



**ODESA I.I. MECHNIKOV NATIONAL
UNIVERSITY**
**Faculty of Mathematics, Physics, and
Information Technologies**
**Department of Computer Systems and
Technologies**



**Syllabus for the Elective Course
"Computer Engineering" Educational Program**

Cloud Technology Security

Volume, total number:	Credits – 6; Hours – 180; Content modules – 2
Semester	Spring
Days, Time, Place	According to the class schedule
Instructor(s)	Larysa Yaroslavna Martynovych, Senior Lecturer of the Dept. of Computer Systems and Technologies
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Workplace	Dept. of Computer Systems and Technologies, Room 19, Physics Building
Consultations	In-person: schedule is provided at the start of classes. Online: ZOOM (link provided at the start of classes).

COMMUNICATION

Communication with students will be carried out via email, Telegram or Viber messengers, in the classroom, or through ZOOM and Google Classroom.

COURSE ANNOTATION

Subject of study: The course focuses on basic concepts, principles, and technologies related to the use and security of cloud computing.

Course Prerequisites: Students require basic knowledge of "Operating Systems," "Fundamentals of Network Technologies," and "Distributed and Parallel Computing."

Course Objective: To study the principles, technologies, and tools related to using cloud services to ensure high availability, scalability, and efficiency of computing systems.

Course Tasks: To provide students with an understanding of:

- Basic concepts and models of cloud computing
- Cloud services and their functional capabilities
- Architecture and infrastructure of cloud computing
- Security in cloud computing
- Tools and technologies for deploying and managing cloud resources

EXPECTED LEARNING OUTCOMES

Upon completion of the course, the student should:

know:

- major cloud services;
- cloud infrastructure architecture and its components;
- key cloud computing concepts and models;
- the operating principles and functional capabilities of cloud services;
- technologies for deploying and managing cloud resources;
- major security threats in cloud computing, as well as methods for their prevention and detection;

be able to:

- critically analyze the subject area;
- learn and acquire new, up-to-date knowledge;
- automate cloud infrastructure management;
- manage cloud identity and access;
- utilize tools for enabling network access to cloud resources;
- apply available methods for encrypting data at rest and in transit;

be capable of:

- selecting effective models and methods for building, deploying, and managing cloud resources;
- collecting data on network activity and events;
- solving complex tasks and problems related to access control for cloud resources;
- automating cloud infrastructure management;
- providing various levels of network access to cloud resources;
- establishing and maintaining an appropriate level of cloud resource security.

ALIGNMENT WITH SUSTAINABLE DEVELOPMENT GOALS

Mastering this course enables students to acquire skills and competencies aimed at achieving the global Sustainable Development Goals (SDGs) through 2030, proclaimed by United Nations General Assembly Resolution No. 70/1 of September 25, 2015, and defined by Decree of the President of Ukraine No. 722 of September 30, 2019, specifically:

- SDG 4: Quality Education (Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all)

The "Cloud Technology Security" course provides access to modern knowledge and technologies by facilitating the professional development of specialists in scientific research, experimentation, and academic inquiry. This promotes equal opportunities for learning and professional growth. Engaging in scientific and practical activities helps students acquire highly competitive skills.

- SDG 8: Decent Work and Economic Growth (Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all)

Knowledge and skills in critically analyzing the subject domain, conducting applied research, acquiring modern knowledge, and implementing cutting-edge data processing and security technologies are in high demand in the labor market. This fosters job creation in IT and high-tech sectors. Specialists equipped with these competencies can work across various industries, driving broader economic development.

- **SDG 9: Industry, Innovation and Infrastructure** (Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation)

Applying knowledge in cloud deployment, implementation, and data security contributes to the efficient use of existing computing resources, data protection, and the development of various data storage and processing systems, smart cities, transport, and modern infrastructure.

- **SDG 12: Responsible Consumption and Production** (Ensure sustainable consumption and production patterns)

Utilizing knowledge of cloud deployment, execution, and security promotes the rational use of available computing power, robust data protection, reduction of production and data storage costs, and the efficient utilization of all available technological resources. Опанування цієї навчальної дисципліни забезпечує набуття здобувачами навичок і компетентностей, спрямованих на досягнення глобальних цілей сталого розвитку до 2030 року, що проголошені резолюцією Генеральної Асамблеї Організації Об'єднаних Націй від 25 вересня 2015 року No 70/1 та визначені Указом Президента України від 30 вересня 2019 року No 722, зокрема:

COURSE CONTENT

CONTENT MODULE 1. Standards, architecture, and principles of building distributed systems based on cloud platform service models and technologies

Topic 1. Basic concepts and classification of cloud computing systems.

Topic 2. Base architectures and components of cloud platforms.

Topic 3. Service models of cloud platforms.

Topic 4. Deployment models of cloud platforms.

CONTENT MODULE 2. Cloud platforms: principles of functioning and construction. Advantages of different providers and their combination.

Methods and models of cloud protection, different types of responsibility. General overview of modern platforms.

Topic 5. Google Cloud Platform. Main components and their purpose.

Topic 6. Amazon Web Services (AWS) cloud computing platform.

Topic 7. Capabilities of Microsoft Azure cloud services.

Topic 8. Access security and cloud resources.

RECOMMENDED LITERATURE

Main:

1. John Culkin, Mike Zazon. AWS Cookbook: Recipes for Success on AWS. — 1st Edition — O'Reilly Media, 2022 — 356 p.
2. Reza Salehi. Azure Cookbook: Recipes to Create and Maintain Cloud Solutions in Azure. — 1st Edition — O'Reilly Media, 2023 — 332 p.
3. Rui Costa, Drew Hodun. Google Cloud Cookbook: Practical Solutions for Building and Deploying Cloud Services. — 1st Edition — O'Reilly Media, 2021 — 282 p.
4. Sean P. Kane, Karl Matthias. Docker: Up & Running: Shipping Reliable Containers in Production. — 3rd Edition — O'Reilly Media, 2023 — 422 p.

5. Alan Hohn. The Book of Kubernetes: A Complete Guide to Container Orchestration. — No Starch Press, 2022 — 384 p.
6. Chris Richardson. Microservices Patterns: With examples in Java. — 1st Edition — Manning, 2018 — 520 p.
7. Thomas Erl, Zaigham Mahmood, and Ricardo Puttini. Cloud Computing Concepts, Technology & Architecture. Prentice Hall, 2013. - 528 p.
8. Ray J Rafaels. Cloud Computing: From Beginning to End. CreateSpace Independent Publishing Platform, 2015 – 152 p.

Supplementary:

- AWS Documentation: <https://docs.aws.amazon.com/>
- Azure documentation: <https://learn.microsoft.com/en-us/azure/>
- Google Cloud documentation: <https://cloud.google.com/docs/>
- GCP Student Webinars: <https://cloudonair.withgoogle.com/events/cloud-for-students/resources>
- Google Cloud Skills Boost: <https://www.cloudskillsboost.google/>

EVALUATION

Current control methods: Completion of laboratory work, control tests.

Form of final control: Credit (Pass/Fail).

TEACHING METHODS AND FORMATS

The course is delivered through lectures (16 hours), practical classes (14 hours), and organized independent student work (60 hours).

Core training takes place during lectures and laboratory sessions using the Google Cloud Platform, where each student must complete laboratory assignments focused on cloud data organization and security.

Teaching methods employed include: verbal methods (lectures, explanations); visual aids (PowerPoint presentations); practical methods (seminars); and working with literature sources (independent student work).

ASSESSMENT

Assessment is conducted in accordance with principles of objectivity, an individual approach, systematicity, and comprehensiveness.

Ongoing assessment: questioning during practical classes; completion and defense of practical assignments.

Periodic assessment: tests covering specific course modules.

Final assessment: a pass/fail grade (credit) awarded based on a 100-point cumulative grading system.

Current and periodic control								Total points
Content Module 1				Content Module 2				100
T1	T2	T3	T4	T5	T6	T7	T8	
10	10	10	10	10	10	10	10	
Control work for CM 1 – 10				Control work for CM 2 – 10				

T1, T2 ... T8 – topics

****Note:** Control work for the content module is carried out in the form of written test tasks after completing the study of the educational material of each content module. Written test tasks consist of 10 test tasks and correspond to the content of the educational material of the module. For each correct answer to one test task, the student receives 1 point.