

Study program: Geoinformation Technologies

Qualification: PhD

General Information	
University	Yerevan State University (YSU)
Course title	Cloud technologies
Course/Module code	Geoinformation Technologies
Course type	Elective
Year of Study	1 st Year, 1 st semester
Term/Semester	Spring Semester
Credits awarded	5 (ECTS)
Degree	PhD
Enrollment status	Full-Time
Prerequisites and co-requisites (if applicable):	<ul style="list-style-type: none">- Basic understanding of computer science principles and programming concepts.- Familiarity with networking fundamentals, including TCP/IP, HTTP, and DNS.- Knowledge of operating systems and command-line interfaces.- Prior experience with at least one programming language (e.g., Python, Java, C++).

Lecturer's details	
Name, surname	Artak Piloyan
Academic title	Associate Professor
Contact details	Email: artakpiloyan@ysu.am
Office hours and consultation schedule	09:00-14:00 Monday, Wednesday, Friday

Course Structure	
Course Goal	This course provides an in-depth exploration of cloud technologies and their application in the field of geospatial technologies. Students will learn about the advanced concepts of cloud computing and how they can be leveraged to store,

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	<p>process, and analyze geospatial data. The course will cover various cloud platforms, tools, and services commonly used in geospatial applications, and students will gain hands-on experience in developing cloud-based geospatial solutions with a particular emphasis on big data processing.</p>
<p>Learning Outcomes</p>	<p>By the end of this course, students will be able to:</p> <ul style="list-style-type: none"> - Understand the principles of cloud computing and its relevance to geospatial technologies. - Identify and evaluate different cloud platforms and services for geospatial applications. - Design and implement cloud-based solutions for geospatial data storage, processing, and analysis. - Apply best practices for managing and securing geospatial data in the cloud. - Demonstrate practical skills in developing geospatial applications using cloud technologies.
<p>Course contents</p>	<ol style="list-style-type: none"> 1. Introduction to Cloud Computing <ul style="list-style-type: none"> • Definition and characteristics of cloud computing • Benefits and challenges of using the cloud for geospatial applications • Cloud deployment models: public, private, hybrid clouds 2. Cloud Platforms for Geospatial Technologies <ul style="list-style-type: none"> • Overview of major cloud platforms (e.g., AWS, Azure, Google Cloud) • Geospatial services and tools provided by cloud platforms • Case studies of cloud-based geospatial applications 3. Geospatial Data Management in the Cloud <ul style="list-style-type: none"> • Storing and organizing geospatial data in the cloud • Cloud-based databases for geospatial data (e.g., Amazon RDS, Google BigQuery) • Data formats and standards for geospatial data interoperability 4. Cloud-based Geospatial Data Processing <ul style="list-style-type: none"> • Introduction to cloud-based geoprocessing services (e.g., Amazon Elastic MapReduce, Google Cloud Dataflow) • Parallel and distributed processing of geospatial data in the cloud • Geospatial analysis algorithms in the cloud environment 5. Geospatial Data Visualization in the Cloud <ul style="list-style-type: none"> • Web-based mapping platforms and APIs (e.g., Google Maps, Mapbox)

	<ul style="list-style-type: none"> • Designing interactive geospatial visualizations in the cloud • Integration of cloud-based visualizations into geospatial applications <ol style="list-style-type: none"> 6. Cloud Security and Privacy for Geospatial Data <ul style="list-style-type: none"> • Security considerations for geospatial data in the cloud • Access control mechanisms and encryption techniques • Privacy concerns and compliance in cloud-based geospatial applications 7. Case Studies and Project Work <ul style="list-style-type: none"> • Analysis of real-world cloud-based geospatial applications • Group projects involving the design and development of a cloud-based geospatial solution • Presentations and discussions of project outcomes 8. Emerging Trends in Cloud Technologies for Geospatial Applications <ul style="list-style-type: none"> • Current trends and advancements in cloud computing and geospatial technologies • Exploration of emerging technologies (e.g., serverless computing, containerization) in geospatial applications
Assessment methods and criteria	<p>This course is evaluated as follows:</p> <p>60% Assignments</p> <p>15% Final Exam</p> <p>25% In-class Exercises and Quizzes</p>
Recommended textbooks and links (in order of relevance):	<p>Recommended Textbooks:</p> <ol style="list-style-type: none"> 1. "Cloud Computing: Concepts, Technology & Architecture" 2013. by Thomas Erl, Ricardo Puttini, and Zaigham Mahmood 2. "Geospatial Development By Example with Python" 2016. by Pablo Carreira <p>Online Resources:</p> <ol style="list-style-type: none"> 1. Cloud Platforms Documentation: <ul style="list-style-type: none"> • Amazon Web Services (AWS) Documentation: https://docs.aws.amazon.com/ • Microsoft Azure Documentation: https://docs.microsoft.com/en-us/azure/ • Google Cloud Documentation: https://cloud.google.com/docs/ 2. Geospatial Libraries and Tools:

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- GDAL: <https://gdal.org/>
- GeoServer: <http://geoserver.org/>
- PostGIS: <https://postgis.net/>
- Leaflet: <https://leafletjs.com/>
- OpenLayers: <https://openlayers.org/>

3. Additional Reading and Tutorials:

- "Geospatial and Cloud Computing" by Dr. Monica Wachowicz:
<http://spatial.utep.edu/geospatial-and-cloud-computing/>
- "Cloud Computing and Geospatial Analysis" by Dr. Joseph Kerski:
<https://www.gislounge.com/cloud-computing-and-geospatial-analysis/>
- "Geospatial Data in the Cloud" by Dr. Dalia Varanka:
<https://www.esri.com/about/newsroom/arcuser/geospatial-data-in-the-cloud/>
- "Introduction to Cloud Computing with Amazon Web Services" by Coursera: <https://www.coursera.org/learn/aws-fundamentals-going-cloud-native>