



CURRICULUM

University of Belgrade Faculty of Mining and Geology (FMG)

CENTER FOR REMOTE SENSING & GIS

Remote Sensing Center (RSC) was founded in 1976. as a branch of Faculty of Mining and Geology, University of Belgrade. Beside the Faculty its founders were many geological and geophysical institutions from all republics of former Yugoslavia.

Center's activity covers all aspects of Remote Sensing, starting with geological interpretation of air photos up to processing and interpretation of satellite images and GIS application, mainly in geological research. It is basically focused on:

- Education: Undergraduate and postgraduate courses of Remote Sensing at the Geological Department on Faculty of Mining and Geology; Preparation of master and doctor thesis in Remote sensing for domestic and foreign students; training courses of Remote Sensing and GIS application for specialists from scientific institutions and industry
- Development of Remote Sensing methods
- Publishing professional and scientific papers and books on Remote Sensing (text-books, instructions for work, etc).
- Organization of scientific and professional manifestation of Remote Sensing (local and international conferences, seminars, workshops, etc.)
- Support and cooperation with industry: preparation and realization of projects with Remote Sensing and GIS application
- Cooperation with international organizations for Remote Sensing and GIS
- Participation in international projects in Remote Sensing and GIS

Permanent staffs of the Remote Sensing Center (from 2007. Center for Remote Sensing & GIS) are dr. Uroš Stojadinović - assistant professor (Head of Center), dr. Branislav Trivić - professor, dr. Marinko Toljić - professor and retired professors dr. Radmila Pavlović and dr. Miroslav Marković. In work of the RSC temporary are included many other experts from the University of Belgrade as well as from Industry.

From its foundation RSC have participated in realization of numerous projects in former Yugoslavia and abroad. Main topics were geological mapping, geotechnical and hydrogeological investigations, tectonics, neotectonics, seismotectonics and ore deposits research.

The most important projects of the Center's engagements in the past were activity in regional geological mapping of Northern Libya, hydrogeological investigation of Western Iraq, application of

remote sensing techniques in hydrogeological research in North Algeria and Somalia, investigations of large dam and reservoir locations in Iraq, Peru, Gabon, Guinea, etc.

RSC organized First Mediterranean Conference on Satellite Earth Observation - MeCEO2004 (<http://www.meceo.info>). For a couple years RSC was a member of European Association of Remote Sensing Laboratories (EARSL)

Members of RSC participates in some national and foreign very important projects as:

- Image processing and GIS, with World University Service – Austrian Committee.
- GIS Workshop – course of application informatics technologies in geological mapping, Geological Survey of Republic Serbia
- Satellite Image Processing – Application in Geology, with World University Service – Austrian Committee
- GIS for natural resources and groundwater aquifers of Northern Algeria, with Enegoproject – Belgrade
- GIS for slope stability in the zone of all reservoirs and dam objects in Republic Serbia, the data base, with Electro-economy, Serbia.
- Geological Information System of Serbia *geolISS* – Ministry of Science and Environmental protection of Serbia, Serbia.

In April 2007, by decision of FMG scientific board, Remote Sensing Center (RSC) change name in **Center for Remote Sensing & GIS (RSC&GIS)**. Decision is based on expansive development of RSC in field of Remote Sensing and GIS in last couple years.

Adoption of Bologna process on Belgrade University, activate member of Center for Remote Sensing & GIS (RSC&GIS) to spread teaching activity through couple new courses briefly delineate below.

GIS technologies (ESPB 4)

The main goal of this course is the introduction of theoretical concepts of geographic information system (GIS), and the acquirement of practical experience in capturing, storing, analyzing and managing data and related attributes which are spatially referenced to the Earth. The course will start with a review of different GIS types, fields of application, as well as available software tools and standards. Techniques of spatial data management will also studied, combined with the creation of interactive queries (user created searches), analysis of spatial information, editing of data, maps, and presentation of results of all these operations. Possibilities of integration and data exchange with other related software tools will be studied, as well as different types of data conversion, data acquisition, GPS. During the practical exercises students will be trained to use a GIS software tool, through case studies. Each student will demonstrate the skills acquired within this course and his/her mastering of the basics of GIS technology through a final project report.

Databases (ESPB 6)

The general aim of this course is to introduce students to database technology, its principles, benefits, techniques and practical applications. The course will start with basic concepts related to data management. Further, different approaches to data modeling are studied, from entity-relationship model, through relational, network and hierarchical model to object and object-relational model. Specific attention will be given to fundamentals of database and database management systems, as well as to database design procedures and CASE software tools and query structuring in SQL. Advanced approach to data organization will be illustrated through Data Warehouse and techniques and tools for Data Mining, as well as analytical processing of data (OLAP). The lectures are organized around the database design lifecycle, while in the labs students will be guided through the process of developing small databases from given requirements. Through extensive examples and exercises students will test their skills producing a simple

relational database design, as well as gain an understanding of the issues involved in more complex and realistic designs.

Geostatistics (ESPB 4)

The course is aimed at outlining the basics of applied geostatistics with a focus on concepts and methods important for modeling heterogeneity and uncertainty in reservoir models. The course starts with an introduction to the basic geostatistical approach to questions of mineral resources estimation, dealing with estimation from or interpolation between samples collected on a spatial basis. Basic assumptions of spatial estimation methods include: statistical methods, geostatistical methods, geostatistical estimation, construction and interpretation of semi-variograms and choice of appropriate kriging techniques, variations on Kriging. Students will be guided through tutorial exercises on statistical and geostatistical analysis, with prepared datasets for geostatistical estimation, using weighted averages, confidence levels, ordinary and simple Kriging and cross validation. Through a case study students will demonstrate the use of these methods.

GIS- Application in Geology (ESPB4)

This course provide opportunity to gain elementary knowledge and methodology for adequate modeling of geological data trough elaborating conceptual and logical models of database and forming Geographical/geological Information System (GIS). On actual geological examples, structure of spatial data in fundamental and applied geological discipline, will be analyzed; raster and vector models, and relationship between geological attributes. Likewise through elementary geometric entity (point, line, and polygon) will be calculated basic principles of different topology types (especially polygon and network topology), unite measure and measures in geology and there presentation in GIS. Raster models will be treated through satellite images, as well as 3D terrain models (DTM, DEM). Students will be introduce in software for manipulating with spatial data, GIS software and learn how to work with them. All students will be most stimulated for using freeware software package: Microdem, Grass as well as academic license of TNT-mips and ArcGIS. Practical work will comprise creating an object-oriented model of geological data, vectorization of geological compound, translation of data in Gauss-Kruger coordinate system (official reference system of Serbia) and transformation to other geographical or projected systems, application of geostatistical tools and queries making. Visualization of geological data will be represented through delineation of essential content of digital geological maps and all kind of other geological thematic maps and 3D modeling of geological compound.

Processing of Satellite Images (ESPB4)

Purpose of this course is to master over the process of digital analyzing of satellite images with goal to collect geology data, interpretation of results from processed images in fundamental and applied geological survey and use of those results in GIS. Trough series of lectures the students will comprehend differences between vary type of sensors used in remote sensing, nature and characteristic of digital satellite images, different types of images and use of them in geological investigations. With tools in specialized software's they will learn how to do radiometric and geometric corrections, then how to increase quality of digital images by spectral and spatial enhancement. Mostly, methods and procedure in classification of satellite images together with use of hyperspectral tools in analyzing geological characteristics of terrain on Landsat-7, Landsat-8, Aster and other satellite images and synthesis of all collected results will be analyzed. Also, production of thematic geological maps based on processed satellite image will be presented. All those tasks will be done in TNT-mips, ENVI, ArcGIS software for processing of digital satellite image. Especially, presentation of main results and collecting data from satellite images and application in GIS, will be treated.