At the end of the practice, students make a detailed analysis and create a theoretical basis for the work done. In a practice note, they describe not only the technological part of the practice, but also the very concept of design, which ultimately consolidates their knowledge of Suprematism as an elegant concept of the interaction of creativity and creator.

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DESIGN ARCHITECTURAL LAYOUTS PREPARED WITH USING 3D PRINTING

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Keywords: 3D printing, layers, fused deposition modeling, stereolithography, polyjet.

3D printing has revolutionized structural prototyping, design and the creation of new creative objects. Making architectural models is an important task for any design or architectural bureau. Depending on the quality of the design of the future project, the impression of clients and potential investors is created. Creating a design using traditional methods is a complex, time consuming and costly process. With the help of 3D printing, it is possible to significantly reduce the time of design production, improve the quality and make it as close as possible to the original. At the same time, most of the design work is performed on a computer using modern 3D modeling software.

- 3D printing has several advantages:
- Creation of accessible architectural models.
- Saving time.
- Easy updating of 3D architectural models.
- 3D printing of accurate and striking architectural models.

Purpose of the work: studying the principles of operation of various types of 3D printers, determining the main features and technologies for manufacturing products using 3D printing.

Material and methods. The research material was literature and articles on the use of 3D printing. The following methods were used: observation, description, synthesis and generalization.

Findings and their discussion. 3D printing allows you to create a wide range of models – from small elements of all types of products to functional elements of spaceships and aircraft parts, from stationery and auto parts to prototypes of sweets and souvenirs.

The principle of 3D printing using any existing technology is to create three–dimensional objects that are formed by overlaying flat layers. A special program (slicer) divides the digital model of the product into layers, and the printer prints these layers one on top of the other, making up an object from them in three projection planes. Thus, a three–dimensional part is obtained from many layers.

The general principle of creating models is the same, but manufacturing technologies have their own differences. The most common and affordable among them is FDM.

FDM Fused deposition modeling (FDM) is one of the most common and popular types of 3D printing. The standard FDM works on the principle of a glue gun controlled by a robot. A plastic rod passes through the hot nozzle, it melts and lays down layer by layer on a plane. The process is repeated until the final shape of the object is formed.

A distinctive feature is that 3D printers do not use hot melt sticks, but plastic filaments in the form of wound spools.

The plastic thread is made in such a way that it melts easily at a given temperature and hardens very quickly – after cooling down by just a couple of degrees. This factor makes it possible to accurately print a 3D product with complex geometry.

Stereolithography. Stereolithography uses light in a photopolymer resin container to create objects. Such a product is formed in layers when the liquid photopolymer solidifies under the influence of light.

Photopolymer exposure produces neater layers than molten filament extruded from the nozzle of an FDM printer.

There are two types of stereolithography: SLA – laser stereolithography, DLP – digital projection. The difference between them is that in the first case, the light source is a laser, and in the second, a projector. To start printing, a special platform is lowered into a container with liquid photopolymer resin.

The platform stops at a height of one layer from the bottom of the tank.

The light source of the printer is being illuminated.

When exposed to light, the liquid polymer hardens and adheres to the platform. The process is repeated when the platform is raised to the height of one more layer.

SLS The main advantage of SLS printing is that there is no need to create support structures, since the material surrounding the model acts as a support.

This technology allows you to create products of various shapes, with an unlimited number of internal cavities, and fill the entire working area of the printer. Parts printed on SLS printers, due to their strength, can be used in practice, and not only as prototypes and decorative elements.

To create an object, the device aims a laser at a layer of fine powder, fusing the particles together to form a layer of product. Then the device sprays the next portion of the powder onto the surface of the previous layer and smoothes it, and the laser melts it. Thus, the subsequent layers of the product are obtained. This operation is repeated until printing is complete.

The model produced by the SLS printer does not require removal of the feet and can be created without the need for post–processing, it only needs to be cleaned of excess powder.

Polyjet The main advantage of Polyjet technology is its multimateriality – many Polyjet printers are capable of simultaneously printing an object from a large number of different materials, which makes it possible to create products consisting of areas with different physical properties, which are, different strengths and colors.

Polyjet 3D printers spray tiny droplets of photopolymer resin onto the surface and cure them with ultraviolet light.

This repeats until the 3D object is fully completed.

Conclusion. Knowledge of the technologies and principles of functioning of various types of 3D printers allows us to produce architectural layouts taking into account the basic requirements of design, optimize the manufacturing process, and also improve the quality of layouts.

PROJECT OF IMPROVEMENT AND GREEN SPACE EXPANSION OF THE DVINA RIVER TERRITORY

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Keywords: park, design concept, design scenario, UNOVIS and suprematism.

Park areas and recreation areas are an important component in the life of townspeople and modern megacities, where people actively spend their free time, relax from the bustle of the city and just enjoy nature. Park spaces contribute to improving air quality, solving many environmental problems, and are a habitat and development of flora and fauna. They also generally have a beneficial effect on the appearance of urban space and improve the quality of life of the population.

The aim of the work is to develop a design project for the improvement of the park zone of the territory of the Dvina River, which meets the trends