PhD program: Cartography and GeoInformatics

General Information	
University	Osh Technological University named after M. Adyshev (OshTU)
Course title	**Spatial Big Data Analytics**
Course/Module code	**Spatial Big Data Analytics**
Course type	Elective
Year of Study	1st year
Term/Semester	Spring semester
Credits awarded	5 ECTS (150 academic hours)
Degree	PhD
Enrollment status	Full-Time
Entry requirements/ Competences	

Lecturer's details	
Name, surname	**Nurgul Kadyrkulova**
Academic title	
Contact details	
Office hours and consultation schedule	
Course Structure	
Course Aim and Objectives	1. To develop students' understanding on geospatial data mining and geospatial knowledge 2. To enable students te be familiar with the methods of spatial data mining, including classification, clustering analysis, association rules analysis. 3. To enable students critically review data mining and knowledge discovery problems through case studies
Short Description	**Spatial Big Data Analytics**
Module/Topic	**Spatial Big Data Analytics**
Teaching Method	– Regular lectures; – Laboratory and practical works – Project work – Discussions in class
Form of Assessment	– Labs and computing tasks (25%)

	– Class discussion/participation (10%) – Project report (40%) – Final exam (25%)
Knowledge and understanding	- the importance of spatial data for planning, decision making and sustainable development - describe the current status/problems for spatial data in terms as availability, accessability, applicability and usability, - describe the general concepts and the aims for Spatial Big Data Analytics and the importance of data exchange, in detail, explain and give an account of the main components of Spatial Big Data Analytics, - describe the factors that influence the development of Spatial Big Data Analytics and the nature of these factors, at a general level describe the concepts clearinghouse networks and geoportals, - in detail explain the different generations of clearinghouse networks, the main components of these networks, interoperability of these systems, the available standards to achieve interoperability and the principles of service orchestration, - explain the cartographic aspects for geoportals - give an account of concepts and technologies for modelling and evaluation of Spatial Big Data Analytics - describe and discuss what is meant with a society that is spatially enabled.
Learning Outcomes	On completion of the course, the student shall be able to: - Explain and understand the purpose of spatial data mining, - describe and understand a range of data mining methods and their use in analyzing, - identify and select the appropriate methods for mining knowledge from geo-spatial data, - analyze geo-spatial data and construct models, - test models through validation and able to criticize their reliability.
Course content	Lesson 1. Introduction of big data and spatial big data Lesson 2: Big data preprocessing. ▪ Data cleaning, normalization, and integration ▪ Noise identification Lesson 3: Exploratory Spatial data analysis and visualization Lesson 4: Descriptive and Regression ▪ Descriptive statistics for spatial data

	▪ Geographically weighted regression Lesson 5: Point data pattern analysis ▪ Quadrat estimation ▪ K functions Lesson 6: Line data pattern and network analysis ▪ Line features ▪ Network connectivity and path algorithm Lesson 7: Stream data and time-series analysis ▪ Smooth ▪ Decomposition ▪ Modeling PRACTICES: Lab #1. - Data Services. Lab #2. - Metadata. Lab #3. - Technologies Applied to Spatial Big Data Analytics. Lab #4. - Spatial Big Data Analytics evaluation. Lab #5. - Compare existing legislation, standards, etc used in different Spatial Big Data Analytics. Lab #6. - Develop or improve some specific component for an existing Spatial Big Data Analytics. Lab #7. - Improve an existing Spatial Big Data Analytics to support risk management/Environmental modeling.
Literature:	**Mandatory:** - Statistical methods for spatial data analysis / Schabenberger & Gotway (2005). - Statistical methods in spatial epidemiology / Lawson (2006). - Statistical analysis of spatial and spatio-temporal point patterns / Diggle (2013). - Applied spatial data analysis with R / Bivand, Pebesma, & Gómez-Rubio (2013). - Spatial data mining: theory and application / Li, Wang, & Li (2015).

	Elective: - Maps and the internet. Edition: 1st ed.. Author: -. Publisher: Amsterdam ; London : Elsevier, 2003. - Internet GIS: distributed geographic information services for the internet and wireless networks. Edition: -. Author: Peng, Zhong-Ren. Publisher: New Jersey: Wiley, cop. 2003