

Mechanical Movement Course Outline/Proficiencies

High Point Regional High School

Purpose:

In the physical world, mankind's climb from the primitive has, from the start, depended upon the application of power. In the beginning, it was only the power of human muscle. Long after the caveman era came the harnessing of animal power, much later still, the harnessing of natural forces such as wind and water. Today we are much more dependant on the development and use of power than ever before.

Power means machines, both to generate it and use it. Webster defines machine as "Any device consisting of two or more parts, which may serve to transmit and modify force and motion so as to do some desired kind of work." Automation has already multiplied the development of the highly sophisticated machines, and will continue to do so. Yet every machine, new or old can be resolved into a combination of no more than six basic mechanical elements. These are the pulley, wheel and axel, inclined plane, wedge and the screw.

The seeds of ingenuity, always present in the human makeup, have sometimes born strangely premature fruit. Automation itself, for example, began some time in the middle ages with an unknown miller who wanted to grind grain as rapidly as the wind allowed.

Making automata is hard. It requires a wide range of construction skills and an understanding of certain mechanical and engineering principles. It is this ingenuity and understanding of basic machines that will be added to the creative and artistic ability of the student to design and develop new and remarkable automated devices. Students will be introduced to the history and principles of mechanical motion and mechanisms. Students will learn the importance of automata by designing and building various devices and mechanisms, such as movable toys and sculpture. This course will also develop the students skill in drawing, design, and hand and power tool use.

Method of Instruction:

Mechanical Motion is divided into specific areas of instruction, each being taught through lecture class discussion, worksheets, research, videos, demonstrations, group and individual projects. Students will build various automata and mechanisms, using power and hand tools.

Course Proficiencies

Unit 1 Course Introduction and Safety Guidelines

Students will be able to:

- Understand the course expectations and timeline for instruction.
- Understand the discipline policy that relates to behavior in this class
- Outline the specific safety guidelines of the classroom.

Unit # 2 Introduction to technology, engineering, and design

Students will be able to:

- Define Technology
- List and describe the technological method
- Define engineering
- List and describe the specific areas of engineering
- Differentiate between technology, engineering, and science
- Define design
- Draw and describe the design loop
- List the benefits of using the design process
- Describe different presentation techniques, their advantages and drawbacks
- Describe the "Edisonian Nature"

- Define and describe “The workmanship of risk”
- Define and describe “The workmanship of certainty”

Unit # 3 **Group Work**

Students will be able to:

- Demonstrate effective skills for interaction with others
- Demonstrate the ability to work with people who are different from oneself
- Demonstrate a positive attitude
- Demonstrate skills in responding to criticism and providing constructive criticism to others
- Demonstrate an understanding of the importance of personal skills and attitudes towards job success
- Demonstrate positive work behaviors

Unit # 4 **History of Automata**

Students will be able to:

- Understand the development of automata, its origins and evolutionary path
- Categorize and explain basic simple machines, and mechanisms
- Provide examples of automata and place them in chronological order

Unit # 5 **Construction and Safety**

Students will be able to:

- Safely operate the machines that are available for use in room 120
- Safely use power tools made available by the instructor
- Safely use hand tools
- Read a ruler

Unit # 6 Design and Setup for Project One

Students will be able to:

- Identify and discuss cranks, pulleys, links, gears, and cams
- Implement the design process for a mechanical device that uses the above mentioned mechanisms
- Gain an in-depth understanding of the design process and the problems that will inevitably arise
- Gain an understanding and an appreciation for solutions to design problems
- Understand Bloom's Taxonomy and how it relates to the reworking ideas and the design process
- Develop a manufacturing plan to efficiently complete the project

Unit # 7 Building Project One

Students will be able to:

- Implement steps in the manufacturing process to produce the mechanical device designed in Unit 6
- Apply acquired knowledge into the development of a working prototype.
- Implement teamwork skills to maximize efficiency
- Familiarize oneself with material for usage and processing
- Gain experience by safely operating the machines, hand and power tools located in the shop.

Unit # 8 Project Two

Students will be able to:

- Students will further their knowledge in design and manufacturing by building a second automata creation.
- Students will gain knowledge of and implement additional mechanism such as additional cams and gears, levers, linkages, ratchets, crank and sliders, Geneva Stops, couplings, etc.

Unit # 9 Presentation

Students will be able to:

- Create a portfolio of the years work
- Present a journal documenting the creative process

Submit a written summary of the year