Name of subject	DESIGN AND RECONSTRUCTION OF ROAD AND BRIDGE STRUCTURES (ECTS 6)
Subject/module code	**YKILRQ2010**
Science taught semester (s).	1st and 2nd semesters
Responsible teacher	Ganiyev Inomjon Gulomovich – head of the department "Road engineering", PhD, professor
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	**Total hours – 180 hours** **Contact hours – 54 hours** Lecture training hours – 24 hours Practical training hours – 30 hours **Independent education – 126 hours**
Course work	No
ECTS	6
The purpose and tasks of subject / learning outcomes	**The purpose of teaching the subject is** To develop competence for analyzing initial data, designing and reconstructing integrated road-and-bridge facilities, checking structures, interpreting diagnostic evidence, comparing strengthening alternatives, using CAD/BIM and justifying decisions through technical-economic and life-cycle criteria **The objectives of teaching the subject** are – To teach students how to select road alignments, bridge structural configurations, structural components, and construction materials in accordance with specific engineering conditions; To develop skills in structural analysis and design with respect to loads, limit states, strength, stiffness, and stability; To identify the need for reconstruction based on structural defects, testing results, and monitoring data, and to compare various structural strengthening techniques; To verify CAD/BIM models and structural analysis models, plan repair and rehabilitation stages, and assess life-cycle costs and environmental impacts; To develop competencies in reviewing scientific literature, preparing technical engineering reports, and independently presenting and defending engineering decisions. **Learning outcomes:** 1. Classify road-bridge structures by structural system and function and explain the interaction of their elements. 2. Use topographic and soil data to justify road alignment, profile, pavement and drainage solutions. 3. Select applicable standards, define loads and load combinations and document design assumptions. 4. Check strength, stiffness and stability of reinforced-concrete and steel elements using a selected structural model. 5. Analyse defect, testing and monitoring data and issue a condition conclusion with stated reliability limits. 6. Compare at least two reconstruction/strengthening options using technical criteria and justify selection. 7. Prepare a CAD/BIM or analytical model/drawing and independently verify key inputs and results. 8. Evaluate life-cycle cost, service life and environmental factors of alternatives and test sensitivity to major assumptions. 9. Plan construction/reconstruction stages, quality-control points and temporary traffic-management solutions.

	10. Correctly document sources, drawings and technical reports and independently defend individual contribution and engineering decisions.
Course content (topics)	**I. Main Theoretical Part (Lecture Sessions).** Topics: 1. Introduction and development of road-bridge structures 2. Theoretical foundations of highway design 3. Road structural composition and engineering elements 4. Bridge types, classification and structural elements 5. Engineering methods for bridge analysis and design 6. Construction technologies for reinforced-concrete and steel bridges 7. Bridge reconstruction and strengthening methods 8. Traffic flows and operation 9. Innovative technologies, BIM and monitoring 10. Environmental and sustainable solutions 11. Construction-process organisation and management 12. Uzbekistan and international advanced practice **II. Instructions and recommendations for organizing laboratory exercises** Laboratory work is not included in the curriculum **III. Practical training instructions and recommendations** The instructor's preparation for a practical session begins with the study of initial documents (such as the curriculum, topic schedule, etc.) and concludes with the development of a detailed lesson plan. The instructor must have a clear understanding of the objectives and tasks of the practical session, as well as the amount of work each student is expected to perform. Methodological guidelines serve as the primary instructional document for instructors in preparing and conducting practical sessions. The purpose of the practical session is to facilitate the comprehension of theoretical material, the acquisition of practical skills, the ability to consciously apply knowledge in academic and professional activities, and the development of critical thinking and confidence in forming personal viewpoints. *Recommended Practical Topics:* 1. Select and map a highway alignment 2. Design longitudinal and cross profiles 3. Calculate earthworks 4. Design pavement structure 5. Design drainage and water-crossing systems 6. Develop bridge structural scheme 7. Determine bridge loads 8. Calculate bridge-element strength 9. Design reinforced-concrete bridge elements 10. Analyse steel bridge structures 11. Select bridge reconstruction methods 12. Analyse strengthening technologies 13. Monitor technical condition of roads and bridges 14. Model roads and bridges using BIM 15. Evaluate technical-economic efficiency of a road-bridge project **IV. Independent learning and independent work** Independent learning competency helps students to develop self-improvement skills and increase the efficiency of their professional activities. Students perform independent tasks on their mobile devices under the guidance of a teacher, either in traditional or electronic form. Recommended topics for independent work: 1. Classification and regulatory approaches for road-bridge structures 2. Factors affecting alignment and profile selection

	3. Interaction of pavement, materials and drainage 4. Bridge loads and limit-state calculation fundamentals 5. Road alignment, profiles and earthwork quantities 6. Pavement/drainage solution under traffic load 7. Reinforced-concrete and steel bridge checks 8. Bridge defects and monitoring-data analysis 9. Strengthening with composite materials 10. Link defects to a BIM model 11. Reconstruction stages and quality control 12. Life-cycle cost of reconstruction alternatives
Exam form	Written
Teaching/learning and examination requirements	Complete mastery of theoretical and methodological concepts and practical knowledge of the discipline, the ability to correctly reflect the results of analysis, independently reason about the processes being studied and carry out tasks in the current, intermediate forms of control and independent work, pass written work on the final control. When drawing up final exam questions, deviations from the content of the discipline program are not allowed. The bank of final exam questions for each discipline is discussed at the meeting and approved by the head of the department. No later than 1 week before the start of the final control, tickets signed by the head of the department, enclosed in an envelope, are sealed by the Dean's office and opened 5 minutes before the start of the exam in the presence of students. Final exam duration is 80 minutes. Answers to final exam questions are recorded in copybooks with the seal of the Dean's office. After completion of the final work, the work is immediately encrypted by a representative of the Dean's office, and the copybooks are handed over to the commission for verification. From the moment of completion of the final exam, a period of 72 hours is allotted for checking and posting the results on the electronic platform. The teacher who taught the students in this discipline is not involved in the process of conducting the exam and checking the students' answers. Student(s) who are dissatisfied with the final exam results may submit a written or oral appeal within 24 hours of the publication of the final exam results. Complaints submitted after 24 hours from the publication of the final exam results will not be accepted.
Scope of assessment criteria and procedure	CURRENT CONTROL Purpose: Determining and assessing the student's level of knowledge, practical skills, and competencies on course topics. Instructions: The student's activity in daily classes is assessed through the student's mastery of course topics, as well as constructively interpreting and analyzing the educational material, developing module specific skills, acquiring practical skills (in terms of quality and the specified number) and competencies, solving problem situations aimed at applying professional practical skills, working in a team, preparing presentations, etc. Current control form: Activity in lessons; Preparing educational materials; Working with sources within the subject; Using educational technologies; Working in a team Preparing presentations; Working with projects. MIDTERM CONTROL Purpose: Assessing the student's knowledge and practical skills and level of mastery of lecture material after completing the relevant section of the course. Form and procedure of intermediate control: Midterm examination is held during the semester during the training sessions after the completion of the relevant module of the curriculum of the subject. Midterm examination

is held once in written form within the framework of this subject. Midterm examination questions cover all topics of the subject.

INDEPENDENT LEARNING

Purpose: Independent learning is aimed at fully covering the content of this course, expanding the theoretical knowledge acquired, and establishing independent learning activities for students.

Form and procedure of independent education: independent work assignments are completed in the form of an educational project, presentation, case study, problem solving, information search, digest, colloquium, essay, article, abstract, etc. Completed assignments for independent study are placed in the electronic system and checked based on the anti-plagiarism program and evaluated by the subject teacher.

In this case, the uniqueness of the completed assignment should not be less than 60%, otherwise the assignment will not be accepted for assessment. The number of independent work assignments, depending on the nature of the subject, should not be less than 3 for one subject (module). Independent work assignments account for 60% of the points allocated for current and intermediate control.

FINAL CONTROL

Purpose: The final examination is held at the end of the semester to determine the level of mastery of the student's theoretical knowledge and practical skills in the relevant subject. The final examination is held at a specified time according to the examination schedule created by the Registrar's Office on the electronic platform.

Requirements: The student must have passed the current control, intermediate control and independent learning assignments by the deadline for the final control type in the relevant subject. A student who has not passed the current control, intermediate control and independent learning assignments, as well as who has received a score in the range of "0-29,9" for these assignments and control types, is not included in the final control type. Also, a student who has missed 25 percent or more of the classroom hours allocated to a subject without a reason is excluded from this subject and is not included in the final control type and is considered not to have mastered the relevant credits in this subject. A student who has not passed or was not included in the final control type and has received a score in the range of "0-29.9" for this type of control is considered to be an academic debtor.

Final control form: The final examination in this subject will be conducted in written form. If the final examination is conducted in written form, the requirements for assessment must also be reflected.

Criteria for assessing student knowledge

5 grade	100 points		Assessment criteria
5	90-10	Excellent	When a student is considered to be able to make independent conclusions and decisions, think creatively, observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and have an idea about the subject.
4	70-89,9	Good	When the student is considered to be

				able to observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and has an idea about the subject
	3	60-69,9	Satisfactory	When the student is found to be able to apply the knowledge he has gained in practice, understands, knows, can express, and narrate the essence of the subject, and has an idea about the subject.
	2	0-59,9	Unsatisfactory	When it is determined that the student has not mastered the science program, does not understand the essence of the subject, and does not have an idea about the science.

Course assessment criteria and procedure

Assessment type	Total points allocated	Control (task) form	Distribution of points	Qualifying score
Current assessment	30 points	System tasks	20 points (divided by number of tasks)	18 points
		Student activity (in seminars, practical, laboratory classes)	10 points	
Midterm assessment	20 points	Supervision: writing work	10 points	12 points
		System tasks	10 points (divided by number of tasks)	
Final assessment	50 points	Written assignment (5 questions)	50 points (10 points per question)	30 points

* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work assignments are evaluated as system assignments through the electronic platform.

Recommended Literature	1. Ganiyev, I. G. Yo‘l-ko‘prik inshootlarini loyihalash va rekonstruksiya qilish / I. G. Ganiyev. — Jizzakh : Ilm nuri print, 2026. — 234 b. 2. SHNQ 2.05.03-22. Ko‘priklar va quvurlar : shaharsozlik normalari va qoidalari. — 2022. 3. SHNQ 3.06.07-23. Ko‘priklar va quvurlar. Tekshirish, sinash va diagnostika qilish qoidalari : shaharsozlik normalari va qoidalari. — 2023. 4. SHNQ 2.05.02-23. Avtomobil yo‘llari. Loyihalash talablari : shaharsozlik normalari va qoidalari. — 2024. 5. Bridge Inspector’s Reference Manual (BIRM) (2022 NBIS) / T. W. Ryan et al.; Federal Highway Administration. — Revised March 2023. — National Highway Institute, 2023. — 1412 p. — Report No. FHWA-NHI-23-024. 6. AASHTO. LRFD Bridge Design Specifications. — 10th ed. — AASHTO, 2024. — 1905 p. — ISBN 978-1-56051-828-0.