

Series title: vectors and laser plotter

Age of participants: 11+

Maximum number of participants per group: 12

Number of hours: 9

Type of track: STEAM, art, design, design

Brief description of the workshop series:

Create your first vector design from scratch and learn how to make it on a laser plotter.

During the class, those attending will learn how to use one of the most user-friendly tools for creating vector graphics, Inkscape. From simple lines or arcs to the precise and artistic at the same time design of isometric graphics - all to create amazing vector designs of anything you can think of. We will also learn why in today's world it is so important to not only know what vector graphics is, but most importantly how to use it efficiently: create, edit and adapt to your needs.

In addition, during the series of workshops there will be no shortage of space for practical application of the knowledge gained - we will learn about the laser plotter. With the help of this machine, we will easily turn the designs we have created into physical objects.

The projects made by them, those participating in the workshop will take home with them.

What does the workshop teach?

- What is vector graphics
- How to create vector graphics
- Differentiate between vector and raster graphics
- The creative process of design thinking
- What is a laser plotter and what you can use it for
- Using the computer and its capabilities to create designs
- Working with a laser plotter and a CAM-type program dedicated to the plotter

What skills does the workshop develop?

- Advanced computer skills
- Operation of
- Creating illustrations and advertisements
- Creative thinking
- Critical thinking

- Graphic design skills

Success Criteria:

- The participant is able to create simple advertising graphics
- The participant knows and can use the graphic design program Inkscape
- Participating person recognizes vector graphics
- Participating person is able to create his/her own logotype
- Participating person is able to make isometric graphics in a vector program

Meeting 1

Duration: 3h

Description.

It's time to take matters into your own hands - let's start the adventure in the vector world! We will learn a free, extremely easy and at the same time fully professional program for creating and editing vector graphics - Inkscape. The first meeting will be entirely devoted to creating vector designs. We will learn what vectors are in general and why the ability to efficiently use tools for creating and editing vector designs is so important in today's world. Get ready for a good dose of new knowledge and, even more importantly, practice!

15 min

Welcoming people attending the workshop, ice breaking, introducing the topic of the class. At the end, those participating take a seat at the previously prepared computer stations.

15 min

Story of vectors.

The educator, in the form of an interactive lecture (preferably using a tool like Kahoot or another interactive presentation), presents the following issues:

What is raster graphics?

Introduce it with the example of photos and pixels, you can refer to old low-quality digital cameras in the presentation or show approximate photos

What is vector graphics?

Comparing the two methods and techniques

Showing where vector graphics can be used

(cnc, advertising, websites, practically all applied graphics including illustrations)

Showing sites with sample inspirations

15 min

Working with Inkscape. Step-by-step educator presents and explains the following content.

People participating in the workshop repeat the steps. The educator makes sure that everyone understands the content discussed.

1. launching the program

2. presentation of available UI types

3. page settings workspace size and units

4. A short story about the current page size standards.

5. navigation with the mouse and keyboard (zoom in, zoom out, pan, pan, rotate).

6 Task: set the page size to A5 and set the view so that the page fills the computer screen as much as possible.

15 min

Break

It is mandatory for workshop participants to leave the computer stations.

45 min

Working with the program. The educator presents and explains the following content step by step.

Persons participating in the workshop repeat the activities. The educator makes sure that everyone understands the content discussed.

1. basic tools for creating and editing self-shapes.
2. stroke and fill.
3. Layers: what they are and what they are for, how to create new ones and delete unnecessary ones, moving objects between layers, turning layer visibility on and off, moving layers up and down. It is a good idea to prepare a teaching aid for this purpose in the form of several sheets of paper with different shapes printed on them. Then by applying the sheets to a light source (window, white screen, etc.) we can easily explain the principle of layers.
4. task: let's create 3 different shapes and transfer them to 3 different, appropriately named layers.
- 5 Import images.
Task: Find the funniest picture/photo of a funny cat on the Internet. Then download it to your computer.
6. import the picture into the program and place it on the newly created layer.
- 7 Cover.

15 min

Break

It is mandatory for those participating in the workshop to leave the computer stations.

45 min

Working with the program. The educator presents and explains the following content step by step.

Persons participating in the workshop repeat the activities. The educator makes sure that everyone understands the content discussed.

1. drawing tools: pen, pencil, pen - discussing the operation and pointing out the differences. We work on a new layer, outlining a photo/picture previously imported into the program.
- 2.Edit nodes.
- 3.Task: let's try to go through the whole process by ourselves: let's find a picture of a funny dog or other animal/animal on the Internet (it should be appropriately adjusted to the age and interests of the group). Let's import it into Inkscape on a new layer and outline the main character.
- 4 Save the files.

15 min

Brief summary of the work and the workshop day.

Each person has about a minute to show the work and describe how the task went from their perspective.

People participating in the workshop list 1 thing they liked most about the class. The educator encourages everyone to speak up.

Homework: The educator presents the topic to be covered by the projects created by the participants. It's a good idea to limit the size of the work area here, such as 40x40x40mm. It might be a good idea to design a key ring or a cup holder.

It is a good idea for those attending the workshop to bring their saved designs in Inkscape with them to the next class. A good way to do this might be to use a classroom platform such as Google Classroom.

Putting the workshop room in order.

Meeting 2

Duration: 3h

Description.

This meeting will be dedicated to working with a laser plotter !

We will learn what a laser plotter is and how it works. We will go through the entire process together: from the proper preparation of files in Inkscape, through working with a dedicated laser plotter program, to the correct and safe work with the plotter itself. Each Participant will finish this meeting with a cut / engraved, designed item. It's going to happen!

15 min

Welcoming the people participating in the workshop. Introduction of the subject of the workshop.

Participants take a seat at the previously prepared computer stations. We discuss the homework assignment. We ask the question: were there difficulties, problems with something? At the end of this part of the workshop, we go to the laser plotter stand(s).

15 min

A story about laser plotters and a demonstration of the capabilities of this tool.

The educator, in the form of an interactive lecture, presents the machine(s), encouraging those participating to actively join in the discussion.

He asks questions such as:

What is a laser?

What is created during combustion?

How does the laser plotter know what to cut or engrave?

What can such a laser plotter be used for?

In this part of the workshop, it is a good idea to use objects made earlier on the laser plotter.

This will make it easier for those attending to visualize the multitude of applications for which it can be used.

The educator then talks about the applications for which this type of equipment is used in industry and hobby applications.

We return to the computer stations.

15 min

A short presentation about laser plotters.

The educator presents the following in the form of an interactive lecture:

1. How does a laser plotter work?

1a. Light source

1b. Mirror system

1c. Lens

1d. Nozzle with blowing

2 What materials can and cannot be cut on a laser plotter under any circumstances?

3. exhaust filtration system: why is it necessary?
4. types of laser work: cutting, linear engraving, continuous engraving
5. examples of realizations made on a laser plotter - a demonstration of inspiration
6. CAM type software - introduction

15 min

Break

Those participating in the workshop are obliged to leave the computer stations.

45 min

Working with CAM type program.

Depending on the laser plotter you have, before the workshop we make sure that we have the latest version of the dedicated CAM program for the machine (Lightburn / RDWorks / Ruby etc.) installed on the computers.

Depending on the level of sophistication and age of the group, the presentation of the content should be selected so that the level of complexity is understandable and accessible.

The educator presents and explains the following content step by step.

Those participating in the workshop repeat the activities. The educator makes sure that everyone understands the content discussed.

1. colors and their importance for the work of the machine - we prepare a project accordingly in Inkscape based on the projects created by the people participating in the workshop created in the homework.
2. what is the .dxf /.svg format?
3. export designs to vector formats.
4. what are CAM type programs?
5. what is g-code / z-code?
6. importing designs into a CAM program
7. navigating through the CAM program - a brief overview of the program's UI.
8. setting machine parameters: type of operation, power, speed.
9. setting the sequence of operations.
10. Save the G-code program on the medium appropriate for the machine you have: USB flash drive, SD card or send via wi-fi directly to the machine.

15 min

Break

It is mandatory for the people participating in the workshop to leave the computer stations.

35 min

Working with the machine.

1. basics of machine operation: health and safety rules, switching on the machine, switching on the air filtration system (if it is not switched on automatically), switching on the tube cooling system (if the machine requires it and it is not switched on automatically), discussion of the machine control panel: moving the head in the X and Y axes, moving the table (Z axis).
2. discussion of the specific behavior and operations that the machine performs at the start (basing, checking whether the tube cooling system is on, etc.).
3. setting the local point 0,0 (Origin).
4. Uploading a previously prepared design to the machine.
5. basing the Z axis - proper lensing of the laser beam.
6. operation of the machine.
7. What to do when the machine finishes work? Rules for cleaning up, removing leftovers (outcuts), turning off the machine and peripherals.

It would be good if those participating in the workshop could go through the whole process by themselves: from the design to the execution of the item, for example, working in groups of 3-4 people, under the watchful eye of the instructor and other participants.

15 min

Brief summary of the work and the workshop day.

Evaluation - final round

Individuals participating in the workshop name 1 thing that they liked the most during the class. The educator encourages everyone to speak up.

Putting the workshop room in order.

Meeting 3

Duration: 3h

Description.

This meeting will be devoted to further acquiring knowledge in the design and operation of laser plotters. There will also be time to work on your own - both with Inkscape and plotters. This is a day of concrete projects!

5 min

Welcoming those attending the workshop. Introduce the topic and plan of the workshop. Participants take a seat at the previously prepared stations.

40 min

Working with the program. The educator presents and explains the following content step by step.

Persons participating in the workshop repeat the activities. The educator makes sure that everyone understands the content discussed.

1. advanced editing of nodes
2. operations on objects: boolean
3. tools: guidelines, ruler, align
4. snapping
5. isometric design, or 3D in 2D

<http://ahninniah.blogspot.com/2013/04/isometric-projection-in-inkscape.html>

6. find and replace

15 min

Break

It is mandatory for those participating in the workshop to leave the computer stations.

45 min

Own work of persons participating in the workshop.

Under the watchful eye of the Educator, persons participating in the workshop design objects and prepare files for the laser plotter.

The Educator answers ongoing questions and randomly repeats the content presented during the previous days, for example: tell me, what is the height of a layer?

It may happen that some of the people attending the workshop have no idea what they want to design and make on the plotter. For such a situation, it is useful to prepare some universal theme, such as a bookmark / mug pad / notebook cover, etc.

15 min

Break

It is mandatory for those participating in the workshop to leave the computer stations.

30 min

Continuation of own work of persons participating in the workshop.

The educator makes every effort to ensure that each person attending the workshop creates a project and prepares a program for the laser plotter.

The educator assists with both the program and working with the machine.

15 min

Summary of the workshop day and the entire workshop series.

People participating in the workshop list 2 things they enjoyed most in all the classes. Educator encourages everyone to speak up.

Putting the workshop room in order.

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