

Ketchikan High School Course Guide

Course Title: Principles of Technology-Year 1 **Course Length:** One Year
Department: Science
Grade: 10-12

- **Course Description:**

Principles of Technology is designed for the student who wants an understanding of technological systems that will enhance his/her employability as well as prepare the student for college and technical schools.

It is a course short on theory and long on applications. The course is 80% computer-interfaced "hands on" lab equipment. The computer is used as a data acquisition center as well as a tutor. There are eight stations in which students will work within a team to solve problems that are based on applied physics. Students should have a minimum of algebra 1 completed, but algebra 2 and trigonometry are desired.

The course is focused around the understanding of how technological systems work by looking at individual components of those systems and understanding how they work together.

This course is designed so that the teacher is more of a facilitator and the students are expected to engage in peer tutoring.

The following are the specific areas that build upon each other in this sequence:

1. Force
2. Work
3. Rate
4. Resistance
5. Energy
6. Power
7. Force Transformers

Each unit above is divided into four areas that demonstrate and offer problem solving. They are: Fluid, Thermal, Electrical and Mechanical

- **Course Outcomes/Standards:**

Standard 1. The student will be able to use linear algebraic equations to convert units and solve problems.

Standard 2. The student will be able to solve problems in both English and SI (metric) systems and convert between them.

Standard 3. The student will apply principles learned in each unit to see how current systems operate by reading assignments, discussions and labs as well as written problems.

Standard 4. The student will complete all 28 labs with a minimum score of 85% on each lab.

Standard 5. The student will write about applications of principles within systems clearly and show viability.

Standard 6. The student will investigate careers that utilize the skills of a person knowledgeable in technology and problem solving.

• **Content/Performance Indicators:**

- 1.1 Solve problems in the seven areas listed in the course description. Following are specific areas:
 - force as a push or a pull
 - change in voltage
 - change in pressure
 - change in temperature
 - mechanical work, force X displacement
 - fluid work pressure X volume
 - electrical work using charge in coulombs
 - mechanical rate, both linear and rotational
 - thermal rate using conductivity constants
 - fluid rate in mass and volume flows
 - electrical rate - the ampere
 - mechanical resistance - coefficient of friction
 - thermal resistance - properties of materials
 - electrical resistance - ohms law
 - fluid resistance - pressure and volume
 - mechanical energy - gravitational potential and kinetic-rotational and linear
 - electrical energy, stored and transferred
 - thermal energy: change in temperature and calories, Btu's and the Joule
 - fluid energy, transfer and gravitational potential
 - mechanical power, the watt and horsepower
 - thermal power, rate with respect to time and energy
 - electrical power, using ohms law, current and voltage and charge
 - force transformers in mechanical systems
 - force transformers in electrical systems using the transformer
 - force transformers with the transfer of energy between the four areas of year 1
- 2.1 Solve problems in both the English and SI (metric) systems as this is required knowledge for technological work in the U.S.
- 3.1 Each of the seven units will have reading and essay assignments to be completed and critiqued and lab work will be monitored and peer teaching will be observed by the instructor.
- 4.1 Use the data acquisition capabilities of the PT computer program to self-monitor lab grades and repeat any lab below an 85%.
- 5.1 Seek out real-life applications and be able to relate lab results with these applications.
- 6.1 Research jobs and career opportunities available to those with technology education. Investigate post secondary education in technology and applied physics.

- **Desired Affective Outcomes:**

Understand that modern society is based on creative application of science which we know as technology.

See technology as a collective of individual scientific principles into a system — whether a toaster or the space shuttle, each can be broken down into fundamental systems as learned in the course.

Gain basis for continuing education at higher levels of technology at the college or technical school level as a result of taking the Principles of Technology course.

Become good problemsolvers as a result of this course of study.

- **Major Activities**

Each of the seven areas in the course description above will include two quizzes that each cover two sub-units within a major unit. Then, the student will also complete a written essay of the application of a sub-unit concept in a technological system. (examples below)

Unit 1 - Force

subunits: Mechanical
 Fluid
 Thermal
 Electrical

Quiz 1-Force, problems to solve in mechanical and fluid systems.

Complete essays to show understanding of force in mechanical and fluid systems.

Quiz 2-Force, the same as Quiz 1, except thermal and electrical systems will be used to solve problems in force as well as written applications.

Students are given as many chances to complete a lab as they want, but must have at least an 85% to earn credit for that lab. Students may work on labs after school if they find they are falling behind. They are encouraged to help others, and peer tutoring is a major component of the class.

Each student will provide the class with a list of possible careers that they have investigated. They must give an oral report to the class on at least one particular area that they are most interested in.

- **Instructional Materials:**

Center for Occupational Research and Development (CORD) texts
Lab manuals from Innovative Technology in Education (ITE)

- **Technology Resources**

Computers that interface with lab stations
Lab stations by DEGEM

- **Audio Visual**

Video equipment