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WP4 – Development of teaching and training resources with the use of remote teaching methodology

IO.10 Development of resources for road safety audit

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1 INTRODUCTION

The COVID-19 pandemic has forced a departure from the current functioning of society in many aspects of the economy, travel, work and education, not excluding higher education. The necessity of remote education is one of the ways to maintain social distancing and protect our health and life.

A preliminary assessment of the situation at universities in European countries indicates that academic staff were not sufficiently prepared to conduct attractive and practical classes in a remote format.

The necessity to conduct classes remotely involves developing a dedicated didactic and training process project, considering the specific requirements of interdisciplinary engineering knowledge. Transferring this knowledge in remote education, due to its large scope, requires various didactic tools (lectures, fieldwork, design, practicals, laboratories, student assignments and assessment of the progress and knowledge of students and trainees).

The measurable expected final results are:

- Development of a remote learning methodology for Road Infrastructure Management (RIM) as a model solution to provide a basis for extending the methodology to include further aspects of civil engineering and transport.
- Developing an e-handbook for academic staff supporting the remote learning process.
- Development of model digital teaching and training materials dedicated to technical colleges and training for road management staff on RIM:
 - Road safety audit,
 - Roadside safety management,
 - Safety management of vulnerable road users,
 - Road pavement management.
- Developing an e-learning platform with access to project products.
- Appointment of a panel of experts in road infrastructure management.

The InfRO@D project targets the following groups:

- 1) Students, researchers, and academic teachers at universities.
- 2) Road authority staff at national, regional and local levels.
- 3) Experts, specialists, and practitioners involved in RIM activities, including staff who conduct training in various RIM courses.
- 4) All users of road infrastructure, as an indirect target group, for whom the risk of road accidents will ultimately be reduced by increasing the effectiveness and efficiency of RIM activities.

The project is also supported by a group of associates who will cooperate with project partners to consult and evaluate the results. They will implement final products and promote the dissemination and accessibility of the project results.

ABOUT OUTPUT IO.10

- **Objective:** Development of resources for road safety auditing.
- **Work package:** The task falls under WP4 – Development of teaching and training resources with the use of remote teaching methodology.
- **Target Groups:**
- Research and teaching staff from institutions involved in the project and other European institutions.
- Students of civil and transportation engineering.
- Road authority staff at a national, local and regional level.

2 CONTENT AND RESOURCES

2.1 Division of Road Safety Audit Lessons

The planned outcome of this IO is the development of modern and innovative digital teaching and training content for remote education in road safety audits following the breakdown below. IO10 consists of 150 hours, The work included a detailed breakdown of the issue into three chapters (Table 1):

- 1) Road Safety Audit – Introduction - 30 h.
- 2) Road Safety Audit - Rural roads - 60 h.
- 3) Road Safety Audit - Urban roads - 60 h.

Table 1 The planned division of road safety audit

Types of classes	Chapter		
	1	2	3
Lecture	16	24	26
Field activities	10	20	16
Practicals (remote)	4	16	18
Number of lessons	30	60	60

In line with the project's objectives, the work included preparing examples of didactic and training materials. Materials for Chapter 2 Road Safety Audit - Rural roads, and it is broken down into six sub-chapters:

- Rural highways
- Motorways
- Interchanges
- Intersections
- Infrastructure for VRUS
- Discussion of lectures

Following the assumptions made during the development of the methods of remote education (task IO.4 – IO.9), it is assumed learning by doing. Emphasis on practical activities, student collaboration, and knowledge exchange during group work or webinars. The planned division of road safety audits is shown in Table 2. The potential extension of the programme will be possible when syllabuses have been adapted.

Table 2 The planned division of road safety audit lessons

Types of classes	Sub-chapter					
	Rural highways	Motorways	Interchanges	Intersections	Infrastructure for VRUS	Discussion of lectures
Lecture	4	2	4	4	4	2
Field activities	4	2	4	4	2	2
Practicals (remote)	4	4	4	4	4	2
In total	12	8	12	12	10	6

In line with the project's objectives, the work included preparing examples of didactic and training materials.

2.2 Type of didactic and training resources

Road safety audits include competencies in the design and use of the road network. This knowledge is insufficiently imparted to students and infrastructure management personnel in curricula and various training courses. The materials developed will make it possible to fill this gap in the learning process. The work includes theoretical and practical activities:

- lectures (purpose of road safety audits, typical road design deficiencies, etc.),
- fieldwork (safety analysis of national, regional or local road sections, interactions, interchanges, infrastructure elements for VUR, identification of potential safety issues),
- practical classes (preparation of road safety audit reports using video data or maps with road infrastructure elements).

As part of the project implementation, the following type of data was prepared:

- PowerPoint-teacher – presentation, which should be presented by the teacher (Figure 1),
- PowerPoint-audio – presentation with teacher soundtrack in English (Figure 2),
- PowerPoint – without voice – presentation for students/road specialists to self-teaching (Figure 3).
- PowerPoint with YouTube resources.
- PowerPoint for field activities (Figure 4).
- Interview with specialists (Figure 5)
- Video data with road infrastructure elements, and road sections (Figure 6).
- Project maps (Figure 7).
- Road safety inspection report (Figure 8).
- Excel files with accident data (Figure 9).
- Interactive quiz – different quizzes (open questions, multichoice, yes/no).
- Webinar, Q&A, PowerPoint - student presentation (final discussion with the teacher, all groups together).

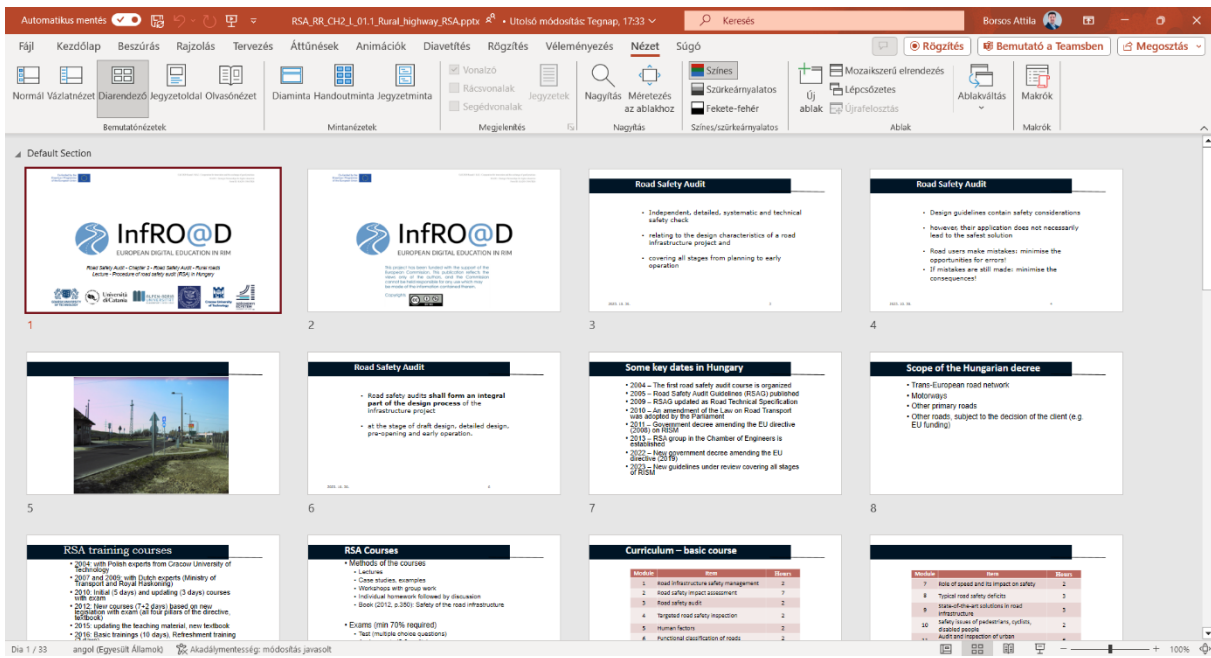


Figure 1. Example of didactic materials - presentation

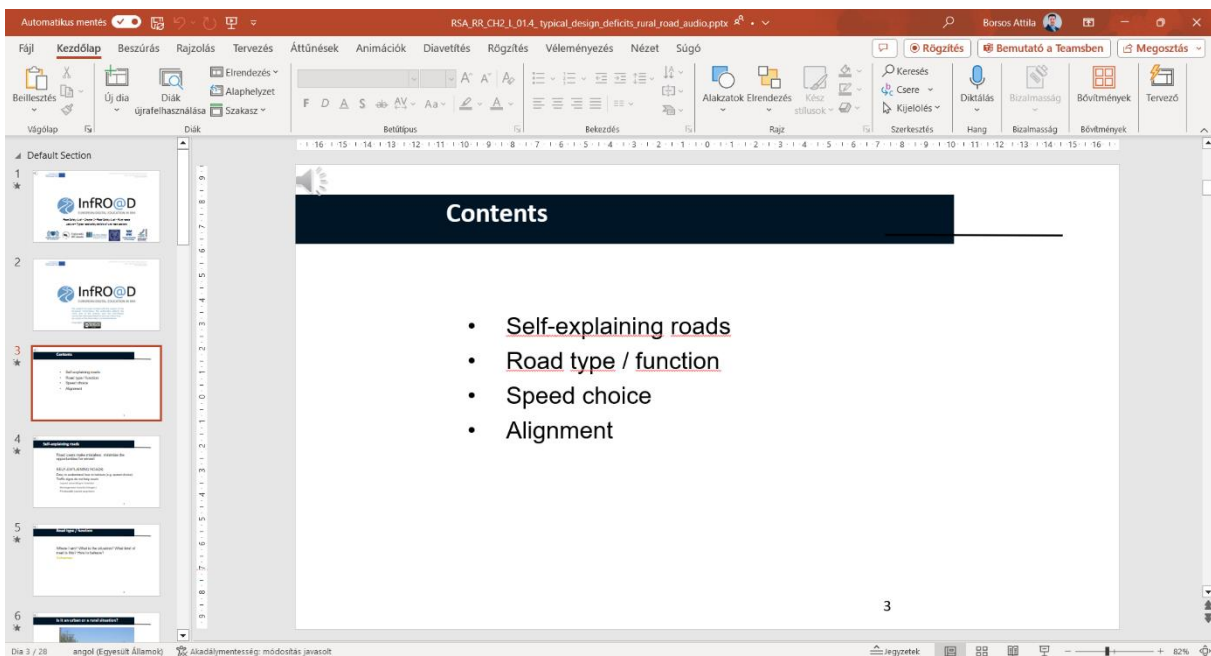


Figure 2. Example of didactic materials – presentation with recorded voice

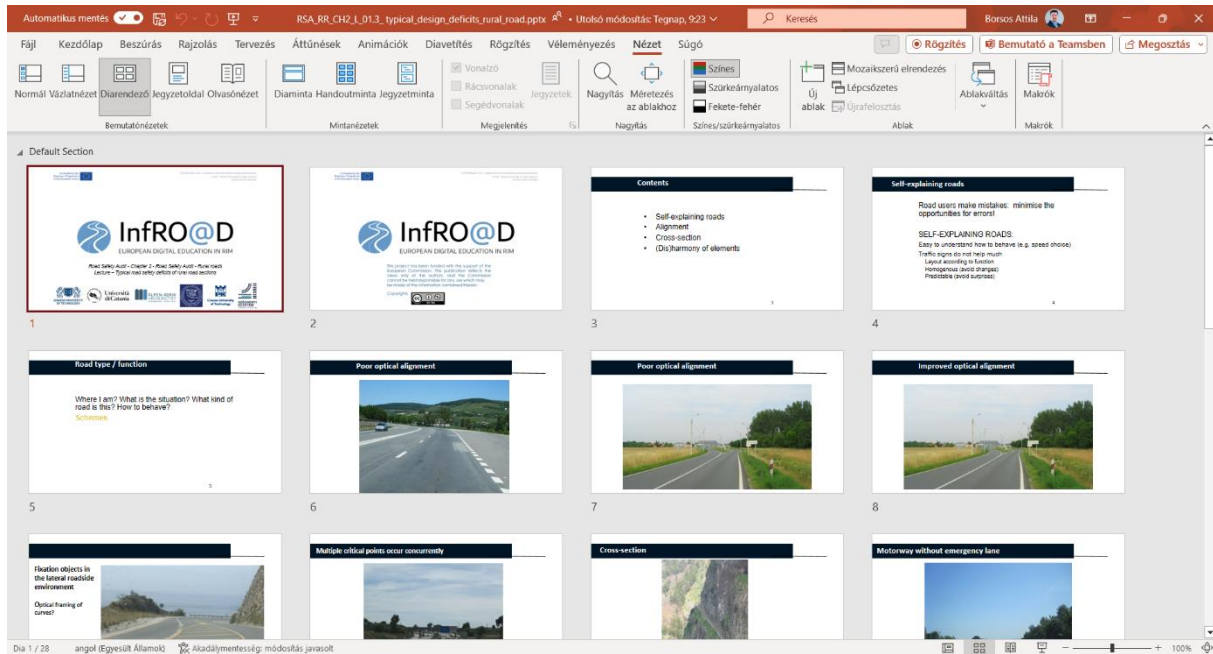


Figure 3. Example of didactic materials – PowerPoint presentation without voice

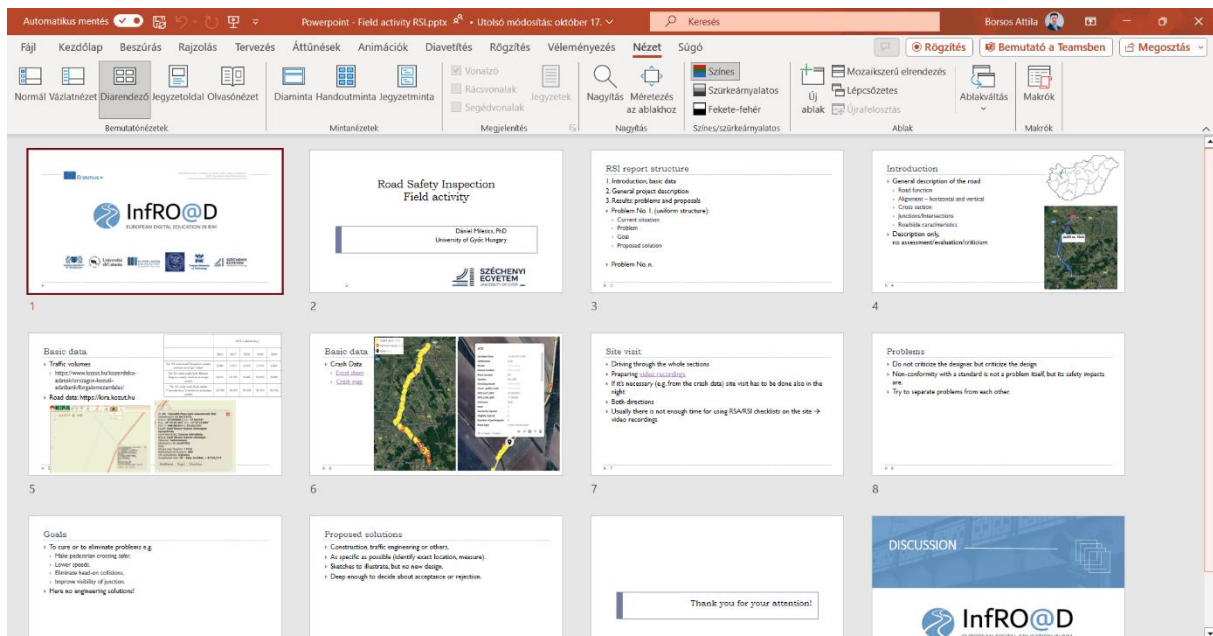


Figure 4. PowerPoint for field activities



Figure 5. Example of didactic materials – interview with the specialist

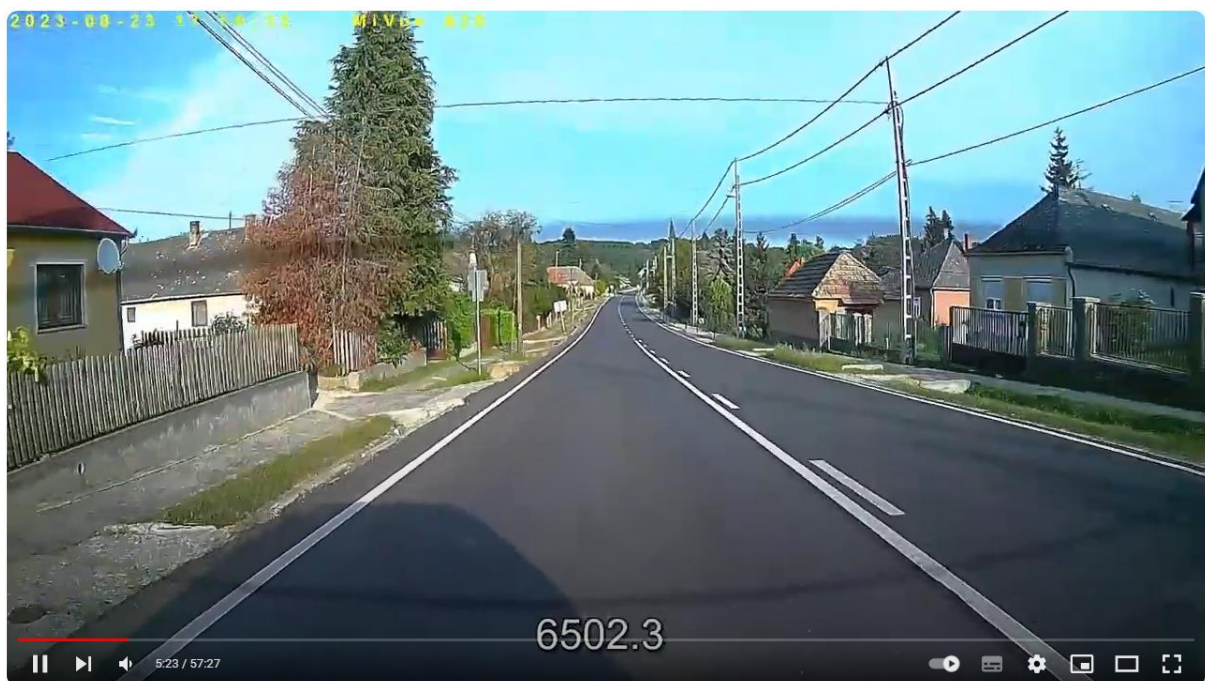


Figure 6. Example of didactic materials – YouTube video

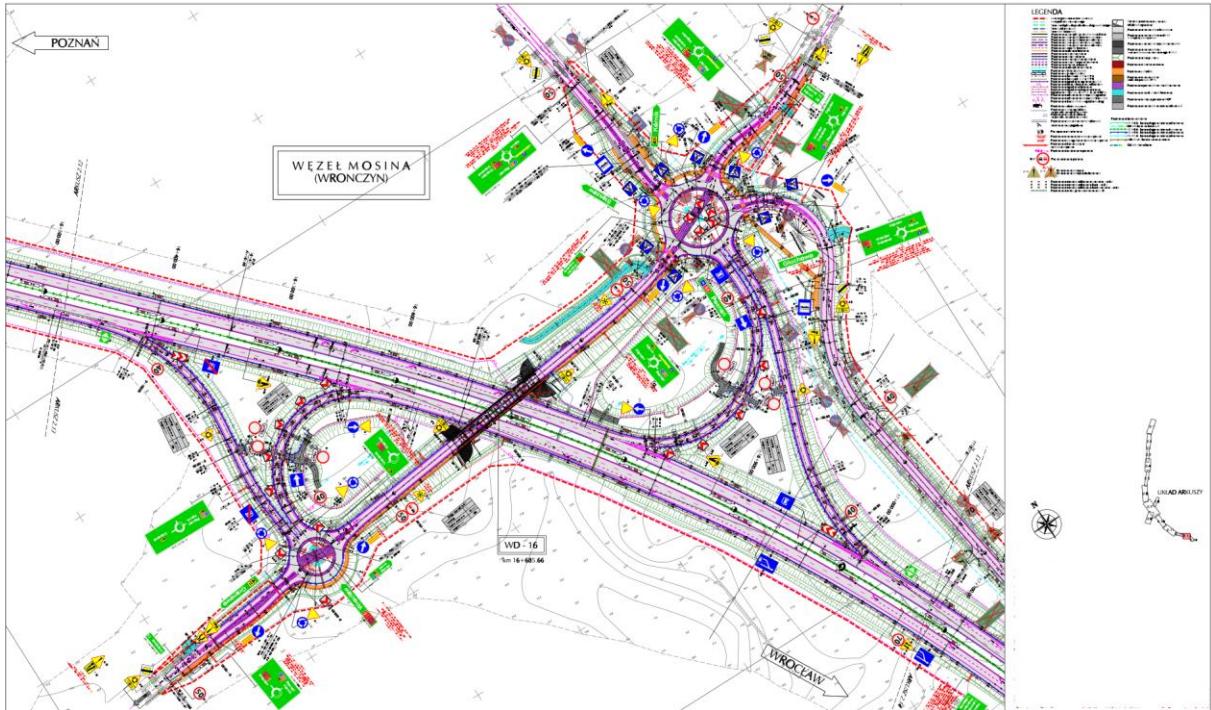


Figure 7. Example of didactic materials – Interchange maps

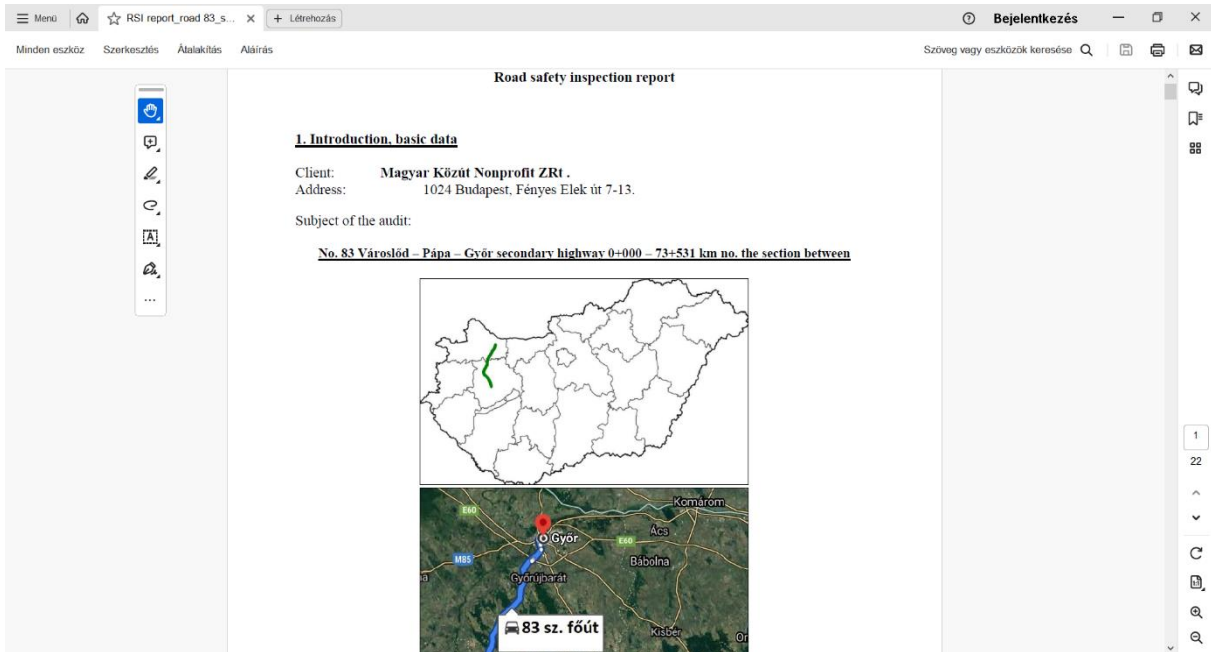


Figure 8. Example of didactic materials –Road safety inspection report

House number	Road number	Section	Crossing street	Cross. public road	GPS_LAT_D	GPS_LOW_D	Outcome	Died	Seriously injured	Slightly injured	Number of participants	Road type	Road shape
83 67+177					47.6272472222	17.5913861111	fatal	1	0	0	0	3 motor vehicle road	straight route
83 52+350			Gyömrői	8306	47.5159444444	17.5167472222	serious injury	0	1	0	0	1 motor vehicle road	crossroads
83 63+486					47.5963166667	17.5879638889	serious injury	0	1	0	0	1 motor vehicle road	horizontal curve
83 63+380					47.5955555556	17.5871361111	slight injury	0	0	1	2	2 motor vehicle road	horizontal curve
83 48+900				94000	47.4889972222	17.4955277778	serious injury	0	1	0	0	2 motor vehicle road	straight route
83 63+387					47.5956111111	17.5871666667	serious injury	0	1	0	0	2 motor vehicle road	straight route
83 50+977					47.5049222222	17.5097916667	serious injury	0	1	0	0	3 motor vehicle road	straight route
83 68+720				8311	47.6382777778	17.6033583333	serious injury	0	1	0	0	1 motor vehicle road	crossroads
83 61+600				83132	47.5649166667	17.5794972222	slight injury	0	0	2	2	2 motor vehicle road	crossroads
83 63+438					47.5959416667	17.5875805556	slight injury	0	0	4	4	2 motor vehicle road	horizontal curve
83 7+515					47.2106388889	17.6223305556	slight injury	0	0	1	0	2 motor vehicle road	horizontal curve
83 21+202					47.2900555556	17.5131388889	serious injury	0	1	0	0	2 motor vehicle road	straight route
83 50+120					47.4983361111	17.5039055556	slight injury	0	0	2	2	1 motor vehicle road	horizontal curve
83 45+271	4				47.4584722222	17.4853583333	slight injury	0	0	1	0	1 motor vehicle road	straight route
83 38+705		Rákóczi		94000	47.4020555556	17.4676083333	slight injury	0	0	1	0	1 motor vehicle road	crossroads
83 29+225					47.3305555556	17.6313027778	slight injury	0	0	1	0	1 motor vehicle road	straight route
83 5+360					47.1973611111	17.6393305556	slight injury	0	0	1	0	1 motor vehicle road	straight route
83 48+720					47.4877472222	17.4947750000	serious injury	0	1	0	0	2 motor vehicle road	horizontal curve
83 52+194					47.5146388889	17.5158583333	slight injury	0	0	1	0	1 motor vehicle road	horizontal curve
83 52+232					47.5150944444	17.5161833333	serious injury	0	1	0	0	2 motor vehicle road	straight route
83 20+795	134				47.2870833333	17.5163888889	serious injury	0	1	0	0	1 motor vehicle road	straight route
83 39+400					47.4054861111	17.4709805556	slight injury	0	0	1	0	1 motor vehicle road	horizontal curve
83 25+775					47.3104694444	17.4657722222	fatal	1	0	0	0	2 motor vehicle road	straight route
83 43+510					47.4427777778	17.4819416667	slight injury	0	0	1	0	1 motor vehicle road	straight route
83 45+400					47.4595833333	17.4857750000	serious injury	0	1	0	0	2 motor vehicle road	straight route
83 68+760					47.6386283333	17.6036361111	slight injury	0	0	1	0	3 motor vehicle road	straight route
83 63+463					47.5961388889	17.5877472222	slight injury	0	0	1	0	1 motor vehicle road	horizontal curve
83 42+311					47.4323583333	17.4784694444	serious injury	0	1	1	1	1 motor vehicle road	horizontal curve
83 73+161				96549	47.6659694444	17.6446916667	slight injury	0	0	1	0	2 motor vehicle road	straight route
83 61+337					47.5783055556	17.5803305556	slight injury	0	0	2	0	2 motor vehicle road	straight route
83 62+420					47.5879611111	17.5824083333	slight injury	0	0	2	0	3 motor vehicle road	straight route
83 66+469				8418	47.6212777778	17.5906638889	slight injury	0	0	3	0	2 motor vehicle road	crossroads
83 56+650					47.4983055556	17.5604416667	serious injury	0	3	0	0	1 motor vehicle road	straight route
83 59+150					47.5610555556	17.5724416667	serious injury	0	2	0	0	2 motor vehicle road	straight route

Figure 9. Example of didactic materials – Excel file with accident data

3 DIDACTIC AND TRAINING MATERIALS FOR ROAD SAFETY AUDIT

Per the adopted assumptions, the material development is available on a publicly accessible e-learning platform.

3.1 Gdansk University of Technology e-learning platform

GUT e-learning is a platform developed by the Gdansk University of Technology to provide remote education, conduct tests to verify knowledge, and access virtual laboratories. E-learning is integral to the university's education and virtualisation, utilising ICT (Information and Communication Technologies). The courses are available in electronic form via web browsers and mobile applications, created using Moodle - a popular software for eLearning.

At Gdansk University of Technology, it covers a fully remote form (e-learning) and a mixed form, in which traditional classes and distance learning complement each other (blended learning).

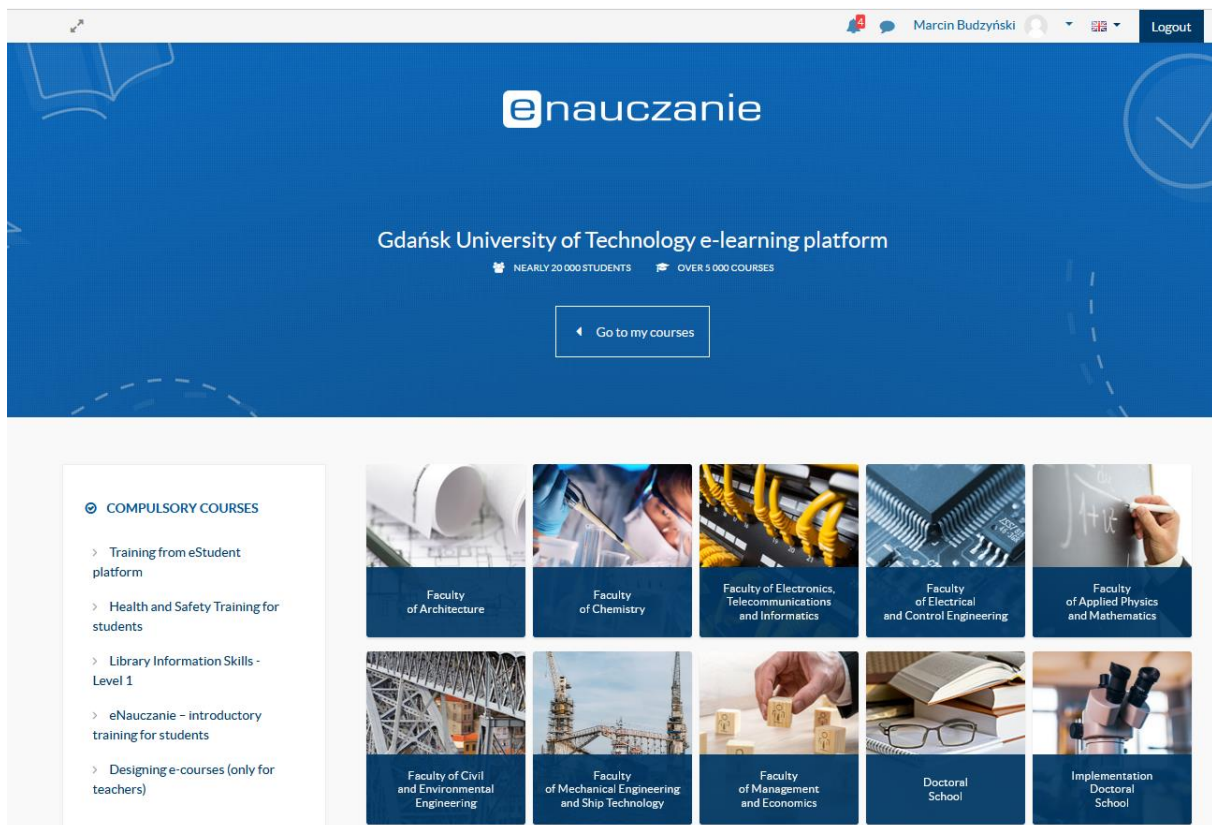


Figure 10 Start menu of e-learning

3.2 Introduction and purpose of the e-learning platform

The Moodle-based e-learning platform, developed under the project InfRo@D, is a comprehensive digital tool to enhance road safety education.

The e-learning platform is available on the Internet, which enables its use by research centres and road authorities throughout Europe. The e-learning platform contains road safety courses, all available to be applied to existing university course curricula. Through the e-learning platform, the project is committed to creating a one-stop solution for online learning on Road Safety by offering training on all aspects of the subject that cater to all levels.

The platform's content is a synthesis of extensive research on the impact of infrastructure on road safety, combined with established road safety methodologies. Users of the platform can:

- **Observe Road Safety Audit (RSA) - Erasmus+ European Digital Education in Road Infrastructure Management INFRO@d.**
- Observe Roadside safety management - Erasmus+ European Digital Education in Road Infrastructure Management INFRO@d.
- Observe Safety management of vulnerable road users - Erasmus+ European Digital Education in Road Infrastructure Management INFRO@d.
- Observe Road pavement management - Erasmus+ European Digital Education in Road Infrastructure Management INFRO@d

The platform with InfRo@d courses is accessible at: <https://enauczanie.pg.edu.pl/moodle/my/>

The didactic and training materials will be available after logging into the e-learning platform. Detailed information describing the process of registration is available at <https://support.pg.edu.pl/archive/display/HPPG/Access+to+eLearning+platform>.

A Chrome browser on a PC or Laptop is recommended for optimal performance. A user registration process is mandatory for full access. Post-registration, certain features may require administrative approval.

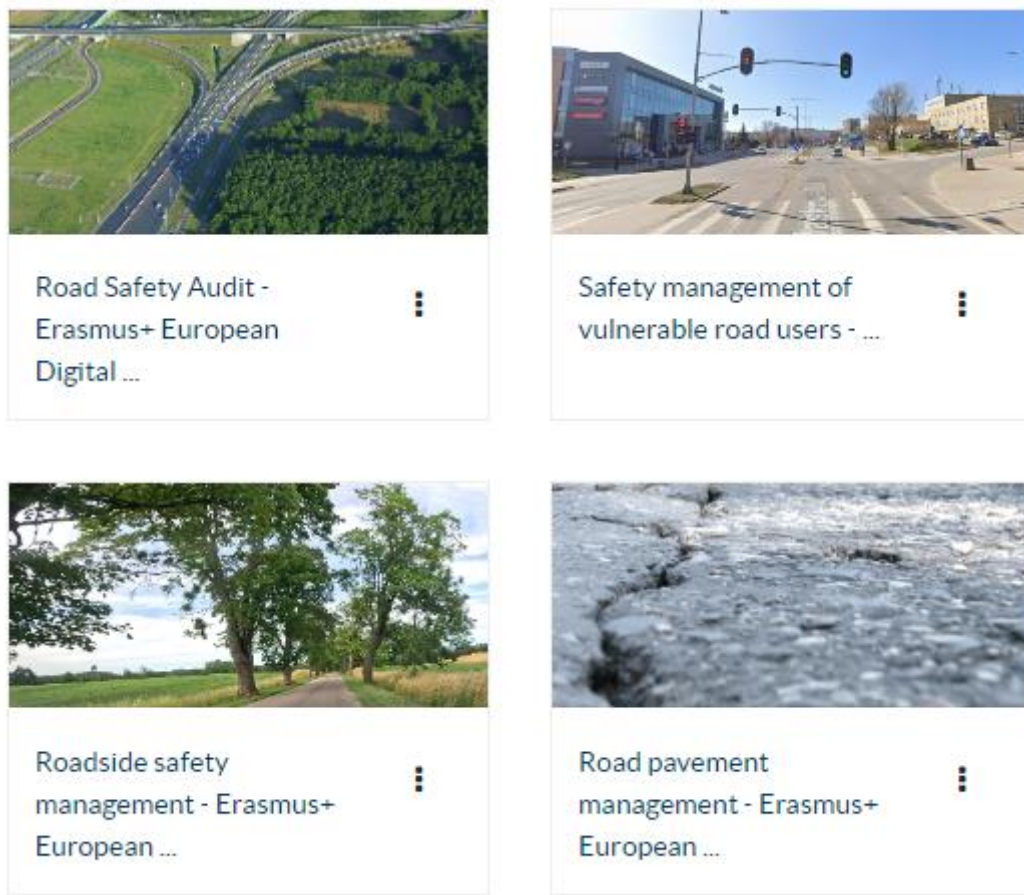


Figure 11 Overview of InfRO@d didactic materials and certification programme available on <https://enauczanie.pg.edu.pl/moodle/my/>

3.3 YouTube InfRo@d canal

A dedicated channel on the YouTube platform will complement the course on the platform. The platform with InfRo@d canal is accessible at [youtube.com/@Infrod-EuropeanDigitalEducation](https://www.youtube.com/@Infrod-EuropeanDigitalEducation)

The platform's content is video, which is used in didactic materials divided into playlists:

- INFRO@d Road Safety Audit - Rural highways,
- INFRO@d Road Safety Audit - Motorways, Expressways
- INFRO@d Road Safety Audit - Rural roads
- INFRO@d Road Safety Audit - Rural Interchanges
- INFRO@d Road Safety Audit - Urban Interchanges (additional materials)
- INFRO@d Roadside safety management - National Roads
- INFRO@d Roadside safety management - Regional Roads
- INFRO@d Roadside safety management - Local Roads
- INFRO@d Interview.

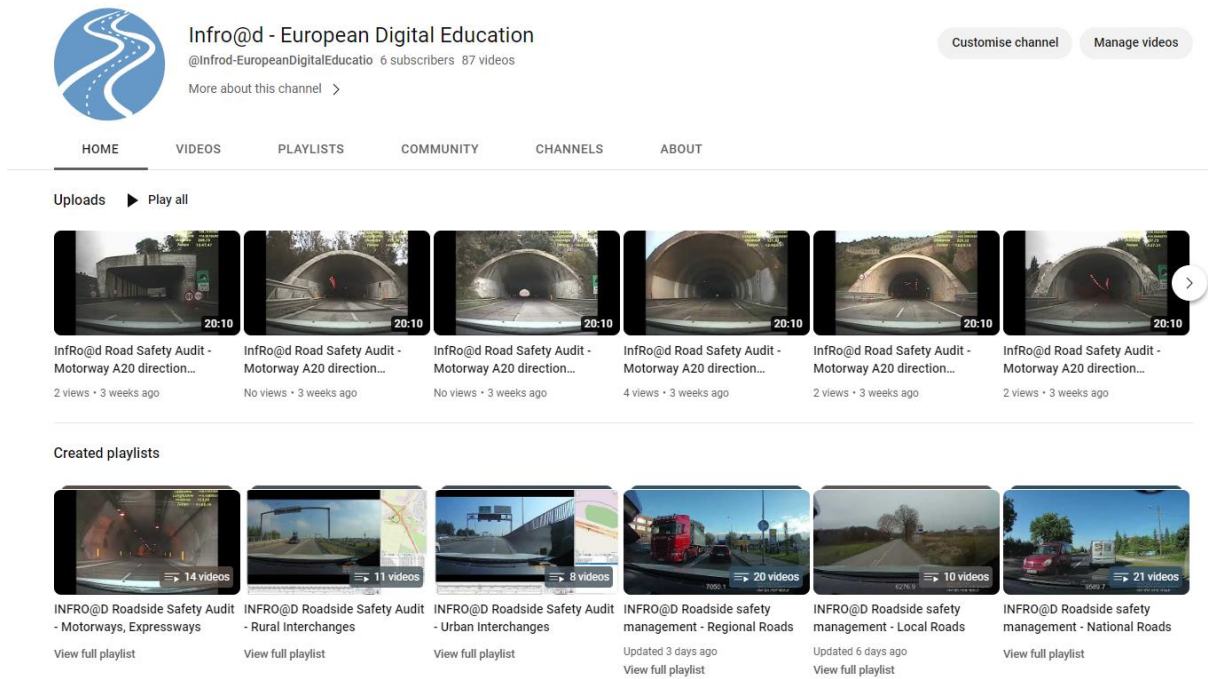


Figure 12 Overview of InfRo@d video didactic materials available on youtube.com/@Infrod-EuropeanDigitalEducatio

3.4 Detailed division of didactic and training materials

Table 2 provides a detailed description of the planned didactic and training materials under the roadside environment safety management issues.

Table 3 The planned detailed division of road safety audit lessons for rural roads

Exampled materials were prepared for chapter 2 (white colour of the table).

No.	Types of classes	Hour	Short Name	Detailed description	Resource Type
Chapter 1 - Road Safety Audit - Introduction					
1	Lecture	2	RISM directive	Position of RSA in Road Safety Management	PowerPoint-teacher Interview with a safety expert from road administration about how the role of RSA is perceived Interactive quiz PowerPoint-teacher (Photo gallery with comments on a few examples of road safety deficits and consequences)
2	Lecture	4	RSA procedures	Players and their role (client, designer, auditor), process of RSA, RSA stages (draft, detailed, pre-opening, early operation), audit report, checklist	PowerPoint-teacher Interactive quiz PowerPoint-teacher Podcast with a safety expert (RSA auditor) about the role of an auditor
3	Practicals (remote)	4	RSA procedures	Students will need to construct the process of RSA and discuss their results.	Infographics in break-out rooms - RSA process and participants Group discussion PowerPoint-teacher Student PDF report, presentation
4	Lecture	2	Road network classification	Context, users, infrastructure	PowerPoint-teacher Videos or photo galleries of different types of roads Interactive quiz Interactive map

No.	Types of classes	Hour	Short Name	Detailed description	Resource Type
5	Practicals (remote)	4	Road network classification	Students need to study the guidelines of their own country and create a road network map of a selected county (region) indicating the various network categories, ensuring that all categories are represented.	Map in teamwork - network classification Peer-to-peer presentation Group discussion Student PDF report, presentation
6	Lecture	2	Safety analysis tools	Crashes analysis, surrogate measures of safety	PowerPoint-teacher Interactive quiz PowerPoint-teacher Interactive quiz
7	Field activities	4	Safety analysis tools (crashes, surrogate measures of safety)	Speed measurements, conflict analysis	PowerPoint-teacher Video recording, Picture gallery, PowerPoint with examples Group working (by themselves) Student PDF report, presentation
8	Lecture	2	Discussion of lectures RSA procedures, safety analysis	The certified auditor will manage the webinar, fixing the time slots and online tools (like Teams and Zoom).	Webinar, Q&A, PowerPoint - student presentation (Final discussion with teachers all groups together)
9	Lecture	2	Structure of the RSA report	Structure of the Raod safety report	PowerPoint-teacher Interview/Podcast with a safety expert PowerPoint-teacher Interactive quiz PowerPoint-teacher (Drawing/photo, gallery with comments, description of RS problems)

No.	Types of classes	Hour	Short Name	Detailed description	Resource Type
10	Practicals (remote)	2	Structure of the RSA report	Students need to select either RSA II. or RSA III. case study and write a full report	RSA Final report (teamwork) PowerPoint - student presentation
11	Lecture	2	Communicating the report to the client		PowerPoint-teacher RSA Report
Chapter 2 - Road Safety Audit - Rural roads					
1	Lecture	4	Rural highways	Typical design mistakes, safety issues, treatments, design standards	PowerPoint-teacher Interactive quiz Interview PowerPoint-teacher PowerPoint-teacher Interactive quiz
2	Lecture	2	Motorways		PowerPoint-teacher PowerPoint-teacher Interview Interactive quiz PowerPoint-audio

No.	Types of classes	Hour	Short Name	Detailed description	Resource Type
3	Lecture	4	Interchange		Interactive quiz PowerPoint-teacher PowerPoint-teacher PowerPoint-audio PowerPoint-teacher Interview
4	Lecture	4	Intersections		PowerPoint-teacher PowerPoint-teacher PowerPoint-teacher PowerPoint-teacher Interactive quiz
5	Lecture	2	Infrastructure for VRUs		Interactive quiz PowerPoint-teacher PowerPoint-teacher PowerPoint-teacher PowerPoint-YouTube resources
6	Lecture	4	Discussion of lectures RSA-rural roads	The certified auditor will manage the webinar, fixing the time slots and online tools (like Teams and Zoom).	Webinar, Q&A, PowerPoint - student presentation (Final discussion with the teacher, all groups together)
7	Field activities	2	Rural highways	Students need to analyse a location in operation (either photos/videos are provided, OR	PowerPoint-teacher (project details) Video recording Group working (by themselves) Student PDF report, presentation

No.	Types of classes	Hour	Short Name	Detailed description	Resource Type
8	Field activities	4	Motorways	students find a location on their own)	PowerPoint-teacher (project details) Video recording Group working (by themselves) Student PDF report, presentation
9	Field activities	4	Interchanges		PowerPoint-teacher (project details) Video recording Group working (by themselves) Student PDF report, presentation
10	Field activities	4	Intersections		PowerPoint-teacher (project details) Picture gallery Group working (by themselves) Student PDF report, presentation
11	Field activities	2	Infrastructure for VRUs		PowerPoint-teacher (project details) Video recording Group working (by themselves) Student PDF report, presentation
12	Lecture	2	Discussion of field activities	The certified auditor will manage the webinar, fixing the time slots and online tools (like Teams and Zoom).	Webinar, Q&A, PowerPoint - student presentation (Final discussion with the teacher, all groups together)
13	Practicals (remote)	4	Rural highways	Students must discuss case studies from actual RSAs in small groups with a certified auditor. The same plan will be available for students before webinars.	PowerPoint-teacher (project details) Student PDF report, presentation
14	Practicals (remote)	4	Motorways		PowerPoint-teacher (project details) Student PDF report, presentation
15	Practicals (remote)	4	Interchanges		PowerPoint-teacher (project details) Student PDF report, presentation

No.	Types of classes	Hour	Short Name	Detailed description	Resource Type
16	Practicals (remote)	4	Intersections	Each group should be a maximum of 5 persons.	PowerPoint-teacher (project details) Student PDF report, presentation
17	Practicals (remote)	4	Infrastructure for VRUs	The certified auditors will manage the webinar, fixing the time slots and online tools (like Teams and Zoom).	PowerPoint-teacher (project details) Student PDF report, presentation
18	Lecture	2	Discussion of practical	The certified auditor will manage the webinar, fixing the time slots and online tools (like Teams and Zoom). One group for each module will present the case study.	Webinar, Q&A, PowerPoint - student presentation (Final discussion with the teacher, all groups together)
Chapter 3 - Road Safety Audit - Urban roads					
1	Lecture	4	Urban roads	Typical design mistakes, safety issues, treatments, design standards	Interactive quiz PowerPoint-teacher Interview/podcast with a safety expert and/or YouTube videos PowerPoint-teacher PowerPoint (Drawing/photo/video gallery without comments) PowerPoint-audio (Drawing/photo/video gallery with comments) Interactive quiz

No.	Types of classes	Hour	Short Name	Detailed description	Resource Type
2	Lecture	4	Intersections non-signalized		Interactive quiz PowerPoint-teacher Interview/podcast with a safety expert and/or YouTube videos PowerPoint-teacher PowerPoint (Drawing/photo/video gallery without comments) PowerPoint-audio (Drawing/photo/video gallery with comments) Interactive quiz
3	Lecture	4	Intersections signalised		Interactive quiz PowerPoint-teacher Interview/podcast with a safety expert and/or YouTube videos PowerPoint-teacher PowerPoint (Drawing/photo/video gallery without comments) PowerPoint-audio (Drawing/photo/video gallery with comments) Interactive quiz
4	Lecture	4	Infrastructure for VRUs		Interactive quiz PowerPoint-teacher Interview/podcast with a safety expert and/or YouTube videos PowerPoint-teacher PowerPoint (Drawing/photo/video gallery without comments) PowerPoint-audio (Drawing/photo/video gallery with comments) Interactive quiz

No.	Types of classes	Hour	Short Name	Detailed description	Resource Type
5	Lecture	2	Smart solutions (new technologies)		Interactive quiz PowerPoint-teacher Interview with a technological expert PowerPoint-teacher/ PowerPoint-audio (Drawing/photo/video gallery without comments)
6	Lecture	2	Discussion of lectures RSA-urban roads	The certified auditor will manage the webinar, fixing the time slots and online tools (like Teams and Zoom).	Webinar, Q&A, PowerPoint - student presentation (Final discussion with teachers all groups together)
7	Field activities	6	Urban roads	Students need to analyse a location in operation (either photos/videos are provided, OR students find a location on their own)	PowerPoint-teacher (project details) Pictures gallery/video collect data about road and VRU, traffic (volume. speed) PowerPoint with examples Student PDF report, presentation
8	Field activities	4	Intersections non-signalized		PowerPoint-teacher (project details) Pictures gallery/video collect data about road and VRU, traffic (volume) PowerPoint with examples Student PDF report, presentation
9	Field activities	4	Intersections signalised		PowerPoint-teacher (project details) Pictures gallery/video Collect data about road and VRU, traffic (volume) PowerPoint with examples Student PDF report, presentation

No.	Types of classes	Hour	Short Name	Detailed description	Resource Type
10	Field activities	4	Infrastructure for VRUs		PowerPoint-teacher (project details) Pictures gallery/video Collect data about road and VRU, traffic (volume) PowerPoint with examples Student PDF report, presentation
11	Lecture	2	Discussion of field activities	The certified auditor will manage the webinar, fixing the time slots and online tools (like Teams and Zoom).	Webinar, Q&A, PowerPoint - student presentation (Final discussion with teachers all groups together)
12	Practicals (remote)	4	Urban roads	<p>Students must discuss case studies from actual RSAs in small groups with a certified auditor. The same plan will be available for students before webinars. Each group should have a maximum of five persons. The certified auditors will manage the webinar, fixing the time slots and online tools (like Teams and Zoom).</p>	PowerPoint-teacher (project details) Pictures gallery/video Collect data about road and VRU, traffic (volume. speed) PowerPoint presentation with examples Student PDF report, presentation
13	Practicals (remote)	4	Intersections non-signalized		PowerPoint-teacher (project details) Pictures gallery/video Collect data about road and VRU, traffic (volume) PowerPoint presentation with examples Student PDF report, presentation
14	Practicals (remote)	4	Intersections signalised		PowerPoint-teacher (project details) Pictures gallery/video Collect data about road and VRU, traffic (volume) PowerPoint presentation with examples Student PDF report, presentation

No.	Types of classes	Hour	Short Name	Detailed description	Resource Type
15	Practicals (remote)	4	Infrastructure for VRUs		PowerPoint-teacher (project details) Pictures gallery/video Collect data about road and VRU, traffic (volume) PowerPoint presentation with examples Student PDF report, presentation
16	Lecture	4	Discussion of practical	The certified auditor will manage the webinar, fixing the time slots and online tools (like Teams and Zoom). One group for each module will present the case study.	Webinar, Q&A, PowerPoint - student presentation (Final discussion with teachers all groups together)