priority will be directed to development of the model of engineers' professional training converging personal and professional competences, professional identification in the self-developing environment of higher education institution. The self-developing environment of higher education institution may be identified as creation of its information model with disclosure of all subjects of engineering personnel training, project of «subjects assembly».

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Issues of Fostering Students' Artistic Taste in the Process of Engineering Education

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The article justifies the need to develop such personal skills of future engineers, as the artistic taste, the sense of beauty, and the inner personal culture. The basic requirements towards mechanical components, connection joints and structures are addressed allowing the creation of not only technically ingenious, but also eye-catching products that would be notable for their harmonic configuration and beauty. Special emphases are put on the phenomenon of golden ratio, inherent to the most attractive and beautiful items created by nature or by human.

Key words: artistic taste, aesthetic culture, visual appeal, expression, beauty, golden ratio.

Owing to the modern rapid development of science and technology there is a possibility of an occurring tendency towards lower requirements for the artistic taste of an engineer with respect to his/her engineering decisions. This may lead to the decrease of the aesthetic qualities of developed items. Finding successful solutions to modern issues of new technical systems' design is only possible in the case of increasing inner aesthetic culture of engineers.

It may seem at the first glance that issues of aesthetics, that need to be solved by a technical specialist, could be handed over to designers or application-oriented artists. However the practice indicates that these specialists, who lack basic engineering knowledge and engineering support, are not capable of creating aesthetically ingenious technical systems [1]. On the other hand, in case if such specialists do not have an opportunity to get direct involvement in the design and development of technical products, engineers are required to take over their functions. Therefore, an engineer has to be specifically trained to conduct these tasks, as well as to be ready to cooperate with professional designers.

As a result higher education institutions have an arising need for sufficient enhancement of engineers' aesthetic culture.

In order to enhance aesthetic education of mechanical engineering students it is necessary to emphasize and demonstrate the most relevant, highly ingenious and beautiful technical decisions within the teaching process of basic engineering and specific professional courses. Such demonstration of technical items' beauty standards with relevant comments would form and foster students' taste and sense of beauty in the field of technology. Besides, this would assure the most efficient and solid understanding and acquisition of study material, since it would be obtained via two channels simultaneously – through the thoughts and logical thinking and through the feelings.

Thus, when designing new mechanical products it is necessary to ensure not only the technical excellence (that is the main indicator of product's quality), but also the coinciding appearance, its visual attractiveness. Advertised technical excellence of a product would be acknowledged only in the process of its exploitation, but the external appeal of a product, reflected in a showpiece or on a picture in the company's catalog would, in no doubt, affect the customer's decision on

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purchasing a particular type of mechanical product. Therefore, the focus on aesthetic excellence of products may spike their competitiveness.

The key components of the external appeal of a technical product that need to be taken into account by engineers when creating new mechanical products are, first of all, predefined by:

- The material of the product, the choice of which is usually strictly limited by the functional attributes. However when choosing the form and method for item production it is necessary to strive for exploiting the natural beauty and the texture of the metal.
- The structure of the surface that depends, in most cases, on the tooling method, and in some cases – on the texture of the design or hard-wearing surfaces.
- The overall dimensions, their correlation, and the correlation of dimensions of the product's parts. These parameters are usually defined by the functional purpose. However, in any case, it is necessary to strive for a maximum correlation of product's dimensions with the dimensions of the space, where this product will be exploited.
- The spatial outline that represents a mix of spatial "hard-lined" (cube, prism, pyramid, etc.) and "soft-lined" (cylinder, cone, solid sphere, etc.) geometrical forms [2]. Designers usually tend to "soften" the edges and corners by rounding them; that, except for its external expression, contributes to decrease in stress concentration, increase of fatigue endurance, preservation of the surface, and allows to keep the product's surface clean easier.
- The contour (silhouette) of the product, which is designed to be balanced and beautiful. It should be taken into account that horizontal lines on the product leave an impression of its stableness and sustainability, whereas the vertical lines – an impression of slenderness.
- The existence of small cymatium on the main surfaces of the product that may serve for different functional purposes. They tincture decorative value and have a positive aesthetic effect on human.
- The color scheme. The use of a few different and at the same time harmonic colors strengthens the aesthetic impression and significance. Besides the aesthetic criteria of color, it is worth to take into account the corrosion resistance requirements, durability of paints and surfaces, as well as the technology and economy of the color decorations.
- The combination of light and shades on the product's surface that should consider the character and the intensiveness of the light needed for product's exploitation.
- The inscriptions, symbols and digital data imposed on the front sides of the product. A well-done inscription makes a positive emotional impact.

Besides ensuring external attractiveness of product's elements, product design engineer should keep track of the product indicators' originality in order to create the sense of its dissimilarity and uniqueness, its individuality, recognizability, and specific historical novelty. At this, the appearance of the product should create an impression of harmony and consistency with the surrounding equipment elements and other hardware.

It is worth noting that most of the previously outlined components of technical items' external attractiveness should consider an opportunity to exploit such distinguished psychological phenomenon influencing human's perception of the product's appearance, as the "golden ratio".

It has been since the Ancient times that people have noticed a certain quantity responsible for the ratio of overall dimensions and dimensions of particular parts of the most ingenious and beautiful creations of construction workers, architects, sculptors and artists. This ratio was named the "golden ratio". It is common that such "beauty" had appeared accidently, so to say, intuitively in the works of the creators; and the latter analysis discovered the existence of the "golden ratio" in their works.

The history of material and spiritual cultures of the humanity accounts a few of irrational numbers that take up a special place, since they reflect some ratios that are universal and occur in the most unexpected phenomena and processes of the material and biological worlds. These numbers include: the number π, the ratio of a circle's circumference to its diameter, the Euler's number e that is the base of the natural logarithm, and also the one known from the ancient science – the number d – the "golden ratio" or the "golden section", according to Leonardo Da Vinci.

Since the "golden ratio" phenomenon occurs and is used in many spheres of exact sciences, biology and art, there are many studies devoted to it [3]. At the same time, it should be admitted that an insufficient time is spent on exploitation of the "golden ratio" in new product design and engineers' training in terms of the art of creating technically ingenious and beautiful structures.

The principle of finding "golden ratio" is the following: divide the AB line segment with a point C so that the ratio of line segments $\frac{AB}{AC}$ and $\frac{AC}{AB}$ is equal. When transforming this setting to the mathematical format, the following quadratic equation is true:

$$d^2 - d - 1 = 0,$$

where the positive root is

$$d = 1.61803...$$

which is called the golden ratio.

Its derivatives are also widely used. Thus, its ascending series is the following:
d^0, d^1, d^2, ..., d^n = 1, 1.618, 2.618, 4.236, ..., 1.618^n;
and the descending series is:
d^0, d^{-1}, d^{-2}, ..., d^{-n} = 1, 0.618, 0.382, 0.236, ..., 1.618^{-n}.

In the context of training future mechanical design engineers it is worth noting that the design of new products in all cases has to, first of all, encompass an analysis of a possibility for the dimensions' ratio to be the "golden ratio" without decreasing products' workability.

It should be mentioned that an externally attractive product is not particularly required to have the overall dimensions' ratio precisely equal to the number stated above: unlike the π and e constants, the golden ratio may differ within a certain range and not be exactly equal to the d number or its derivatives. At this, the psychological influence of such products would still be significant.

Overall, when training engineers, who will be involved in the creation of new mechanical engineering products, it is necessary to foster their will to take into account the "golden ratio" phenomenon indicators as often as possible when designing new products.

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