



«Approved»

by \_\_\_\_\_

«\_\_\_» of \_\_\_\_\_ 2025

## Syllabus

Academic Year 2025 – 2026

1. General information							
Course Code							
Course Title	Cloud Computing						
Degree Cycle (Level)/ Major / Relation to curriculum	Bachelor’s Degree 6B06101 - Computer Science 6B06102 – Software Engineering 6B06103 – Big Data Analysis 6B06106 – Mathematical and Computational Science						
Year, trimester	3rd year, 7-8						
Language of Instruction:	English						
Lecturer(s)/ Instructors/ Instructor Contact Information	Aldiyar Salkenov, Master of Engineering, Information Technology, Senior-lecturer, aldiyar.salkenov@astanait.edu.kz, Office C1.3.357  Elvira Aitmukhanbetova, Master of Science in Computer Science, Senior-lecturer, elvira.aitmukhanbetova@astanait.edu.kz, C1.3.357  Dariya Bissengaliyeva, MSc in IT, Senior Lecturer, dariya.bissengaliyeva@astanait.edu.kz, C1.3.357  Yersultan Tulebayev, MSc in Information Systems, Senior Lecturer, yersultan.tulebayev@astanait.edu.kz, C3.3.357  Gulsipat Abisheva, MSc in Engineering (Technical Sciences), Senior lecturer, g.abisheva@astanait.edu.kz, C1.3.357						
Number of Credits	5						
Workload of course components and credits per trimester	ECTS credits	Contact hours			IASS	SIS	Total hours
		Lectures	Practice sessions	Laboratory work			
	5	20	20	10	10	90	150
Prerequisites	“Cloud computing” is based on knowledge obtained by the students on Information and Communication Technologies, Web technologies, Database Management Systems, Computer Organization and Architecture, and Operating Systems and Computer Networks courses.						
Post requisites	-						
2. Goals, objectives and learning outcomes of the course							
– Course Overview/Description	<p>This course introduces you to the core concepts of cloud computing. You will gain the foundational knowledge required for understanding cloud computing from a practitioner perspective.</p> <p>You will learn about the definition and essential characteristics of cloud computing, its history, emerging trends, and the business case for cloud computing. You also learn about the various cloud service models (IaaS, PaaS, SaaS) and deployment models (Public Cloud, Private Cloud, Hybrid Cloud) and the key components of a cloud architecture (Virtualization, VMs, Storage, Networking, Containers).</p> <p>The course will also familiarize you with emerging trends associated with cloud including Microservices, Serverless, Cloud Native, DevOps, and Application Modernization. You learn about Cloud Security basics and will be introduced to some case studies and career opportunities related to cloud computing.</p>						

– Course Learning Goals	This course is designed to give students a detailed overview of core cloud services, security, architecture, pricing, and support. Study of the technical and economic feasibility of transferring existing applications to the cloud; familiarity with the cloud computing infrastructure; scaling, deployment, backup, and solving security issues in the context of cloud infrastructure.
– Course Learning Outcomes	<p>You will learn:</p> <ol style="list-style-type: none"> <li>1. Essential characteristics and benefits of Cloud Computing, e.g. pay-per-use, etc.</li> <li>2. Common cloud service models (IaaS, PaaS, SaaS) and deployment models (Public, Private, Hybrid).</li> <li>3. Components of cloud infrastructure (Regions, Availability Zones, Data Centers, Virtualization, VMs, Bare Metal, Networking), and types of cloud storage (Direct Attached / Ephemeral, Persistent - File Storage, Block Storage, Object Storage, etc.)</li> <li>4. Emergent trends in cloud computing - including Hybrid MultiCloud, Containers, Microservices, Serverless, Cloud Native, DevOps, and Application Modernization.</li> <li>5. Concepts in cloud security, encryption and monitoring.</li> </ol>
– Methods/forms of teaching	<ul style="list-style-type: none"> <li>– Quizzes,</li> <li>– Oral defence,</li> <li>– Theoretical and practical assignments</li> </ul>
– Coursework and Grading Scheme	<p><b>1st attestation:</b>  <b>Assignments:</b>  Assignment 1: Lab 1 - Introduction to AWS IAM and Lab 2 – Build your VPC and Launch a Web Server – 15%  Assignment 2: Lab 3 - Introduction to Amazon EC2 and Lab 4 – Working with EBS - 15%  Assignment 3: Lab 5 - Build a Database Server and Lab 6 – Scale &amp; Load Balance your Architecture – 15%  <b>Quizzes:</b>  Knowledge checks, activities on AWS (Cloud Foundations) – 15%  <b>Midterm:</b> MCQ – 40%</p> <p><b>2<sup>nd</sup> attestation:</b>  <b>Assignments:</b>  Assignment 4: Lab 2.1 – Exploring AWS CloudShell and the AWS Cloud9 Integrated Development Environment – 15%  Assignment 5: Lab 3.1 – Working with Amazon S3 and Lab 5.1 – Working with DynamoDB 20%  Assignment 6: Lab 6.1 – Developing REST APIs with API Gateway 15%  <b>Quizzes:</b>  Knowledge checks, activities on AWS (Cloud Developing) – 10%  <b>Endterm:</b> MCQ – 40%</p> <p><b>Final Exam (MCQ) – 100%</b></p>
– Academic Integrity	<p>Cheating and plagiarism are defined in the Academic conduct policies of the university and include:</p> <ol style="list-style-type: none"> <li>1. Submitting work that is not your own papers, assignments, or exams;</li> <li>2. Copying ideas, words, or graphics from a published or unpublished source without appropriate citation;</li> <li>3. Submitting or using falsified data;</li> <li>4. Submitting the same work for credit in two courses without prior consent of both instructors.</li> </ol> <p>Any student who is found cheating or plagiarizing on any work for this course will receive 0 (zero) for that work and further actions will also be taken regarding academic conduct policies of the university.</p> <p>The full texts of all the academic conduct code will be posted to the students using the Learning Management System (moodle.astanait.edu.kz).</p>
– Learning resources:	<p>Main:</p> <ol style="list-style-type: none"> <li>1. D.Hemanand. Cloud Computing: Cloud Concepts; Methodology, Network Architecture / D.Hemanand, W.T. Chembian, R.R. Vallem. - Moldova: Lambert Academic Publishing, 2021. - 219 p.</li> <li>2. Tood Hoff.Explain the Cloud like i'm 10: Learn the inner-secrets behind Kindle, Netflix, AWS, APPLE, Facebook, and Google / H. Tood. - Italy: Possibility Outpost INC., 2024. - 279 p.</li> <li>3. Stephen Orban. Ahead in the Cloud: Best Practices for Navigating the Future of Enterprise IT / O. Stephen. - Great Britain: Amazon, 2017. - 300 p.</li> </ol>

	<p>Additional:</p> <ol style="list-style-type: none"> <li>1. Rajkumar Buyya. Cloud Computing : Principles and Paradigms / B. Rajkumar, B. James, G. Andrzej. - USA : Wiley, 2011. - 637 p.</li> <li>2. Риз.Дж. Облачные вычисления/ Д. Риз. - пер. с англ. - СПб. : БХБ-Петербург, 2020. - 288с.</li> <li>3. AWS Academy <a href="https://www.awsacademy.com/">https://www.awsacademy.com/</a></li> </ol>
– Technology employed:	<p>The primary platforms for this course are: Moodle (<a href="https://moodle.astanait.edu.kz">moodle.astanait.edu.kz</a>) – for course materials, assignment submission, grading, and feedback.</p> <p>Microsoft Teams – for online classes, discussions, and virtual office hours (if needed).</p> <p>AWS Academy platform – for online lectures, cloud computing resources and labs.</p> <p>Misuse of laptops, tablets, or mobile phones (e.g., for unrelated browsing, messaging, or social media) will be considered misconduct and may result in disciplinary action. Students are responsible for ensuring reliable internet access and maintaining updated versions of required software.</p>
– Course Policies:	<p><b>Presence and Participation:</b></p> <p>Attendance is a mandatory component of the course. Students are expected to attend all scheduled class sessions with all required reading and supplementary materials. Readings are to be completed prior to class. Students who come late to class for more than 5 minutes will be marked as “absent” for that session. All of the technical problems should be fixed before the class starts. Having a weak Wi-Fi signal or a problem with laptop (in case of online classes) is not considered as an excuse.</p> <p>Students won’t obtain additional points for course attendance, but attendance is important to pass the course. Students are required to attend at least 70% of all scheduled classes to be admitted to the final exam. If a student is absent for 30% or more of the total course sessions, the instructor has the right to assign the status “Not Graded”. In such cases, the student will be automatically excluded from the final exam and will be required to retake the course in accordance with the university’s academic regulations.</p> <p>Excused absences (medical certificates, emergencies) must not exceed 30% of the total course sessions. Active participation in classroom activities and discussions is essential. Participation quality, not just quantity, is evaluated through meaningful contributions that demonstrate preparation, critical thinking, and engagement with the course material.</p> <p><b>Deadlines and Late Submissions:</b></p> <p>All course assignments, projects, and homework must be submitted through the official Learning Management System (<a href="https://moodle.astanait.edu.kz">moodle.astanait.edu.kz</a>) and AWS Academy platform by the announced deadlines. It is the responsibility of each student to ensure they fulfil the requirements for assignment submission/defences to be eligible to get full credit. Submissions via email, messengers, or other unofficial channels will not be accepted.</p> <p>Late submissions will not be graded and will automatically receive a score of zero.</p> <p><b>The Honor Code of Students:</b></p> <p>All students must adhere to the principles of academic integrity. Violations include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• Plagiarism (using someone else’s work without proper citation),</li> <li>• Copying assignments, projects, or code,</li> <li>• Cheating during examinations,</li> <li>• Unauthorized collaboration on individual tasks,</li> <li>• Submitting the same work for credit in two courses without prior consent of both instructors,</li> <li>• Submitting falsified data or information.</li> </ul> <p>Any violation of the Honor Code will result in a zero grade for the respective work and may lead to further disciplinary action according to the university’s Academic Conduct Policy. Repeat violations may result in failure of the course.</p> <p><b>Course Policies for Use of Generative AI:</b></p> <p>The use of generative AI tools (such as ChatGPT, GitHub Copilot, or similar) is permitted only under the following conditions:</p> <p>Students must explicitly acknowledge in writing any use of AI in their submitted work.</p>

	<p>AI tools may be used as assistants for brainstorming, debugging, or code suggestions, but the student remains fully responsible for the correctness, originality, and quality of the final submission.</p> <p>Submitting AI-generated work without acknowledgment is considered plagiarism and will be treated as academic dishonesty.</p> <p>The instructor reserves the right to question and assess a student's understanding of submitted work during defense or oral questioning sessions.</p> <p><b>Extended Absences:</b></p> <p>Students with extended absences remain responsible for all missed assignments, projects, and exams. No make-up opportunities, additional assignments, or alternative assessments will be provided.</p> <p><b>Late Homework Policy:</b></p> <p>Homework and assignments must be submitted on or before the due date. <b>Late submissions and/or defenses will not be accepted</b>, and the grade will be recorded as zero. In-class discussions often review the assigned tasks, making late work irrelevant.</p> <p><b>Exam Policy:</b></p> <p>The final exam for the course "Cloud Computing" includes a multiple-choice question quiz.</p> <p><b>Course Privacy Statement:</b></p> <p>The classroom is considered an academic environment where mutual respect and confidentiality are expected. Course materials, lectures, presentations, and student projects are intended solely for educational purposes.</p> <p>Recording of lectures, discussions, or presentations is prohibited unless explicitly authorized by the instructor.</p> <p>Sharing course materials, assignments, or student work outside the class without permission is strictly forbidden.</p> <p>Unauthorized distribution of lecture slides, solutions, or recordings will be treated as a breach of academic conduct.</p> <p>The full texts of all the academic conduct code will be posted to the students using Learning Management System (moodle.astanait.edu.kz).</p> <p><b>Contacting the Course instructor:</b></p> <p>The easiest and most reliable way to get in touch with the course instructor is by email or MS Teams. Students must feel free to send an email if they have a question related to the course. Instructor responds as soon as they can but not always instantaneously. Besides that, students are also welcome to arrange a one-to-one meeting with the instructor by their office during office hours to discuss the class using both offline and online.</p>
– Course Schedule	
– Syllabus Inclusion Statements	

### 3.1 Abbreviations

#	Abbreviation	Meaning
1	IASS	Instructor assisted student study - Instructors assist students in achieving success by delivering support, feedback, and resources. This support might take the form of clarifying difficult topics, recommending additional materials, or providing individualized guidance.
2	SIS	Student independent study
3	IW	Individual work
4	GW	Group work
5	PA	Practical assignment
6	LW	Laboratory work
7	MCQ	Multiple choice quiz
8	PBT	Paper-based test

### 3.2 Course Plan

Week No	Course Topic	Lectures (H/W)	Practice sessions (H/W)	Lab. sessions (H/W)	TSIS (H/W)	SIS (H/W)
1	- Course Overview - Introduction to AWS - Cloud Computing Concepts	2	2	1	0	9
2	- AWS Economics and Billing - AWS Global Infrastructure Overview	2	2	1	1	9
3	- AWS Cloud Security - AWS Networking and Content Delivery	2	2	1	1	9
4	- AWS Compute - AWS Storage	2	2	1	2	9
5	- AWS Databases - Cloud Architecture - Auto Scaling and Monitoring	2	2	1	1	9
6	- Introduction to Developing on AWS - AWS SDKs, CloudShell	2	2	1	1	9
7	- Developing Storage Solutions - Introduction to Amazon S3 - Securing Access to Cloud Resources	2	2	1	1	9
8	- Developing Flexible NoSQL Solutions - Introduction to Amazon DynamoDB	2	2	1	1	9
9	- Developing REST APIs - Introduction to API Gateway	2	2	1	1	9
10	- Course overview	2	2	1	1	9
<b>Total hours: 150</b>		<b>20</b>	<b>20</b>	<b>10</b>	<b>10</b>	<b>90</b>

### 3.1 Detailed course plan

Week No	Lecture Topics with Learning Resources	Tasks and Activities for Practice Sessions with Recommended Reading Resources	Lab Exercises, Assigned Activities, and Supporting Reading Resources (Some courses do not include lab work; in such cases, this column can be omitted)
1	- Course structure, expectations, and assessment methods - Introduction to AWS and its relevance in the cloud ecosystem - Cloud computing concepts: IaaS, PaaS, SaaS - Shared responsibility model.	Course: Cloud Foundations, Module 1	
2	- AWS pricing models: On-Demand, Reserved, Spot - Total Cost of Ownership (TCO) and AWS Pricing Calculator - AWS Global Infrastructure: Regions, Availability Zones, Edge Locations.	Course: Cloud Foundations, Modules 2 and 3	
3	- Identity and Access	Course: Cloud Foundations,	Lab 1 – Introduction to

	Management (IAM): users, groups, roles, policies. - AWS Security best practices. - Networking: VPC, subnets, security groups, routing.	Modules 4 and 5	AWS IAM and Lab 2 - Build your VPC and Launch a Web Server
4	- Compute services: EC2 basics, AMIs, instance types, EBS. - Storage types: Object, Block, File. - Amazon S3: buckets, objects, lifecycle policies, versioning. - EBS volumes, Snapshots. - Amazon EFS basics.	Course: Cloud Foundations, Modules 6 and 7	Lab 3 – Introduction to Amazon EC2 and Lab 4 – Working with EBS
5	- Amazon RDS: relational databases. - Amazon Aurora, Amazon Redshift overview. - AWS Well-Architected Framework principles. - Auto Scaling groups. - Monitoring with CloudWatch.	Course: Cloud Foundations, Modules 8, 9 and 10	Lab 5 – Build a Database Server and Lab 6 – Scale & Load Balance your Architecture
6	- Introduction to application development on AWS. - AWS SDKs (Python boto3, Node.js). - AWS CloudShell for CLI-based development.	Course: Cloud Developing, Modules 1 and 2	Lab 2.1 - Exploring AWS CloudShell and the AWS Cloud9 Integrated Development Environment
7	- Advanced S3 features: static website hosting, encryption, bucket policies. - IAM policies for secure access. - Securing resources with KMS and encryption in transit/at rest.	Course: Cloud Developing, Modules 3 and 4	Lab 3.1 - Working with Amazon S3
8	- Introduction to DynamoDB: tables, partitions, items - Key-value and document data models - DynamoDB Streams and integrations.	Course: Cloud Developing, Module 5	Lab 5.1 - Working with DynamoDB
9	- Introduction to API Gateway. - RESTful API design principles - Authentication and authorization in APIs.	Course: Cloud Developing, Module 6	Lab 6.1 - Developing REST APIs with API Gateway
10	- Recap of major AWS services covered. - Review of cloud architecture patterns.		

### 3.4 List of assignments for Student Independent Study

№	Assignments (topics) for independent study	Hours	Recommended literature and other sources (links)	Form of submission
1	- Cloud Computing in a Nutshell	9	Students will be enrolled in	Your instructor

	- Software as a Service Providers (SaaS) - Infrastructure as a Service Providers (IaaS) - Platform as a Service Providers (PaaS)		<p>the course by their instructors via an email invitation. To begin, follow the link in the email and register for an account on the AWS Academy Learning Management System (LMS).</p> <p>Once enrolled, use the left-hand navigation menu in the LMS to access course materials, including instructional videos, reading resources, hands-on labs, and knowledge check quizzes</p>	<p>will be able to monitor your progress and view your grades through the AWS Academy LMS. You are required to complete both the Pre-Course and End-of-Course Feedback Surveys</p>
2	- Migrating into a Cloud - Challenges and Risks in Cloud Computing	9		
3	- AWS Overview - AWS Billing & Cost Management - AWS Services & Service Categories	9		
4	- AWS Shared Responsibility - Data and Account Security - Networking Basics - Amazon VPC Overview - AWS EC2 Overview - AWS S3 Overview	9		
5	- AWS RDS Overview - AWS DynamoDB Overview - AWS Well-Architected Framework Design Principles - Elastic Load Balancing - AWS EC2 Auto Scaling	9		
6	- Fundamentals of working with the AWS SDKs	9		
7	- Working with Amazon S3 objects - Protecting data and managing access to S3 resources - Shared Responsibility Model - Authorizing with IAM	9		
8	- Introduction to AWS database options - Basic operations for DynamoDB tables	9		
9	- Introduction to API Gateway - Deployment and optimization of APIs	9		

#### 4. Student performance evaluation system for the course

Period	Assignments	Number of points	Form of assessment	Total
1 <sup>st</sup> attestation	<b>Assignments:</b> <ul style="list-style-type: none"> <li>- Assignment 1: Lab 1 - Introduction to AWS IAM and Lab 2 – Build your VPC and Launch a Web Server</li> <li>- Assignment 2: Lab 3 - Introduction to Amazon EC2 and Lab 4 - Working with EBS</li> <li>- Assignment 3: Lab 5 - Build a Database Server and Lab 6 – Scale &amp; Load Balance your Architecture</li> <li>- Knowledge checks, activities on AWS (Cloud Foundations)</li> </ul> <b>Midterm exam (MCQ)</b>	15  15  15  15  40	Practical tasks on AWS, oral defence in practice session time   quizzes	100
2 <sup>nd</sup> attestation	<b>Assignments:</b> <ul style="list-style-type: none"> <li>- Assignment 4: Lab 2.1 – Exploring AWS CloudShell and the AWS Cloud9 Integrated Development Environment</li> <li>- Assignment 5: Lab 3.1 – Working with Amazon S3 and Lab 5.1 – Working with DynamoDB</li> <li>- Assignment 6: Lab 6.1 – Developing REST APIs with API Gateway</li> <li>- Knowledge checks, activities on AWS (Cloud Developing)</li> </ul>	15  20  15  10	Practical tasks on AWS, oral defence in practice session time   quizzes	100

	<b>Endterm exam (MCQ)</b>	40		
Final exam	Multiple choice quiz		quiz	100
<b>Total</b>	<b>0,3 * 1<sup>st</sup> Att + 0,3 * 2<sup>nd</sup> Att + 0,4*Final</b>			<b>100</b>

Achievement level as per course curriculum shall be assessed according to the evaluation chart adopted by the academic credit system.

Letter Grade	Numerical equivalent	Percentage	Grade according to the traditional system
A	4,0	95-100	Excellent
A-	3,67	90-94	
B+	3,33	85-89	
B	3,0	80-84	Good
B-	2,67	75-79	
C+	2,33	70-74	
C	2,0	65-69	Satisfactory
C-	1,67	60-64	
D+	1,33	55-59	
D	1,0	50-54	Fail
FX	0	25-49	
F	0	0-24	

### Course Assessment Rubric for Student Performance Evaluation

Learning Outcomes	Indicators	Excellent (90–100)	Good (70–89)	Satisfactory (50–69)	Fail (0–49)
1. Demonstrate understanding of cloud computing foundations and architectures	1.1 Explains core concepts (virtualization, on-demand services, elasticity) 1.2 Identifies key building blocks of cloud computing 1.3 Differentiates cloud service and deployment models	Clearly defines core concepts, accurately relates to “Cloud in a Nutshell” and “Enterprise Cloud Computing,” and critically discusses trade-offs of architectures	Explains most core concepts and models with minor gaps; makes partial connections to enterprise context	Provides a general explanation of concepts but lacks depth and clear connections to practice	Cannot explain cloud fundamentals or confuses key concepts
2. Analyze and evaluate cloud system design and architecture	2.1 Describes cloud architecture layers and components 2.2 Compares stateful vs. stateless services 2.3 Evaluates load balancing, scalability, availability, and fault tolerance	Thoroughly analyzes and justifies architectural choices; integrates trade-offs between scalability, availability, and fault tolerance	Analyzes architectural components but connections between trade-offs are partial or incomplete	Identifies some architectural components but lacks evaluation of trade-offs	Does not recognize or explain architectural elements
3. Apply AWS	3.1 Explains	Accurately	Explains AWS	Demonstrates	Fails to



services and solutions	AWS global infrastructure and economics 3.2 Demonstrates AWS compute, storage, networking, and content delivery services 3.3 Applies AWS security best practices	explains AWS infrastructure, services, and billing; applies them to realistic scenarios with clear justification	services with some accuracy; applies them in simplified contexts	limited knowledge of AWS services and their application	identify AWS services or misapplies them
4. Design and evaluate data-driven cloud solutions	4.1 Explains principles of data-driven organizations 4.2 Designs data pipelines using best practices 4.3 Applies design principles and patterns for cloud-based data processing	Designs robust data pipelines; critically applies design patterns; explains the role of data in cloud architecture	Designs data pipelines with partial application of patterns and principles	Demonstrates limited ability to design or explain data pipelines	Cannot explain or apply data pipeline principles
5. Monitor, optimize, and secure cloud systems	5.1 Implements auto scaling and monitoring techniques 5.2 Evaluates cost optimization strategies 5.3 Assesses cloud security risks and controls	Provides comprehensive strategies for monitoring, cost optimization, and security with real-world examples	Explains and applies monitoring, cost, and security concepts with some limitations	Describes some monitoring and security concepts but lacks practical application	Does not demonstrate knowledge of monitoring, cost optimization, or cloud security

### 3. Course assessment methodology

Assessment is conducted continuously throughout the course, comprising 60% continuous assessment throughout the semester and 40% summative assessment during the examination session, totaling 100%. Continuous assessment evaluates students' ongoing performance through attendance, laboratory work defense, in-class activities, course assignments as well as independent study (SIS).

- **IASS (Instructor assisted student study)** - Instructors assist students in achieving success by delivering support, feedback, and resources. This support might take the form of clarifying difficult topics, recommending additional materials, or providing individualized guidance.
- **SIS** – Student engagement in self-directed study on assigned topics and the completion of relevant assignments given in the syllabus.
- **Midterm and Endterm** are a review of the topics covered and assessment of

each student's knowledge. The form of the midterm and end term exams is MCQ.

- **Final assessment.** The final exam will be held according to schedule in the Academic Calendar. The form of the final exam is computer testing.

**6. Lecturer (lecturers) approvals Full name Job title Date Sign**

<b>Full name</b>	<b>Job title</b>	<b>Date</b>	<b>Signature</b>
Aldiyar Salkenov	Senior Lecturer		
Elvira Aitmukhanbetova	Senior Lecturer		
Dariya Bissengaliyeva	Senior Lecturer		
Yersultan Tulebayev	Senior Lecturer		
Gulsipat Abisheva	Senior Lecturer		