

**Course/module description** (*Spatial data science – Наука о пространственных данных*)

<b>Course provider (institution):</b> Razzakov Kyrgyz State Technical University (KSTU)
<b>Course title:</b> Spatial data science (D.1.2)
<b>Target group:</b> PhD Students (620100 – Geodesy and Remote Sensing Direction. Geodesy and Geoinformation Technologies Program)
<b>Type (compulsory/optional):</b> Compulsory
<b>Number of ECTS credits allocated (if applicable); estimated workload:</b> 10 ECTS (300 academic hours)
<b>Mode of delivery (face-to-face/ distance learning etc.); number of contact hours:</b> 90 hours (face-to-face hours)
<b>Language of instruction:</b> Kyrgyz/Russian/ English
<b>Prerequisites and co-requisites (if applicable):</b> Fundamentals of Geodesy/Engineering Geodesy/GPS Technology, Knowledge of English for reading literature
<b>Course aims:</b> extract deeper insight from data using a comprehensive set of analytical methods and spatial algorithms, including machine learning and deep learning techniques. This course explores the application of spatial data science to uncover hidden patterns and improve predictive modeling.
<b>Learning outcomes:</b> After taking this course, the students should: <ol style="list-style-type: none"><li>1. understand and deepen own knowledge of a range of modern Spatial Data Science (SDS) methods and methodologies.</li><li>2. be able to apply SDS methodologies in practice to a range of topics related to sustainability / global change.</li><li>3. have the skills and understanding of how to extract, process and analyze modern big geospatial data in various formats.</li><li>4. have skills in interpreting aerial and space images and using unmanned aerial vehicles to obtain up-to-date information about the state of the environment.</li><li>5. be able to process geodata and realize operational visualization of geographic information.</li></ol>
<b>Course content:</b> <ol style="list-style-type: none"><li>1. Spatial data. Fundamental concepts of cartography and geoinformatics</li><li>2. Elements of spatial analysis based on geographic information systems</li><li>3. Mathematical basis of maps. Cartographic ways of the image. Cartographic generalization</li><li>4. Sources of spatial data. GIS data types</li><li>5. Fundamentals of spatial analysis and processing of spatial data</li><li>6. Ways to integrate and present spatial and attribute data in a GIS</li></ol>
<b>Recommended or required reading and other learning resources/tools:</b> <ol style="list-style-type: none"><li>1. Lecture Materials</li><li>2. The course materials will be available through ELMS</li><li>3. The Power Point lecture slides are available for download as PDF files at the course website.</li><li>4. Electronic resources on the lecture topics are available at the course website.</li><li>5. The class notes, latest journal articles and references related the course topics will be referred to and/or distributed during the lectures.</li><li>6. Text and Reference Books</li></ol>

**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. Regular lectures;
2. Labs and computing tasks;
3. Regular quizzes, and discussions on the questions from the quizzes;
4. Class discussions.

**Assessment methods and criteria:**

1. Mid-term exam (25%)
2. Labs and computing tasks (25%)
3. Class discussion/participation (10%)
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. Mirlan Dyldarev. Contacts: mdyldaev@gmail.com, tel.: +996-550-52 88 83