Surveying Field Course - BMEEOAFAT43

I. Subject Specification

1. Basic Data

1.1 Title

Surveying Field Course

1.2 Code

BMEEOAFAT43

1.3 Type

Module with associated contact hours

1.4 Contact hours

Type	Hours/week / (days)
Field course	(9)

1.5 Evaluation

Midterm grade

1.6 Credits

3

1.7 Coordinator

name	Dr. Bence Takács
academic rank	Associate professor
email	takacs.bence@emk.bme.hu

1.8 Department

Department of Geodesy and Surveying

1.9 Website

https://epito.bme.hu/BMEEOAFAT43
https://edu.epito.bme.hu/course/view.php?id=421

1.10 Language of instruction

hungarian and english

1.11 Curriculum requirements

Compulsory in the Civil Engineering (BSc) programme

1.12 Prerequisites

Weak prerequisites:

- Surveying II. (BMEEOAFAT42)

Parallel prerequisites:

- Surveying II. (BMEEOAFAT42)

Strong prerequisites:

- CAD for Civil Engineers (BMEEOFTAT41)

1.13 Effective date

5 February 2020

2. Objectives and learning outcomes

2.1 Objectives

Based on the two-semester surveying education, students are solving complex tasks from civil engineering practice. In the framework of the tasks, the students evaluate the available existing surveying data, determine the surveying activities required by the given civil engineering task, exercise the necessary surveying, data processing, setting-out planning, setting-out and documentation tasks. During the field course students are carrying out traversing, detailed tacheometry, the survey of engineering facilities (road, building, utilities) and the setting-out of these facilities, profile boarding, and different deformation monitoring measurements. They will have skill-level practise in the use of classical surveying instruments such as automatic optical levels and total stations. They also get acquainted with professional instruments and methods used in everyday civil engineering practice (RTK GNSS, total stations with extra functions, drone, construction lasers, digital terrestrial photogrammetry, etc.).

2.2 Learning outcomes

Upon successful completion of this subject, the student:

A. Knowledge

1. Understands the techniques used for the densification of control networks, ie. traversing, free station, RTK GNSS observations and line levelling.
2. Is familiar with surveying instruments in the field of civil engineering, such as the automatic levels, total stations, RTK GNSS receivers.
3. Understands the principle of precise leveling and the structure of the precise levels.
4. Understands the necessity to support photogrammetry with surveying measurements.
5. Is informed in the field of procedures to reduce errors in GNSS measurements. Knows the accuracy of the GNSS technology as well as its limitations. It also sees the possibilities and benefits of GNSS technology.
6. Understands the fundamental geometrical elements (straight, transition curve, radial curve) of the horizontal alignment of linear facilities (roads, railways). Understand the relationship between calculating the geometric quantities required to set structure of the the road/railway out.
7. Knows the system of public utilities in Hungary and understands the methods necessary for locating and registering public utilities.

B. Skills

1. Able to compute new control and detail point heights from line levelling using automatic levels, and to set out given levels.
2. Able to measure and set out angles and distances with total stations, to determine the 3D coordinates of detail points and to set out points given by their coordinates.
3. Able to perform basic plane surveying calculations.
4. Able to plan the activities needed for the execution of the tasks, to select the instruments and tools needed for accomplishing the tasks with the assistance of the instructor.
5. Able to create base map for planning engineering facilities. Can densify the geodetic control network, and measure detail points with tacheometry. Can use CAD software for mapping and able to create hardcopies and check its quality on-site.

6. Calculate the geometric data required for the setting out of the transition curves on horizontal alignments and set out the principal and details points of the roadwork.
7. Able to produce the surveying products for the assessment of current geometry of roadworks with classical surveying methods such as profiles and cross sections using levelling instruments.
8. Able to set out simple building contours and build a profile board.
9. Able to check the alignment of a wall using a vertical plane.
10. Able to supplement maps with underground pipelines and other utilities using suitable underground public utility locator instruments.
11. Able to build a model of buildings based on digital photographs

C. Attitudes

1. Seeks surveying measurements with the required accuracy of the task, recognizes and uses the controlling possibilities.
2. Open to the modern surveying techniques and procedures, and recognizes its importance for a civil engineer.

D. Autonomy and Responsibility

1. Collaborates with other students as a part of a team in solving specific tasks. Leads the team in specific tasks.
2. Keeps and urges the team to keep the working safety instructions on the workplace in order to avoid accidents.
3. Carefully handles the surveying instruments, takes moral and financial responsibility for them

2.3 Methods

After a short introduction, students will solve surveying exercises, take measurements, do calculations, planning and documentation tasks in small groups. All of these activities are carried out in a coherent 9-day exercise on a field, suitable for performing measurement exercises.

2.4 Course outline

Week	**Topics of lectures and/or exercise classes**
1.	Arrival, occupation of accommodation, administration (e.g. meal tickets). Describing camp order. Describing the subject requirements. Training on working safety.
2.	Measurement of the closed traverse line.
3.	Computation of the traverse line.
4.	Detail survey using tacheometry.
5.	Mapping the detail measurements, quality checking on-site.
6.	Computation of the double transition curve, planning the setting out.

7.	Setting out the transition curves.
8.	Densifying the height network, establishing new benchmarks required for the survey of road geometry.
9.	Surveying road geometry, create profiles and cross sections.
10.	Determining control points on a building facade required for photogrammetry.
11.	Building facade survey with digital photogrammetry.
12.	Building profile boarding. Geometrical quality control of an existing wall using alignment observations.
13.	GNSS positioning techniques in surveying and civil engineering.
14.	Structural setting out of a building with mm accuracy. Precise levelling.
15.	Surveying of public utilities and structures, map supplement.
16.	Summary on the practical exercises.
17.	Summary. Finalization minutes, preparation of technical descriptions, compilation of docu-mentation.
18.	Evaluation, Camp Closing, Leaving.

The exact schedule is announced by the camp leader at the beginning of the field course.
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:

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

b) Online materials:

- https://edu.epito.bme.hu/course/view.php?id=421

2.6 Other information

1. The subject is taught during the spring semester either in or after the examination period.
2. Accommodation is provided for the students during the field course, it is mandatory to use them.
3. Some of the measurements are carried out outdoors, regardless of the weather.
4. We will publish an advertisement on Moodle about the necessary clothing, shoes and other items before the field course.
5. Participation in the exercises is compulsory.
6. Wired and wireless internet connection is provided at the field course. Use of your own laptop or equivalent device during the learning and exercises, is recommended but not mandatory; computers are provided.

2.7 Consultation

Appointments: The possibility of consultation is continuously ensured during the field course.

This Subject Datasheet is valid for:

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 the practical test, an online midterm test, as well as the student's attitudes and activities during the field course. We provide a sufficient number of practicing tasks in the educational framework to repeat, systematize and understand the knowledge and skills acquired in the pre-studies.

3.2 Assessment methods

Evaluation form	Abbreviation	Assessed learning outcomes
1. Practical test	PT	B.1-B.3
2. Midterm test	MT	A.1-A.7; B.1-B.10
3. Student's Activity	A	B.1-B.11; C.1-C.2; D.1-D.3

The exact time of the evaluations held in the individual field courses is announced by the camp leader at the beginning of the course.
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
PT	33.3%
MT	33.3%
A	33.3%
Sum	**100%**

For each performance evaluation, 1-5 grades are given.

3.4 Requirements and validity of signature

Signature could not be obtained from the subject.

3.5 Grading system

The condition for obtaining the grade is the full participation in the exercises and perform all the tasks listed in point 3.3 at least at a satisfactory level. The final grade is the average value of the result of the tasks weighted according to the 3.3 point.

3.6 Retake and repeat

The classified task and the online midterm test can be repeated at one time at the field course. The exact date of the retake is advertised by the camp leader.

3.7 Estimated workload

Activity	Hours/semester
contact hours	9×8=72
preparation for the assessments	9×2=18
Sum	**90**

3.8 Effective date

5 February 2020

This Subject Datasheet is valid for: