# Public Works 2 - BMEEOVKAI41

## I. Subject Specification

1. Basic Data

1.1 Title

Public works 2

1.2 Code

BMEEOVKAI41

1.3 Type

Module with associated contact hours

1.4 Contact hours

| Type | Hours/week / (days) |
|---|---|
| Lecture | 2 |
| Seminar | 2 |

1.5 Evaluation

Exam

1.6 Credits

5

1.7 Coordinator

| | |
|---|---|
| name | Dr. Roland Fülöp |
| academic rank | Associate professor |
| email | fulop.roland@emk.bme.hu |

1.8 Department

Department of Sanitary and Environmental Engineering

1.9 Website

https://epito.bme.hu/BMEEOVKAI41
https://fiek2.mywire.org/course/view.php?id=3583

1.10 Language of instruction

english

1.11 Curriculum requirements

Compulsory in the Specialization in Infrastructure Engineering (BSc) programme

1.12 Prerequisites

Strong prerequisites:

- Public Works I. (BMEEOVKAT42)

1.13 Effective date

1 September 2022

**Public Works 2 - BMEEOVKAI41**

2. Objectives and learning outcomes

2.1 Objectives

The aim of the course is to familiarise students with the specific design features of municipal water and sewer utilities and to acquire design skills. The course is based on the design principles introduced at theoretical and practical level in Public Works I. Major topics include: strategic planning methodology, medium-term planning, technical, economic and optimum calculations, small-scale and regional systems, urban stormwater management and drainage, relationship between the drainage system and the receiving water body, introduction of design and operation of typical structures, maintenance and reconstruction of utilities. The knowledge acquired here will serve as a basis for the Urban Water Infrastructure Design Project.

2.2 Learning outcomes

Upon successful completion of this subject, the student:

A. Knowledge

1. Knowledge of the methodology for determining long-term water needs.
2. Understand the concepts related to aquifer protection. Knowledge of the impacts that threaten aquifers and ways to protect them.
3. Knowledge of hydraulic sizing methods for regional water supply systems. He/she is also familiar with the concepts and methods of protection against pressure surges.
4. Knowledge of water utility ownership, financing of investments and determination of operating costs.
5. Familiar with the calculation principle of looped networks.
6. Understand the principles of designing wastewater networks. Familiar with the hydraulic sizing of sewage treatment plants.
7. Knowledge of the design and operation of pressurised and vacuum systems.
8. Familiar with the main structures of the stormwater network and their design considerations.
9. Understanding the principles of sizing stormwater network.
10. Familiar with the causes of reconstruction and knowing the trenchless pipe reconstruction techniques.
11. Understands the static calculation of pipes and their corrosion vulnerability.

B. Skills

1. Ability to determine water demands over current and distant time horizons.
2. Ability to identify strategic supply options based on knowledge of water demands and water resources.
3. Ability to apply hydraulic scaling principles to simple circular and regional water supply networks.
4. Recognise the adverse consequences of regional system pressure imbalances and apply methods to remedy them on the network.
5. Ability to select the optimum solution during sewer system design.
6. Ability to design pump stations and identify hydraulic problems in the operation of them and to propose solutions.
7. Ability to design an urban storm water drainage network.
8. Identify the causes of corrosion.
9. Ability to find the optimal technology for pipeline construction or reconstruction.

C. Attitudes

1. Collaborate with the teacher and classmates to extend knowledge.
2. Continually builds his or her knowledge by seeking answers to questions from web resources, even beyond the mandatory course materials.
3. In his/her oral communication, he/she strives to be clear and concise, and in his/her written communication, he/she strives to produce documentation that is polished, neat and of the standard expected by the engineering profession.

D. Autonomy and Responsibility

1. Take systems approach in thinking.

2.3 Methods

Presentations with theoretical knowledge; communication in writing and orally. Use of IT tools and techniques.

2.4 Course outline

| **Week** | **Topics of lectures and/or exercise classes** |
|---|---|
| 1. | Aquifer Protection, Parts of Water Supply Security Plans. Characterisation, quantity and quality of surface and groundwater resources. EU Water Framework Directive. River Basin Management Plan. Groundwater quality protection. Pollution sensitivity. Protection against pollution (prevention, protection areas) (Sizing of water networks). Water conveyance, estimation of diameters. |
| 2. | Analysis of future water demand. Determination and forecasting of drinking water consumption/demand. Urban water demand. Factors affecting water demand (settlement structure, urbanisation, demography, economic issues, etc.). Water demand, water loss, scaling water demand. Composition and evolution of water consumption. Calculation of balancing, Calculation of pressures |
| 3. | Regional water supply. Transmission pipeline route. Storage and pumping in regional water supply systems. Design and control of engine houses. Pressure profile plots. |
| 4. | Fittings and special structures of water networks. (Calculation of regional water navigation). Determination of water demand. System design (current, improvements). |
| 5. | Rational method (with applicability conditions). Water |

| | |
|---|---|
| | balances, water management strategies. |
| 6. | Principles of operation, sizing and design of pressurised/vacuum sewerage networks (Hydraulic sizing of regional systems). Design of regional water supply systems. |
| 7. | Design considerations of wastewater sewage pump stations,, associated structures and fittings, construction methods. Regional water supply system operating conditions. Hydraulic calculation of regional water supply system operating conditions. |
| 8. | Drainage structures, connections. Preparation of pressure profile plots and thematic site drawings. |
| 9. | Diagnostics, pipe cleaning. Calculation of energy costs. |
| 10. | Reconstruction (Sizing of stormwater drainage network). Preparation of surface models. Horizontal and vertical alignment of the stormwater network. |
| 11. | Trenchless construction. Hydraulic sizing of a stormwater network using the rational calculation method. |
| 12. | Piping static calculation. Preparation of thematic site plans. |
| 13. | Corrosion. Requiremetns of technical reports. |
| 14. | Economic aspects of water utilities. Ownership of public utilities. Operating entities, forms of operation and operating relationship. Asset management tasks. Development and financing of water utilities. Operating costs, pricing, water charges. Method and purpose of asset valuation. Financing of reconstruction. |

The above programme is tentative and subject to changes due to calendar variations and other reasons specific to the actual semester. Consult the effective detailed course schedule of the course on the subject website.

2.5 Study materials

2.6 Other information

Participation in the practical classes is compulsory. A student who misses more than 30% of the practicals will not be allowed to obtain credits for the course.

2.7 Consultation

During practical lessons or in consultation time agreed with the lecturer in advance (fulop.roland@epito.bme.hu, varga.laura@epito.bme.hu )

This Subject Datasheet is valid for:

2023/2024 semester I

## II. Subject requirements

Assessment and evaluation of the learning outcomes

3.1 General rules

The assessment of the learning outcomes set out in 2.2 will be based on the assessment of the control papers, calculation tasks and written and oral performance assessment during the examination period.

3.2 Assessment methods

| Evaluation form | Abbreviation | Assessed learning outcomes |
|---|---|---|
| Control papers (7 pieces) | CP | A.1-A.11; B.1-B.9; C.1-C.3; D.1 |
| Calculation tasks (4 pieces) | HW | A.1-A.9; B.1-B.3, B.5-B.7; C.1-C.3; D.1 |
| Written and oral examinations | E | A.1-A.11; B.1-B.9; C.2-C.3; D.1 |

The dates of deadlines of assignments/homework can be found in the detailed course schedule on the subject's website.

3.3 Evaluation system

| Abbreviation | Score |
|---|---|
| CP | 25% |
| HW | 25% |
| E | 50% |
| **Sum** | **100%** |

3.4 Requirements and validity of signature

In order to obtain the signature, the student must have a total score of at least 21 points (50% of the total) in the control papers and must complete all four calculation tasks with a grade of at least Passed (2) by the deadline. The deadline for the first assignment is the 4th week of the course; the second assignment is the 8th week of the course, the third assignment is the 11th week and the fourth assignment is the end of the 14th week. Substitutions are possible up to two weeks after the deadline. Missing the deadlines will result in the semester being cancelled.

3.5 Grading system

| Grade | Points (P) |
|---|---|
| excellent (5) | 85%<=P |
| good (4) | 70%<=P<85% |
| satisfactory (3) | 60%<=P<70% |
| passed (2) | 50<=P<60% |
| failed (1) | P=<50% |

3.6 Retake and repeat

At the retake of control papers +10 points can be earned. The points of the 7 CP and retake CP are added together and the CP grade is calculated according to point 3.5. If the CP grade is better Failed (1), a written pre-exam may be written.

3.7 Estimated workload

| **Activity** | **Hours/semester** |
|---|---|
| Participation in lectures | 14×4=56 |
| Preparation for evaluations | 30 |
| Calculation projects | 34 |
| Preparation for exams | 30 |
| **Sum** | **150** |

3.8 Effective date

1 September 2022

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2023/2024 semester I