Study program: Geoinformation Technologies

Qualification: PhD

General Information	
University	Yerevan State University (YSU)
Course title	**Geoprograming (Python)**
Course/Module code	Geoinformation Technologies
Course type	Mandatory
Year of Study	1st Year, 1st semester
Term/Semester	Autumn Semester
Credits awarded	2 (ECTS), 56 Hours (16 theory, 40 practice)
Degree	PhD
Enrollment status	Full-Time
Prerequisites and co-requisites (if applicable):	• General computer skills/Basic algorithm knowledge • Basic knowledge of database structure (Tables, keys, relationships), • Basic knowledge of Geoinformation technologies.

Lecturer's details	
Name, surname	Vahan Manukyan
Academic title	Associate Professor
Contact details	Email: v.manukyan@ysu.am,v.manukyanysu@yahoo.com
Office hours and consultation schedule	09:00-14:00 Monday, Wednesday, Friday

Course Structure	
Type (compulsory/ optional):	Compulsory
Course Goal	The aim of the course is to introduce the basic concepts of programming and scientific data analyzing by using Python programming language, develop coding skills and applying them to various GIS related problems.

	In this course, specific objectives are developing algorithmic solutions to geospatial problems, learning about solution strategies, high-level solution descriptions in pseudo-code, and translations of these into an implementation in Python programming language. By developing and reviewing code, students will be able to increase their knowledge in automation of geoprocessing.
Learning Outcomes	After completing this course, the students will be able: • To describe basic programming concepts, • To develop algorithms • To write codes in Python and visualize them in GIS (ArcPy), • To characterize data structure, and visualizing with "Matplotlib" library, • To develop functions with "Pandas" library and "Geopandas" module, • To describe reverse and forward addresses for geocoding,
Course contents	1. Introduction to Python in GIS, 2. Basic concepts of Python and computer programming, 3. Analyzing and visualizing Geodata with Python, 4. Variables and assignment, 5. Operators and expressions, 6. Data Collections and data structures, 7. Introduction to ArcPy module 8. Introduction of NumPy, Matplotlib, SciPy libraries, 9. Geometric Objects – Spatial Data Model, 10. Geopandas (reading, writing a shapefile), 11. Geocoding in Geopandas, 12. Retriving OpenStreetMap data
Assessment methods and criteria	• Practical task • Project task • Final test exam

	For successfully accomplishment this course student must complete practical task with 5 points average grade. The project task with 10 points average grade which should be developed and introduced individually before final test exam. Project task should cover coding skills and working with geospatial data. Final exam will check the theoretical part of the course with 5 points average grade.
Recommended textbooks and links (in order of relevance):	• Python Documentation-https://docs.python.org/3/ • Zelle, J. (2010) Python Programming: An Introduction to Computer Science, Second edition. Franklin, Beedle & Associates. • Lawhead, J. (2015) Learning Geospatial Analysis with Python: An effective guide to geographic information systems and remote sensing analysis using Python 3, Second edition. Packt Publishing. • McKinney, W. (2012) Python for Data Analysis: Data wrangling with Pandas, NumPy and iPython, First edition. O´Reilly Media. • Westra, E. (2016) Python Geospatial Development: Develop sophisticated mapping applications from scratch using Python 3 tools for geospatial development, Third edition. Packt Publishing. • Zandbergen, P. (2013) Python Scripting for ArcGIS, Alternate edition. ESRI press. (Available from the library Diener, M. (2015) Python Geospatial Analysis Cookbook: Over 60 recipes to work with topology, overlays, indoor routing, and web application analysis with Python. • https://www.codecademy.com/ • http://www.coursera.org/ • http://www.datacamp.com/ • www.udemy.com

	• http://www.bostongis.com/ • http://www.esri.com/training • https://community.esri.com/groups/python