Surveying II. - BMEEOAFAT42

I. Subject Specification

1. Basic Data

1.1 Title

Surveying II.

1.2 Code

BMEEOAFAT42

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

4

1.7 Coordinator

name	Dr. Szabolcs Rózsa
academic rank	Associate professor
email	rozsa.szabolcs@emk.bme.hu

1.8 Department

Department of Geodesy and Surveying

1.9 Website

https://epito.bme.hu/BMEEOAFAT42
https://edu.epito.bme.hu/course/view.php?id=420

1.10 Language of instruction

hungarian and english

1.11 Curriculum requirements

Compulsory in the Civil Engineering (BSc) programme

1.12 Prerequisites

Strong prerequisites:

- Surveying I. (BMEEOAFAT41)
- CAD for Civil Engineers (BMEEOFTAT41)

1.13 Effective date

5 February 2020

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2. Objectives and learning outcomes

2.1 Objectives

The aim of this course is to learn the surveying tasks related to civil engineering activities. Learn different control network densification methods, get acquainted with the assessment and design of the surveying of engineering facilities, know the related measurement procedures and methods of processing the measurements. The student gains experience in reading the maps as well as extracting the geometric inputs from the maps. Students will be familiar with the digital spatial data used in civil engineering practice and their main features. They will recognize the characteristics of measurement errors, the relation of error propagation, and the concept of construction tolerance and applies it to the setting out and the geometric quality control of built structures. Students will be familiar with advanced surveying instruments and measurement methods such as EDM, total station, underground public utility locators and the Global Navigation Satellite Systems.

2.2 Learning outcomes

Upon successful completion of this subject, the student:

A. Knowledge

1. knows the fundamental tasks of surveying and the orientation of mean directions
2. knows the control network densification methods in surveying
3. knows the types and main characteristics of spatial data and maps used most frequently in civil engineering practise
4. has a comprehensive picture of how to produce digital maps
5. knows the relationship between the characterization of measurement errors and the error propagation
6. knows the methods for adjusting the repeated measurements of a single quantity
7. knows the principle of describing the expected accuracy of height determination
8. knows the concept of construction tolerance, its definition and the basics of geometric quality control
9. knows the modern surveying instruments
10. knows the basics of satellite positioning
11. knows the methods, tools and procedures for conducting detailed surveys
12. knows the method of setting out trace type structures
13. knows the basics of settlement and deflection monitoring measurements and their scope
14. knows the rules of public utility registration and its implementation as well as the methods of detecting underground public utilities
15. knows the method of measuring height differences performed by optical levelling and trigonometric heighting.

B. Skills

1. Able to perform basic plane surveying calculations
2. Able to process the measured whole circle bearing values and the orientation of mean directions
3. Able to process and evaluate measurements used for geodetic control network densifications
4. Able to obtain geometric data from digital and conventional maps
5. Able to determine the expected accuracy of surveying measurements and to plan the basic measurements
6. Able to adjust repeated surveying measurements to determine a single quantity
7. Able to apply the error propagation theory

C. Attitudes

1. Attempts to master the use of the instruments needed to provide surveying tasks
2. Attempts to process the measurements by self-testing
3. Open to the use of information technology tools
4. Attempts for accurate and error-free task solving

D. Autonomy and Responsibility

1. Independently practise to solve traversing calculations and the adjustment of observation of a single quantity.
2. Openly receives the well-founded critical comments

2.3 Methods

Lectures, computation and measurement exercises, communication in writing and oral, use of IT tools and techniques, tasks independently and teamwork, logistic techniques.

2.4 Course outline

Week	**Topics of lectures and/or exercise classes**
1.	Length measurement, physical distance measurement. EDM. Processing the EDM observations. Fundamental tasks of surveying, *the* orientation *of mean directions*
2.	Traverse line types. Locating blunders, angular and linear misclosures. *Summary-*fundamental tasks of surveying. Intersections (Foresection, arcsection, resection).
3.	Detail measurement. Offset surveys, tacheometry, total stations. Free station. *Calculating the free traverse line*
4.	Setting out straights, angles and heights. Built-in setting out programs of total stations. *Calculating the closed traverse line*
5.	Random errors. Mean error and the weight. The theory of error propagation. *Summary-traverse lines*
6.	The adjustment of the observation of a single quantity. *Fundamentals of map knowledge (map types, the digital spatial data used in civil engineering practice). Map reading.*
7.	Basics of construction tolerances and geometric quality control of structures

	Data acquisition from map. Map sheet distortions. Different methods of field definition.
8.	A priori mean error of levelling. Computation of heighting lines and joints. *Methods for producing* digital maps
9.	Positioning with Global Positioning System (GPS). The principle, possibilities and accuracy of the positioning. GPS positioning methods. GNSS infrastructure. Transformation of the results into national geodetic control network. *Numerical examples of adjusting observations of a single quantity.*
10.	Setting out principal points of a roadwork. (Straight, radial curve, transition curve) *Numerical examples of* error propagation *topics.*
11.	Types of settlement monitoring measurements. *Summary- the map knowledge, adjusting the observations and* error propagation
12.	Determine the position of underground pipes. Register public utilities. *Determination of building height by trigonometric heighting using total stations.*
13.	In-door building surveys *Height measurement in multi-storey building, heighting between levels.*
14.	Consultation (extra). *Positioning with GPS (navigation, DGPS, RTK).*

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

a) Printed lecture notes:

1. Bannister-Raymond-Baker: Surveying (Prentice Hall)

b) Online materials:

1. https://edu.epito.bme.hu/course/view.php?id=420

2.6 Other information

2.7 Consultation

Appointments:

As specified on the department's website, or in consultation with the course instructors via e-mail

This Subject Datasheet is valid for:

2022/2023 semester I

II. Subject requirements

Assessment and evaluation of the learning outcomes

3.1 General rules

The assessment of the learning outcomes specified in clause 2.2 above and the evaluation of student performance occurs via a control test, two midterm test and an oral exam.

3.2 Assessment methods

Evaluation form	Abbreviation	Assessed learning outcomes
1. control test	CT1	A.1; B.1-B.2; C.3-C.4
2. Midterm test	MT1	A.2; B.1-B.3; C.2-C.4; D.1
3. Midterm test	MT2	A.4-A.6; B.4-B.7; C.2-C.4; D.1
4. Oral exam	E1	A.1-A.15; B.1-B.7; C.1; D.2

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

3.3 Evaluation system

MT1 and MT2 are unsuccessful if they do not reach 50% of the available score.

Abbreviation	Score
CT1	3,6% (10 point)
MT1	10,7% (30 point)
MT2	10,7% (30 pont)
Total achievable during the semester:	**25%**
E1	**75%**
Sum	**100%**

3.4 Requirements and validity of signature

The condition for obtaining a signature is that the student achieves at least 50% of the scores according to 3.3 and both midterm tests (MT1, MT2) are successful.

Anyone who has signature and not register for exam course, his/her midterm result will be overwriten by the recapture result.

The midterm result that can be taken into account at the examination grade previously obtained from the subject can be accepted retroactively for 4 semester.

3.5 Grading system

The final grade is the average value of the results of the midterm grade and the examination.

Grade	Points (P)
excellent (5)	88% (62point)<=P

good (4)	75%(53point)<=P<88%
satisfactory (3)	62%(43point)<=P<75%
passed (2)	50%(35point)<=P<62%
failed (1)	P<50%

3.6 Retake and repeat

1. In case of retaking an assessment the second result will be taken into account from the new and previous results.

3.7 Estimated workload

Activity	**Hours/semester**
contact hours	14×4=56
preparation for the practise	14×1=14
preparation for the assessments	4+10+10+26=50
Sum	**120**

3.8 Effective date

9 February 2022

This Subject Datasheet is valid for:

2022/2023 semester I