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## **AUTOCAD ASSISTED TEACHING OF DESCRIPTIVE GEOMETRY AND ENGINEERING GRAPHICS.**

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The question of teaching of the subject Descriptive Geometry and Engineering Graphics in AutoCAD within the framework of laboratory classes has been discussed. The subject is realized on the Faculty of Electrical and Computer Engineering during the first year of the 1<sup>st</sup> stage stationary studies in electrical engineering and covers 15 hours of lectures and 15 hours of laboratory classes within one semester. The main aim of the subject is to allow the students to learn how to reproduce a 3D space on a plane of a drawing (lectures) and to master skills of their creation in AutoCAD software in order to address various engineering needs (laboratory classes). Within the framework of 45 minute laboratory classes 12 exercises are being completed including PowerPoint and poster presentations. The exercises are divided into three main groups, namely: exercises related to Monge projections [7], technical drawing and computer assisted 3D modeling. They practice the relevant topics, and are related to both mastering AutoCAD commands [5] and teaching of engineering graphics. The subjects help the students to develop the knowledge from the field of the descriptive geometry and the use of the AutoCAD software. The degree of complexity increases gradually. As a result of such development of the scope of laboratory classes, students can master basic skills related to preparation of engineering projects with the use of the AutoCAD software, from blueprints to a 3D model to a presentation in the form of a visualization [1].

The choice of exercises, as well as the way in which they are assigned, which has been adapted to the possibilities and limitations of the AutoCAD software, have been presented. All subjects have been individualized through introduction of variables dependent on either the student's identification number, name or surname or the combination of thereof. This has prevented copying of works. Considering the limited number of laboratory classes the subjects have been developed in such a way as to avoid drawing the entire subjects from scratch, by rather letting students to focus on selected elements, commands and skills; e.g. in the exercise related to projections of a solid, two projections are already available.

Modern training aids [4] have been introduced into the laboratory classes creating thus new possibilities to facilitate the teaching and learning processes. A series of tutorials has been

developed. The tutorials have a form of a sequence of slides in which commands and the ways of drawing are presented in a step by step manner and are accompanied by graphical aids. They show how to complete a given exercise; however, they do not provide a ready solution in order to avoid a mechanical execution of a given exercise. For this reason the tutorials have been elaborated only for the modules related to axonometric projections, dimensioning and structuring of 3D objects in AutoCAD. To intensify the results, and also taking into consideration the limited number of laboratory classes an additional course of this subject has been made available over the Internet. The course has been developed based on Moodle e-learning platform and published on the Cracow University of Technology e-learning website (ELF - e-learning framework). The course has been divided into introductory part, 12 laboratory modules and two presentation modules. The structure of the course as well as the way in which the works are submitted and graded have been presented. The introduction of the Internet platform has strengthened the teacher-student interactions. The possibilities to use Moodle platform to facilitate the teaching have been discussed. The question of the unlimited in time use of the information resources related to the subject has been also given a consideration. Application of modern visual aids to facilitate the teaching process of engineering subjects, like in the case under consideration, is capable of improving the efficiency of the entire process as prove the results achieved by students of the academic year 2012/2013 in comparison to students of the previous academic years. The introduction of multimedia and information technologies into the course requires however a careful design of the course architecture and visual aids, as well as careful approach during the selection of topics.

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