SYLLABUS

1. Course title:

TUNNELS

2. Code:

LRUDTUN

3. Cycle of study:

1

4. ECTS credits:

4

5. Type of course:

Mandatory

6. Prerequisites:

No

7. Class restrictions:

No

8. Duration / semester(s):

1 6

9. Weekly contact hours and student workload:

	Semester (1)	Semester (2)	(for two-semester courses)	Workload: (hours)	
9.1. Lectures	2		Classes:	45,00	
9.2. Seminars	1		Individual work:	60,58	
9.3. Laboratory / Practice classes	1		In total:	105,58	

10. Faculty:

Mining, Geology and Civil Engineering

11. Department/study program:

Mining Engineering

12. Lecturer:

PhD Kemal Gutić Full Professor

13. Course aims:

Familiarize students with the basics of tunnel construction and explain tunnel construction methods.
Introduce students to traditional tunnel construction methods (mining methods) and modern tunnel construction techniques.

Present students with techniques for breaking the working environment using explosives and non-explosive methods.
Define the working environment and explain methods for determining resistance: cutting, scraping, crushing, blasting, and others.
Classify the working environment for the purpose of underground excavation.
Explain mining works and classify underground structures based on position, purpose, and duration.
Cover manual and mechanical excavation, as well as hydromechanical methods of tunnel construction.
Additionally, the course aims to:
Improve students' intellectual skills in applying acquired knowledge to solve various engineering problems.
Enhance their abilities for both individual and team/group work, focusing on a practical approach to tunnel construction.
Develop students' skills for continuous work throughout the academic year.
Prepare students for open communication between professors and students.

14. Learning outcomes:

At the end of the semester/course, successful students who have continuously fulfilled their obligations throughout the entire academic period will be able to:

- **Utilize available (written/electronic) literature related to solving various problems covered in this course.**
- **Understand the structural elements, parameters, operating principles, and basic calculation methods.**
- **Analyze the effect of rock breaking as a function of specific explosive consumption; drilling equipment and accessories; drilling speed calculation; tunnel construction work organization; loading and transport machinery; TBM (Tunnel Boring Machine) tunnel construction; and microtunneling.**
- **Solve problems of varying complexity, both individually and in teams, and present their solutions in written or verbal form.**
- **Understand the significance of this course in solving various engineering practice challenges.**

15. Course content:

The introductory part of the course "Tunnels" includes:
Course presentation: Overview of the literature, course content, course objectives, expected communication outcomes at the end of the course, teaching and assessment methods, and additional information relevant to the course.
Construction of underground spaces by driving protective timber planks; tunnel construction by full-profile pressing.
Tunnel construction under water: Tunnel construction using caissons; tunnel construction by submerging prefabricated elements.
Construction of underground spaces with prior drainage of water-bearing layers.
Methods of underground structure construction using pre-injection of rock masses.
Methods of underground structure construction using prior rock freezing.
EU standards for specialized underground construction.
Practical work in tunnel construction.
Basic static schemes of tunnel structures made of monolithic concrete: arch elastically embedded in the rock mass; arch elastically embedded in massive walls or on a vertical wall; elevated arch in an elastic medium; closed tunnel structure system.
Stress conditions in various environments and basic guidelines for underground construction, including engineering geological models, geotechnical models, computational models, and other relevant models.
Tunnel reconstruction and maintenance: Collapses in tunnels and repair work; tunnel breakages and their causes; tunnel repair in case of wall deformations; impact of underground structures on the surface and surrounding objects.

16. Learning methods:

For effective course delivery and the achievement of the expected learning objectives and student competencies, various teaching methods are used in the course:

- **Lectures,**
- **Seminar work, and**
- **Consultations.**

Students are required to attend lectures throughout the entire semester.

17. Assessment methods:

Student assessment methods include the following criteria:

1. **Attendance and participation in lectures and exercises**
2. **Test**
3. **Seminar work**
4. **Final exam**

18. Assessment components:

Student assessment methods include the following criteria:

- **Attendance – 5 points**
- **Class participation – 5 points**
- **Test – 20 points**

- **Seminar work – 20 points**
- **Pre-exam obligations – 50 points**
- **Final exam – 50 points**
- **Total – 100 points**

The final student performance, after all the planned knowledge assessment activities, is evaluated using a grading system comparable to the ECTS grading scale, as follows:
10 (A) – Outstanding performance with no or minimal errors (95–100 points)
9 (B) – Above average, with some errors (85–94 points)
8 (C) – Average, with noticeable errors (75–84 points)
7 (D) – Generally good but with significant shortcomings (65–74 points)
6 (E) – Meets the minimum criteria (54–64 points)
5 (F, FX) – Does not meet the minimum criteria (less than 54 points)

19. Mandatory reading list:

1. Z. Ibrišimović,N.Vidanović, K. Gutić, Izgradnja podzemnih rudarskih prostorija, rušenje radne sredine bez upotrebe eksploziva, Tuzla, 2008.godina
2. K. Gutić, A. Hodžić, Izgradnja tunela, Tuzla 2015.godine
4. P. Jovanović: Projektovanje i proračun podgrade horizontalnih podzemnih prostorija knjiga 2. Beograd,1994.god.
5. Petar Jovanović: Izgradnja podzemnih prostorija velikog profila , Beograd,1978.godine

20. Additional reading list:

21. Web sources:

22. Applicable from the academic year:

2025726.

23. Adopted in the Faculty/Academy session: