

ArtTek for Teens: 3D Printing Workshop

High School After-School Program

10-Week Syllabus

Course Description

This hands-on, project-based workshop introduces high school students to the exciting world of 3D printing technology. Over 10 weeks, students will learn the fundamentals of 3D design, printing techniques, and real-world applications while developing valuable technical and creative skills. The program combines theory with extensive practical experience, allowing students to complete multiple projects while gaining confidence with cutting-edge technology.

Learning Objectives

By the end of this course, students will be able to:

- Understand the principles and mechanics of 3D printing technologies
- Design objects using CAD software
- Prepare and optimize files for successful 3D printing
- Operate, calibrate, and maintain 3D printers
- Troubleshoot common printing issues
- Apply finishing techniques to printed objects
- Identify career paths and applications of 3D printing in various industries

Materials Required

- 3D printers (provided)
- Laptops/computers with design software installed (provided)
- Various filaments (PLA, PETG, etc.)
- Basic tools for post-processing
- Safety equipment

Weekly Schedule

Week 1: Introduction to 3D Printing

- Course overview and safety procedures
- History and evolution of 3D printing technology
- Different types of 3D printing methods (FDM, SLA, SLS)
- Overview of materials and their properties
- **Hands-on activity:** Simple printer demonstration and first print observation

Week 2: Basics of 3D Design

- Introduction to CAD software (TinkerCAD/Fusion 360)
- Understanding 3D space and coordinates
- Basic shape creation and manipulation

- **Hands-on activity:** Design a simple keychain or name tag
- **Homework:** Complete the design started in class

Week 3: Design Principles and Techniques

- Design principles for 3D printing (overhangs, supports, wall thickness)
- Advanced design tools and techniques
- Importing and modifying existing designs
- **Hands-on activity:** Design a functional object (phone stand, desk organizer)
- **Homework:** Refine design based on feedback

Week 4: Slicing and Print Preparation

- Introduction to slicing software
- Understanding printer settings (layer height, infill, speed)
- How to optimize designs for printing
- Support structures and when to use them
- **Hands-on activity:** Slice and prepare previous designs for printing
- **Project milestone:** Submit final design files for first project

Week 5: Printer Operation and First Prints

- 3D printer components and how they work
- Proper setup and calibration techniques
- Loading filament and initiating prints
- **Hands-on activity:** Students print their first completed designs
- Troubleshooting initial print issues
- **Project milestone:** Complete first print project

Week 6: Advanced Design Challenges

- More advanced CAD techniques
- Designing interlocking or moving parts
- **Hands-on activity:** Begin design of a multi-part object or mechanical assembly
- **Homework:** Continue work on advanced design project

Week 7: Material Science and Selection

- Detailed exploration of different filament types
- Material properties and best uses
- Special filaments (flexible, wood-filled, metallic)
- Print settings for different materials
- **Hands-on activity:** Test printing with different materials
- **Project milestone:** Finalize advanced design project

Week 8: Troubleshooting and Maintenance

- Common printing problems and solutions
- Printer maintenance and calibration
- Advanced slicer settings for problem-solving
- **Hands-on activity:** Diagnose and fix intentionally problematic prints
- **Project milestone:** Begin printing advanced design project

Week 9: Finishing Techniques

- Post-processing methods (sanding, filling, painting)
- Assembly techniques for multi-part prints
- Surface treatments and coatings
- **Hands-on activity:** Finishing and assembling final projects
- **Project milestone:** Complete advanced design project

Week 10: Applications and Final Projects

- Career opportunities in 3D printing
- Industry applications and case studies
- Future of 3D printing technology
- **Final project presentation:** Students demonstrate and explain their completed projects
- **Course wrap-up:** Certificate presentation and next steps

Assessment and Evaluation

Students will be evaluated based on:

- Attendance and participation (25%)
- Completion of weekly assignments (25%)
- Basic skills demonstration (25%)
- Final project quality and presentation (25%)

Safety Guidelines

- Always wear appropriate safety equipment when operating or handling printers
- Never touch hot components or moving parts during printing
- Follow proper procedures for handling and disposing of materials
- Report any equipment malfunctions immediately

Resources and References

- Online tutorials and design repositories
- 3D printing community forums
- Reference books and articles (provided digitally)
- Local makerspace and industry connections

This syllabus is subject to change based on student progress and interests.

Instructor: [Instructor Name]

Email: [Email Address]

Workshop Location: [Location]

Meeting Times: [Days and Times]