CHOSEN SUBJECTS OF EXERCISES FROM GEOMETRY REALIZED IN PROCESS OF ENGINEERS' EDUCATION ON FACULTY OF ENVIRONMENTAL ENGINEERING AND LAND SURVEYING AT THE AGRICULTURAL UNIVERSITY OF CRACOW

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Abstract. This paper presents chosen classes performed within the subject called Descriptive Geometry and Engineer's graphics for first-year students of Environmental Engineering and Land Surveying and Cartography, Faculty of Environmental Engineering and Land Surveying at the Agricultural University of Cracow. They were developed by the author in order to present geometry applications in engineers' practice, and obtain the highest effectiveness of education in relation to reduced time of classes (hours of exercises)..

Keywords: Descriptive Geometry, Engineer's Graphics

1 Introduction

The paper discusses chosen classes performed within the subject called Descriptive Geometry and Engineer's graphics for first-year students of Environmental Engineering and Land Surveying and Cartography, Faculty of Environmental Engineering and Land Surveying at the Agricultural University of Cracow. Classes include axonometry, Monge's Descriptive Geometry orthogonal projections, and perspective. They were developed by the author in order to present geometry applications in engineers' practice, and obtain the highest effectiveness of education in relation to reduced duration (number) of classes.

2 Chosen subjects of exercises from geometry and Engineer's graphics

Students receive exercise subjects, usually individual data in the form of already started drafts, and they solve those problems using knowledge obtained during lectures. The form of lectures was also modified and adapted to the reduced number of those lectures. Therefore, it is a computer presentation of construction performed step-by-step. Furthermore, students receive reprints of subsequent drafts for copying, usually one week before each lecture, so they could take notes with respect to hints on their copies.

Chosen subjects of exercises:

1. In the flat ground, design a reservoir with horizontal, rectangular bottom limited by dykes surrounding the bottom when the crown's ordinate is 1.2 m higher than bottom's ordinate. The width of dyke's crown is 1.5 m, and the slopes' tilt is 1:1.5. The reservoir is surrounded by a ditch 0.4 m wide (on the bottom), and 0.7 m deep when compared with the dyke. There is a road leading to the reservoir, tilted at 10% and 3 m wide. De-

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limit ground works concerning banks and excavations and sketch sectional views in 1:100/200 scale (Fig. 1).

2. Sketch St. Andrew's cross in perspective geometry (axonometry) when dimensions of component elements are given (Fig. 2).
3. Measure buildings presented in the pictures, which have orthogonal walls. The length of one wall section is given (Fig. 3).
4. Describe visibility of two infiltrating regular tetrahedrons with parallel bases. Visibility of one edge is given (Fig. 4).
5. Describe visibility of three circumscribed (tangential) hoops, orthogonal to each other, when visibility of one edge is given (Fig. 5).
6. Design a bicycle lane in children's playground (Fig. 6). The lane should consist of straight fragments, circular arches, connected tangentially. Do geometric constructions of connections between lines and circles when different elements are given (either the radius of connection arch, its beginning or end, or its center).

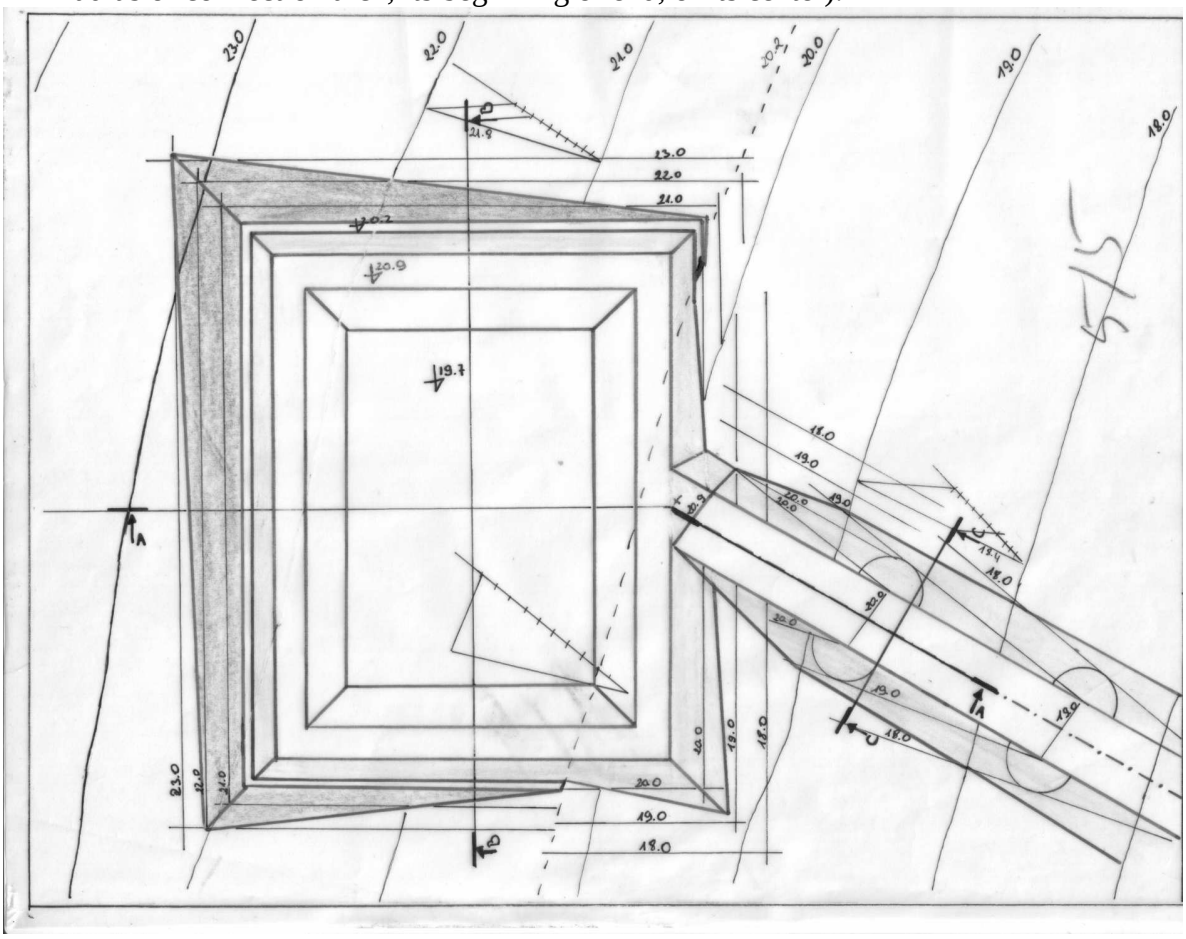

Fig. 1: Reservoir with horizontal, rectangular bottom (student's draft)

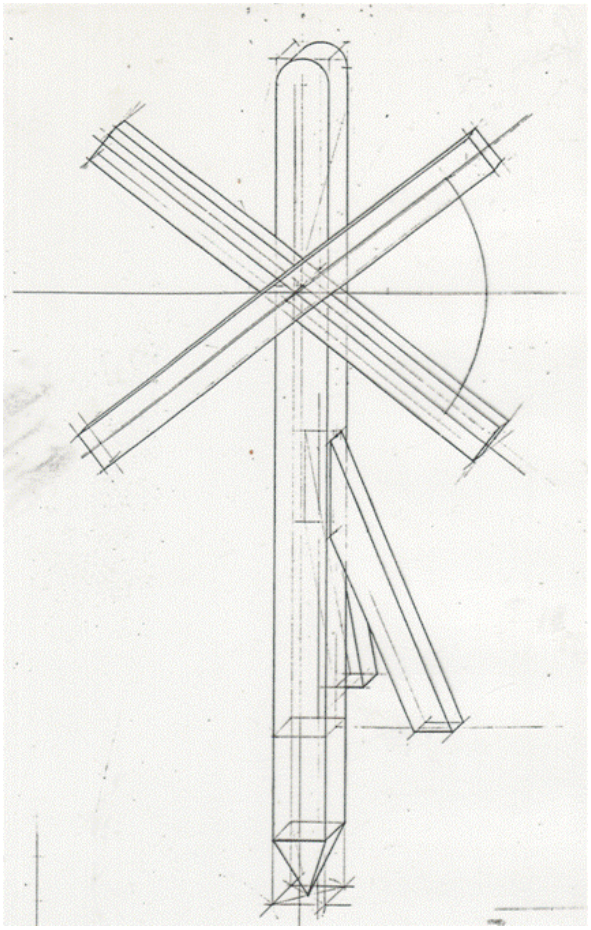

Fig. 2: St. Andrew's cross (axonometry)

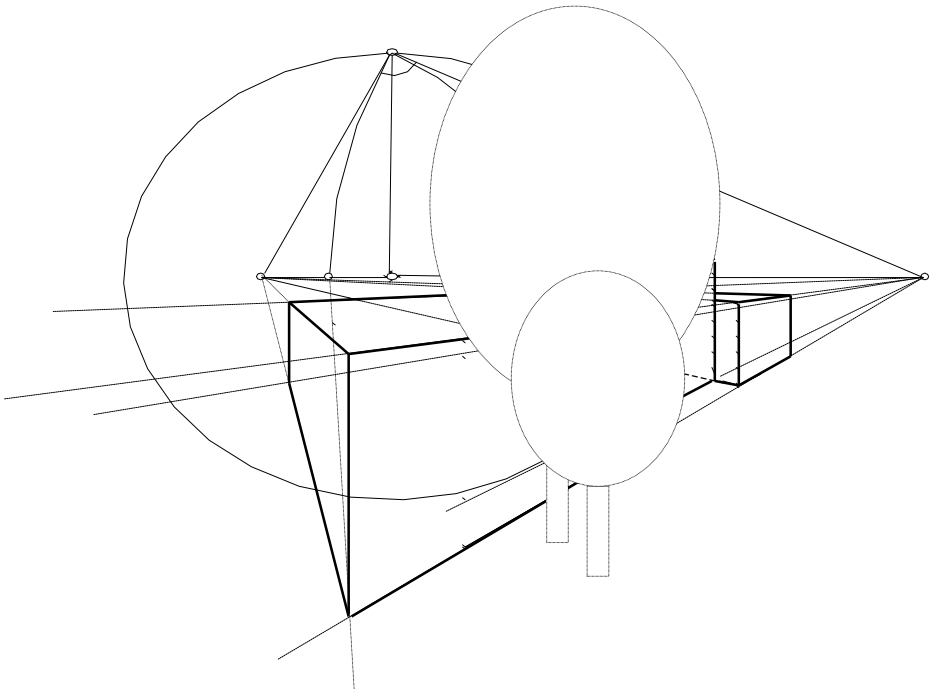

Fig. 3: Buildings

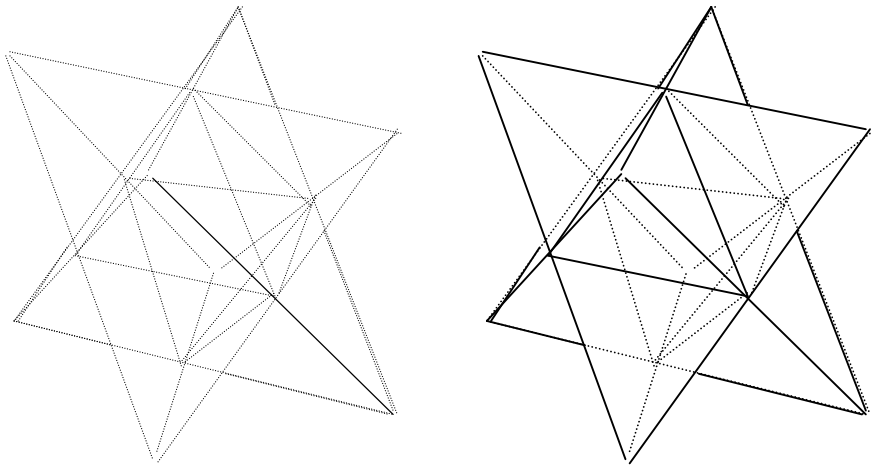

Fig. 4: Two infiltrating regular tetrahedrons with parallel bases

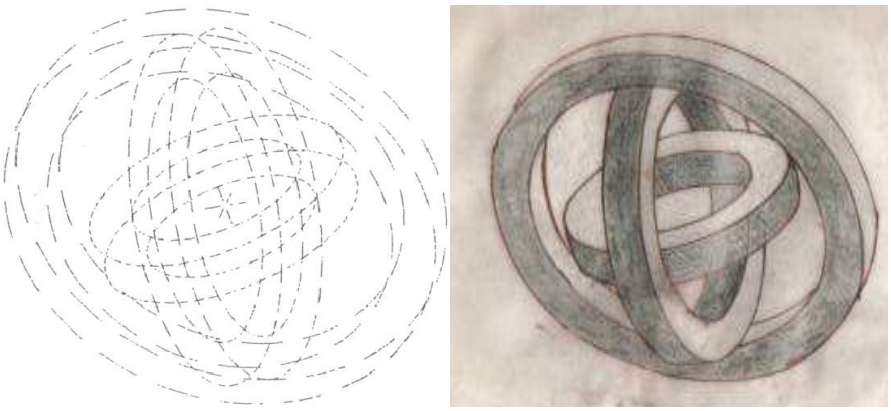

Fig. 5: Three circumscribed (tangential) hoops

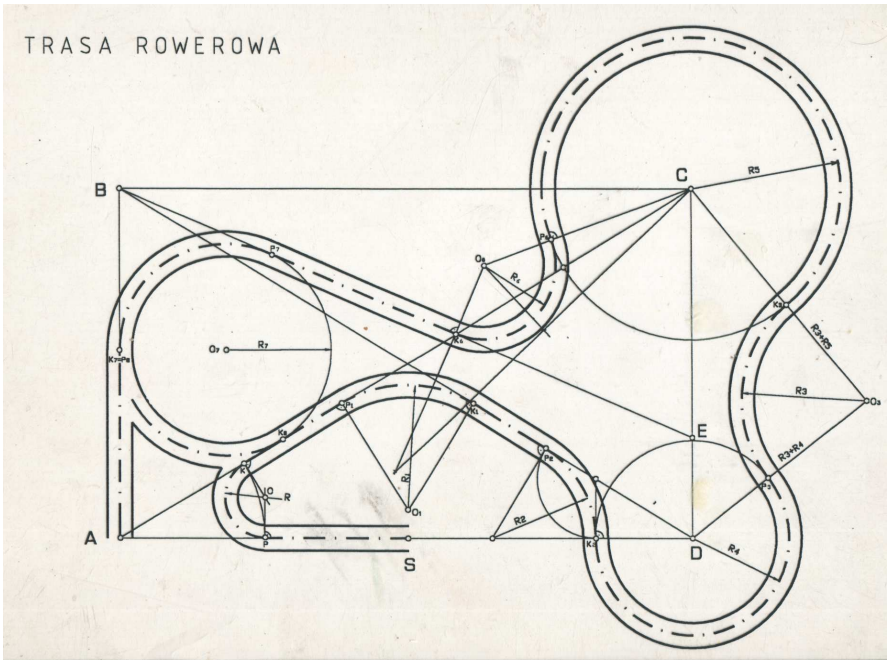

Fig. 6: Three circumscribed (tangential) hoops

3 Conclusion

Gradually reduced number of hours of descriptive geometry and engineer's graphics pose new challenges for teachers. Fortunately, educational experience is assisted by computer techniques, which allow teachers to cope with new problems well.

References

[1] Rużyczka A: Spatial imagination among students commencing the course of descriptive geometry in a technical studies. Journal for Geometry and Graphics Volume 7, 2003, No. 2, 247-252.

[1] Rużyczka A.: Using Microsoft PowerPoint programme to teach Descriptive Geometry. Geometry & Computer Graphic. VSB-Technicka Univerziteta Ostyrawa. Sbornik prispevku GCG 2004.

WYBRANE TEMATY ĆWICZEŃ GEOMETRYCZNYCH REALIZOWANE W PROCESIE KSZTAŁCENIA INŻYNIERÓW NA WYDZIALE INŻYNIERII ŚRODOWISKA I GEODEZJI UNIWERSYTETU ROLNICZEGO W KRAKOWIE

Praca jest prezentacją wybranych ćwiczeń realizowanych w ramach przedmiotu geometria wykreślna i grafika inżynierska przez studentów I roku studiów kierunku Inżynieria Środowiska i kierunku Geodezja i Kartografia na Wydziale Inżynierii Środowiska i Geodezji Uniwersytetu Rolniczego w Krakowie. Dotyczą one zarówno aksonometrii, rzutów Monge,a i perspektywy. Zostały one opracowane przez autora pod kątem zastosowań geometrii w praktyce inżynierskiej, z myślą o jak najwyższej efektywności kształcenia z uwagi na zmniejszoną liczbę godzin ćwiczeń. Studenci otrzymują tematy ćwiczeń zawierające z reguły dane indywidualne w formie rozpoczętych rysunków, a rozwiązania są wykonywane przez nich w oparciu o wiedzę uzyskiwaną na wykładach. Forma tych wykładów również została dostosowana do ograniczonej liczby godzin i jest prezentacją komputerową konstrukcji przeprowadzaną „krok po kroku". Ponadto, studenci otrzymują do kopiowania wydruki kolejnych rysunków, często tydzień wcześniej, aby mając je podczas wykładu mogli ograniczyć notowanie jego treści do uwag na posiadanych kopiach. Zmniejszana stopniowo liczba godzin z geometrii wykreślnej i grafiki inżynierskiej stawia przed prowadzącymi zajęcia coraz to nowa wyzwania, ale na szczęście w ich sprostaniu, obok doświadczenia wykładowców, pomocna jest technika komputerowa.

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