder.



The ArcGIS software is installed on a distance server and allows all students to work simultaneously. The first practical task is to find the shortest way between two points, depending on the terrain parameters. The second problem is to show the spread of fire in the forest, depending on the weather conditions (see the two images below).



Such teaching has shown its effectiveness and high motivation of trainees. Thus, the Department of Geodesy and Cartography of Taras Shevchenko National University of Kyiv has a high scientific and educational potential and is ready to cooperate in the field of training of geomatic specialists, without which it is impossible to correctly predict, prevent and successfully eliminate emergency situations.



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