Name of subject	PRINCIPLES OF ROADSIDE PLANTING (11 ECTS)
Subject/module code	**SHYK27811**
Science taught semester (s).	7th and 8th semesters
Module leader	Professor Inomjon G‘aniyev, Candidate of Technical Sciences, Head of the Department of Road Engineering
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	**Total hours – 330 hours** **Contact hours – 132 hours** Lecture training hours – 60 hours Practical training hours – 72 hours **Independent education – 198 hours**
Course work	No
ECTS	11
The purpose and tasks of subject / learning outcomes	**The purpose of teaching the subject is** to develop competence in planning roadside planting suited to soil, climate, water and road-safety conditions, and in justifying plant selection, establishment and long-term care. **The objectives of teaching the subject** are Inventory existing vegetation and site conditions. Explain plant roots, stems, crowns and growth. Assess soil, moisture, salinity and water supply. Select species and planting material using evidence. Account for visibility, clear zones, roadside equipment and utilities. Prepare planting, irrigation, erosion-protection, maintenance and monitoring plans. **Learning outcomes:** 1. Distinguish the functions and legal scope of roadside planting. Record existing plants, users and constraints in an inventory and map. 2. Interpret soil texture, compaction, permeability, salinity and nutrient data. Identify further investigation needs. 3. Select trees, shrubs or herbaceous ground cover suited to the supplied climate, water and site conditions, using mature size, risk and maintenance criteria. 4. Identify conflicts involving visibility, clear zones, barriers, signs, lighting, drainage and utilities in a planting layout. Justify the proposed option. 5. Specify planting-stock or seed quality requirements and soil-preparation and planting steps. Check quantities and material consumption. 6. Calculate irrigation volume from the supplied water deficit and efficiency. Explain a plan suited to the water source, quality, drainage and season. 7. Analyse relationships among erosion, slopes, surface runoff and vegetation. Identify the geotechnical and hydraulic limits of vegetative protection. 8. Plan maintenance, pruning or mowing, nutrient application and pest monitoring using evidence. Identify authorisation and specialist-training requirements. 9. Evaluate survival, cover, growth, water and maintenance records for the same period and site. Distinguish assumptions, measurements and causal conclusions. 10. Compare two planting options in terms of safety, water, biodiversity and supplied life-cycle costs. Defend individual conclusions.
Course content (topics)	**I. Main Theoretical Part (Lecture Sessions).**

	Topics: 1. Functions of roadside planting. 2. Basic plant biology. 3. Climate and microsite. 4. Existing-site inventory. 5. Soil characterisation. 6. Compaction and salinity. 7. Water supply and site water balance. 8. Plant selection. 9. Road zones and constraints. 10. Mature size and interactions. 11. Planting plans and quantities. 12. Planting material. 13. Soil preparation and planting. 14. Seed sowing and ground cover. 15. Establishment. 16. Irrigation calculations. 17. Irrigation methods. 18. Soil protection. 19. Mowing and pruning. 20. Plant condition and weeds. 21. Vegetated slope protection. 22. Green drainage. 23. Protective planting. 24. Biodiversity. 25. Climate adaptation. 26. Monitoring and digital inventory. 27. Maintenance and acceptance. 28. Water and life-cycle cost. 29. Legal and environmental decisions. 30. Integrated planting solutions. **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. Prepare an inventory for a supplied section, mapping plants, coordinates, condition, size, users and data limitations. 2. Interpret supplied soil, climate and water data. Prepare a sampling and further-investigation plan. 3. Identify root-zone problems from compaction, infiltration, pH and salinity results. State the conditions for improvement. 4. Compare candidate trees, shrubs and herbaceous ground cover using a table of verified characteristics.

	5. Map constraints involving visibility, clear zones, utilities, signs, lighting and drainage. 6. Check space for mature crowns and roots. Compare conflicts in two planting layouts. 7. Prepare a scaled planting plan and quantities. Check row and area calculations against boundaries and gaps. 8. Prepare an acceptance record for planting stock or seed, covering provenance, root condition, quality and storage evidence. 9. Set out soil preparation and planting steps. Explain the root collar, pit, supports and mulching on a diagram. 10. Calculate seed quantities using supplied germination and application-rate data. Record planting-season, cover and erosion conditions. 11. Prepare an establishment-stage irrigation and moisture-monitoring plan. Identify replacement-planting needs separately. 12. Compare two planting options jointly in terms of visibility, safety, soil and water requirements. 13. Phase roadside planting work. Protect pedestrian routes, maintenance-equipment access, existing roots and roadside equipment. 14. Defend the semester 7 interim portfolio, covering the inventory, species selection, mature planting layout, quantities and initial care. 15. Calculate irrigation volume and duration from supplied area, net water deficit and efficiency. 16. Compare irrigation methods. Tabulate the information needed on water quality, filtration, pressure, distribution and maintenance. 17. Prepare a work instruction for mulching, mowing, pruning or nutrient application. Address need, constraints, safety and legal scope. 18. Distinguish observed signs, assumptions and the need for specialist diagnosis in a disease or pest case. Prepare a monitoring plan. 19. Analyse a slope or green-drainage scheme. Address surface runoff, erosion and the boundaries requiring specialist calculations. 20. Use a dust, noise, wind-protection or biodiversity case to assess benefits, adverse effects and measurement needs. 21. Analyse plant survival, cover and maintenance records for the same planting cohort and observation period. 22. Find legal sources, exceptions, competent authorities and the necessary evidence for an existing-tree retention or transplantation case. 23. Calculate life-cycle costs and sensitivity for two options using supplied water, maintenance, replacement-planting and price data. 24. Defend an individual final portfolio containing a planting plan, evidence-based species selection, checked calculations, safety provisions and a maintenance plan **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. Prepare a site inventory and constraints map. Identify soil, climate, water, existing trees and legal scope with their sources. 2. Develop two planting options. Justify species selection, mature size, visibility and equipment conflicts, quantities and each member’s contribution. 3. Justify an establishment plan covering planting-stock or seed quality, planting and initial moisture monitoring.

	4. Calculate water volume and compare irrigation and seasonal maintenance options using supplied data. State assumptions and limitations. 5. Coordinate the planting layout with drainage and user routes. Compare local options using topics from the cited course at a TOP-300 university. 6. Critically review research article, addressing its question, site and sample, method, measured outcomes and limits on local transfer. 7. Develop an option, assess adverse effects and plan further investigation for an erosion, climate or protective-planting case. 8. Prepare a maintenance and monitoring package covering survival, mowing or pruning, maintenance safety, replacement planting, inventory and a cost scenario. 9. Defend an individual portfolio containing the inventory, species sources, mature planting layout, water and quantity calculations, and maintenance conclusions.
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)	

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<tr><td>Final assessment</td><td>50 points</td><td>Written assignment (5 questions)</td><td>50 points (10 points per question)</td><td>30 points</td></tr>
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* 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.
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<tr><td>Recommended Literature</td><td>
1. SHNQ 2.05.02-23. Avtomobil yo‘llari. Loyihalash talablari (Highways. Design Requirements). Ministerial Order No. 01/2-61 of 23 August 2024. Effective from 14 October 2024.lex.uz/docs/-7205692
2. Cabinet of Ministers of Uzbekistan. Resolution No. 464 of 22 August 2022 on improving the procedures for planting, maintaining and using trees and shrubs outside the State Forest Fund, with its regulation. LexUZ revision of 21 July 2026.lex.uz/docs/-6165732
3. Austroads. Guide to Road Design Part 6B. Roadside Environment. Edition 2.2, 26 June 2026. AGRD06B-26. ISBN 978-1-923617-43-8. austroads.gov.au · AGRD06B
4. Transport for NSW. Landscape design guideline. Design guideline to improve the quality, safety and cost effectiveness of green infrastructure on roads and streets. June 2023. TfNSW 23.076. ISBN 978-1-922875-83-9. transport.nsw.gov.au · Landscape design guideline
5. National Academies of Sciences, Engineering, and Medicine. Long-Term Vegetation Management Strategies for Roadsides and Roadside Appurtenances. NCHRP Web-Only Document 350. Washington, DC, The National Academies Press, 2023. 121 pp. DOI 10.17226/26876. nationalacademies.org · NCHRP Web-Only Document 350
6. Austroads. Guide to Road Design Part 6. Roadside Design, Safety and Barriers. Edition 5.0, 26 June 2026. AGRD06-26.
7. Mitchell T. S., Verhoeven M. R., Darst A. L., Patterson C. H., Snell-Rood E. C. Seeding roadsides is necessary but not sufficient for restoring native floral communities. Ecological Solutions and Evidence, 2024, 5(3), e12364. DOI 10.1002/2688-8319.12364. doi.org/10.1002/2688-8319.12364
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