

Course/module description (*Introduction to geospatial programming – Введение в геопространственное программирование*)

Course provider (institution): Razzakov Kyrgyz State Technical University (KSTU), Department of Geodesy and Geoinformatics

Course title: Introduction to geospatial programming (D.1.2.3)

Target group: PhD Students (620100 – Geodesy and Remote Sensing Direction. Geodesy and Geoinformation Technologies Program)

Type (compulsory/optional): Optional

Number of ECTS credits allocated (if applicable); estimated workload: 5 ECTS (150 academic hours)

Mode of delivery (face-to-face/ distance learning etc.); number of contact hours:
45 class hours (15 - lectures, 30 – practical) and 105 hours for the self study

Language of instruction: Kyrgyz/Russian/ English

Prerequisites and co-requisites (if applicable): GIS/Geographic Information Systems, Informatics, Basic Programming, Knowledge of English for reading literature and code

Course aims:

This course aims to help students develop programming skills for GIS. Specifically, this course covers the following topics: fundamentals of programming, object-oriented programming (OOP), web-GIS and web mapping technology using open-source programming languages, GIS data processing, and popular GIS libraries. The course will introduce students to use a programming language to process and analyze big spatial data in the field of Geographic Information Science (GIS).

Learning outcomes:

After taking this course, the students should (be able to do):

1. Understand the basic concepts of the geospatial programming;
2. Describe the purposes and methods of accessing & processing of massive amount of EO data;
3. Implement the practical procedures of the geospatial programming;
4. Produce solutions to automate geoprocessing functions using a variety of programming methods, structures, and data sources;
5. Theory and implementation of the various scripting languages currently in use;
6. Explain basic programming concepts such as variables, conditional statements, and loops;
7. Analyze and visualize geospatial information;
8. Be able to create graphic models and custom tools for spatial analysis projects.

Course content:

1. Introduction to geospatial programming;
2. Concepts of big Earth data, accessing & processing of massive amount of EO data;
3. Data selection for programming in a big Earth data environment, challenges;
4. Programming of Analysis-Ready Data in a big Earth data environment;
5. Copernicus, DIAS & RUS - From data streams to image files;
6. Spatial coverage, spatial vs temporal resolution;
7. Technology Overview, changes in workflows;
8. GEE Concepts;
9. Time series analysis: More than bi-temporal change detection;
10. Time Series Analysis in Google Earth Engine;

Recommended or required reading and other learning resources/tools:

- Course teaching materials available through the university ELMS;
- Instant messaging, blog and personal electronic communication platforms;

Required literature:

1. Метод и системы координат в геодезии. Н.А. Телеганов, Г.Н. Тетерин. Учеб. Пособие. Новосибирск: СГГА, 2008. 143 с.
2. Системы координат в геодезии. В. Л. Клепко, А. В. Александров. Научная монография, Екатеринбург 2011, 116 с.
3. Высшая геодезия. Учебник / Б. Т. Мазуров. Новосибирск: СГУГиТ, 2016. 203 с.
4. Map Projections. Erik W. Grafarend, Friedrich W. Krumm. Springer-Verlag Berlin Heidelberg 2006, 713 p.

Additional literature:

1. Высшая геодезия и основы координатно-временных систем: Контрольная работа № 1. Л.В. Огородова, Москва, 2017, 37 с.
2. Understanding Map Projections. Melita Kennedy. ESRI 2000, 112 p.
3. Map Projections: A Working Manual. John P Snyder. US GS, 1987, 394 с.

Planned learning activities and teaching methods:

1. Lectures and seminars;
2. Laboratory work and computing tasks;
3. Individual project work;
4. Class discussions.

Assessment methods and criteria:

1. Lab assignments and computing tasks (25%)
2. Participation in class activity (5)
3. Individual project (30%)
4. Final exam 40%

Grading system: Five-point academic grading system,
where 5 - "Excellent" and 2 - "Unsatisfactory" (A, B, C, F)

Additional information: Course instructor – Dr. Kubatbek Talypov, Assistant - MSc Nursultan Ismailov.
Contacts: nursultan.ismailov@kstu.kg, tel.: +996-700-107003