



Emporia State University has a unique campus-wide program in **Geospatial Analysis** (GSA) that involves faculty in earth science, biology, geography and other departments.

Geospatial analysis is a rapidly developing, interdisciplinary technology often called GIS (geographic information system or science). It combines traditional geography with remote sensing, computers, cartography, global positioning, and information networks for dealing with practical and scientific problems of the world.

The program and all necessary courses are delivered in a traditional on-campus mode as well as online for distance-learning. Students from all parts of the United States as well as Canada, China, Estonia, Malaysia, and Sweden have participated. Three primary options are available.

- Undergraduate **geospatial analysis minor** is a multidisciplinary program that may be used in combination with any undergraduate major. Required courses (9 credits) include introduction to geospatial analysis, cartography, and computer mapping systems. Elective courses (9 credits) are selected in consultation with a faculty advisor.

- Undergraduate **geospatial analysis certificate** is a stand-alone technical program to prepare students for entry-level professional work. Required courses (12 credits) include introduction to geospatial analysis, cartography, computer mapping systems, and a research project supervised by a faculty advisor. Elective courses (6 credits) are selected in consultation with a faculty advisor.
- Graduate **geospatial analysis certificate** is a stand-alone technical program to prepare students for advanced professional work. Required courses (13 credits) include computer mapping systems, small format aerial photography, remote sensing and either advanced image processing or advanced GIS. Research project (3 credits) is supervised by a faculty advisor.

The **geospatial analysis laboratory** is located in Cram Science Hall. The lab is equipped with state-of-the-art computer workstations, scanners, plotters, and related equipment. *ArcGIS* and *Idrisi* are the primary software systems used for geospatial analysis, image processing, and map display. The lab also includes stereoscopes and other optical equipment for analysis of aerial



Flat Ridge Wind Farm, Barber County, south-central Kansas. Kite aerial photograph.

photographs. The GSA Lab has a large collection of conventional maps, air photos, space-shuttle photography, satellite imagery, and digital datasets. The U.S. Geological Survey depository map library has additional cartographic resources in the same building.

For **field work**, global positioning system (GPS) equipment is available for student instruction and research applications. A hand-held spectrometer is utilized to measure in-situ reflectance for common objects—rocks and minerals, soils, vegetation, and water bodies. A unique capability is aerial photography using kites and a helium blimp. Such photographs are taken from heights of less than 500 feet in order to acquire large-scale imagery that reveals ground features in great detail. Applications include archaeology, historical preservation, hydrology, landforms, soils, wetland environments, and wind energy.

Geospatial **research projects** at ESU include a variety of investigations in North America, Europe and Asia, including all parts of the contiguous United States and the Canadian Prairie region, as well as Denmark, Estonia, Poland, Slovakia, and Thailand. Ground-based field investigations are combined with geographic data bases, aerial photography, and satellite imagery for applications in archaeology, biology, cartography, library and information science, geomorphology, geology,



Cliff and lighthouse at Bovbjerg Klit, North Sea coast of western Denmark. Kite aerial photograph.

hydrology, resource evaluations, wildlife management, and environmental investigations of all kinds.

Since emerging in the 1990s, geospatial analysis has expanded rapidly into all aspects of modern life. Core specialties include GIS and remote sensing techniques based on underlying geographic concepts. Geospatial technology is recognized as one of the most important emerging scientific fields for economic development. Geospatial analysis is now used in many governmental, commercial, educational, scientific, engineering, and military situations.

- **Government** – geodetic survey, geological survey, biological survey, census data, property ownership and appraisal, land use and zoning, evaluation of natural hazards, urban and rural planning, military applications, global-change and climatic research, soil and water resources, etc.



Liberty Memorial and downtown skyline, Kansas City, Missouri. Helium-blimp aerial photograph.



Panorama of the Tatra Mountains and foreland in northern Slovakia, central Europe. Kite aerial photograph.

- **Industry** – pipeline and electric utility systems, transportation networks, shipping and delivery systems, wind energy, landscape design, resource evaluation, hazardous-waste cleanup, civil engineering, mineral resource exploration, environmental impact study, marketing and sales analysis, etc.
- **Education and science** – teaching geography and earth sciences, modeling complex natural systems, documenting environmental change, mapping earth-surface phenomena, integrating various scientific specialties into the new discipline of earth-system science.

Student research projects have covered a wide spectrum of subjects using diverse laboratory and field methods in geospatial analysis, as indicated by selected projects (* distance-learning student).

- *Acosta, Sara: Mosaicking aerial images to be used for defining habitat boundaries on the Squaw Creek National Wildlife Refuge.
- *Alvarez, Jesus: Flood forecast and vulnerability analysis for the City of Sacramento, California.
- Harrell, Kelby: Historical airphoto database and vegetation change analysis for ESU Ross Natural History Reservation, Lyon County, Kansas.
- *Korenman, Tamara: Combination of spatial analysis methods to monitor seasonal changes at Cheyenne Bottoms, Kansas.

- Landis, Ben: Field goniometer for spectral radiometry: Design, construction, and testing.
- *Manders, Gina: GIS database and remote sensing of 2007 flooding at Miami, Oklahoma.
- *Mueller, Julie: Wetlands of Pomona Lake vicinity, Osage County, Kansas.
- Salley, Shawn: Surficial geology of the Hamilton Quarry area, Greenwood County, Kansas.
- Vopata, John: A study of patterned ground at Trinchera Peak, Colorado.
- Zabriskie, Brenda: Investigation of Dry Lake, Kansas: Geospatial analysis based on ground, aerial, and satellite data and imagery during the past 25 years.

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Also see the ESU Earth Science webpage:<<http://www.emporia.edu/earthsci/>>



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