High School Technology Education

Josh Weissman
Poudre High School, Fort Collins, CO
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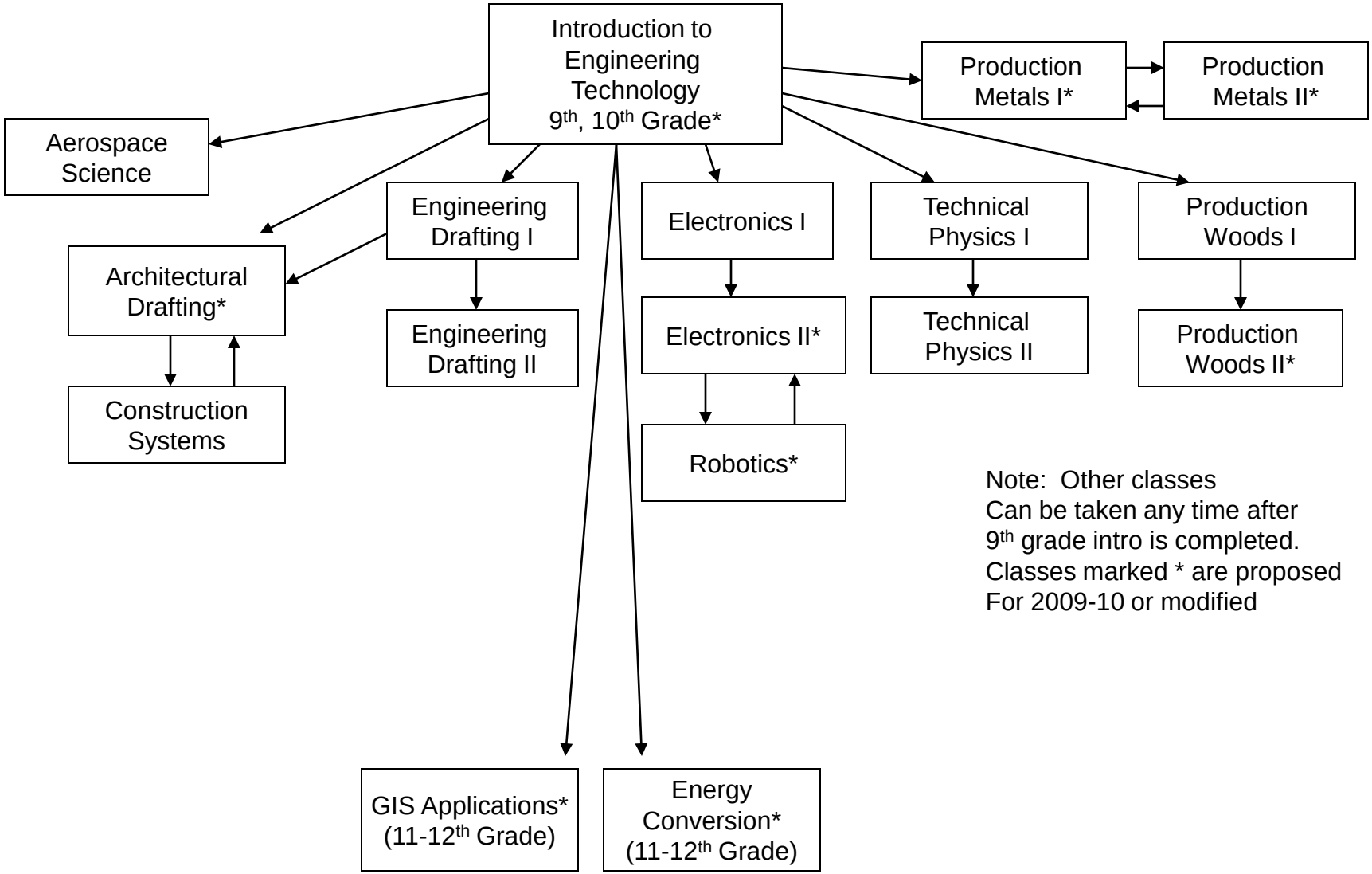
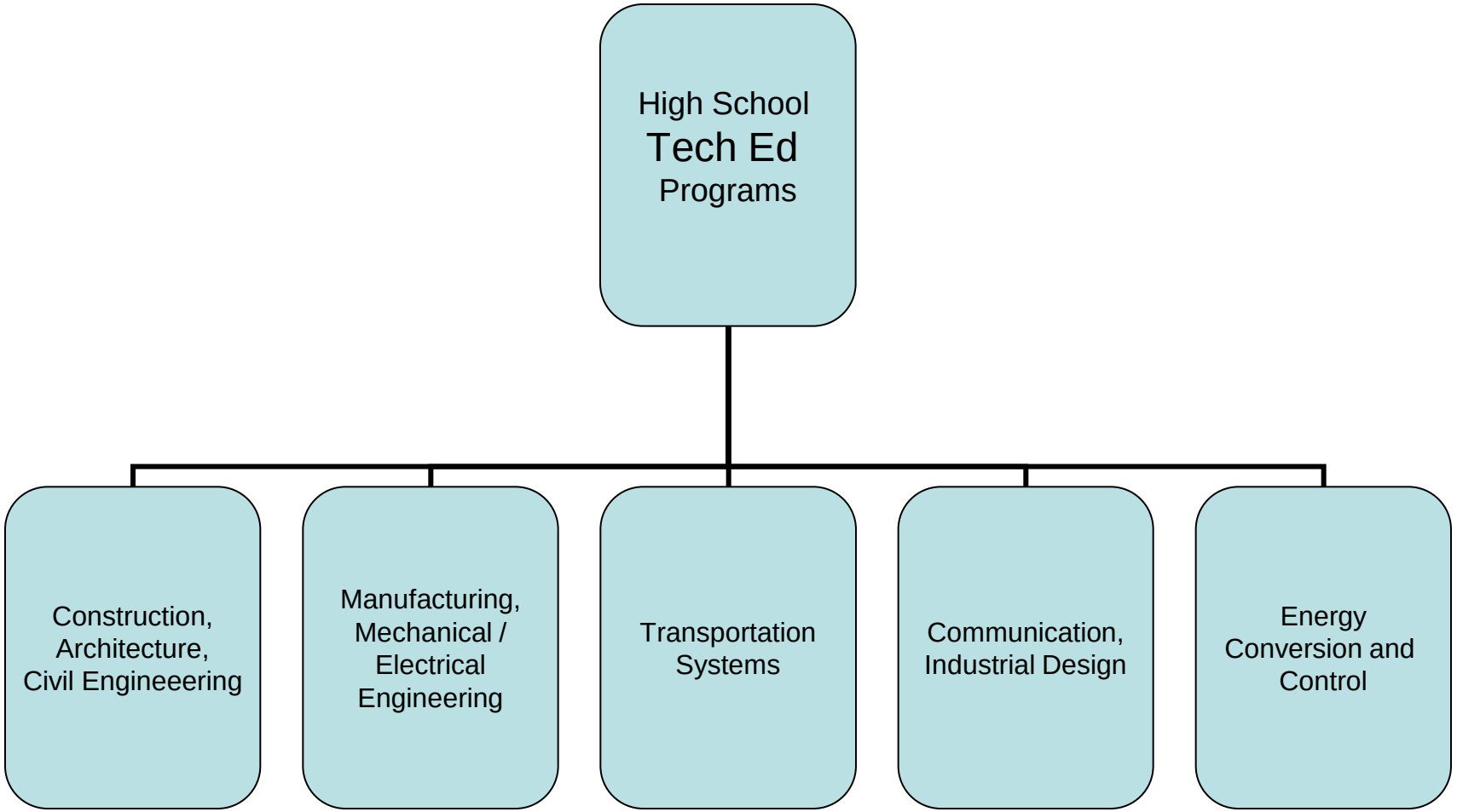


Note: Other classes
Can be taken any time after
9th grade intro is completed.
Classes marked * are proposed
For 2009-10 or modified

Post Secondary Career Clusters



General Assessment Criteria

The following assessment criteria are integrated into all Technology Education Programs in PSD.

- A - Investigate
Students need to clearly define the design task. Students must then produce documented evidence of relevant research and analysis showing sources of their research. This step is essential to provide knowledge and inspiration to help in their design work.

- B - Design
Students show their ability to be creative by generating several ideas explaining the details for each idea. They select the most feasible idea and develop it into a solution.

- C - Plan
Planning is of primary importance in the demonstration of the ability to organize both time and resources. In order for this stage to be assessed, students must document their work plan and justify their choice of alternatives.

- D - Create a Product/Solution
Creating products/solutions is the aim of all technology programs. In order for this stage of the design cycle to be assessed, students must submit a process journal with all amendments to the planning stage as well as the product itself.

- E - Evaluate
Evaluation is necessary to show the ability to critically analyse and suggest where improvements can be made. In order for this stage in the design cycle to be assessed, the student must provide documentation of the assessment of both the product/solution and process, and a form of self-assessment.

- F - Attitudes in Technology
This assesses the students' approach to the subject and looks at personal engagement, self motivation, independence, attitudes towards safety, cooperation and respect for others.

The Traditional Design Cycle

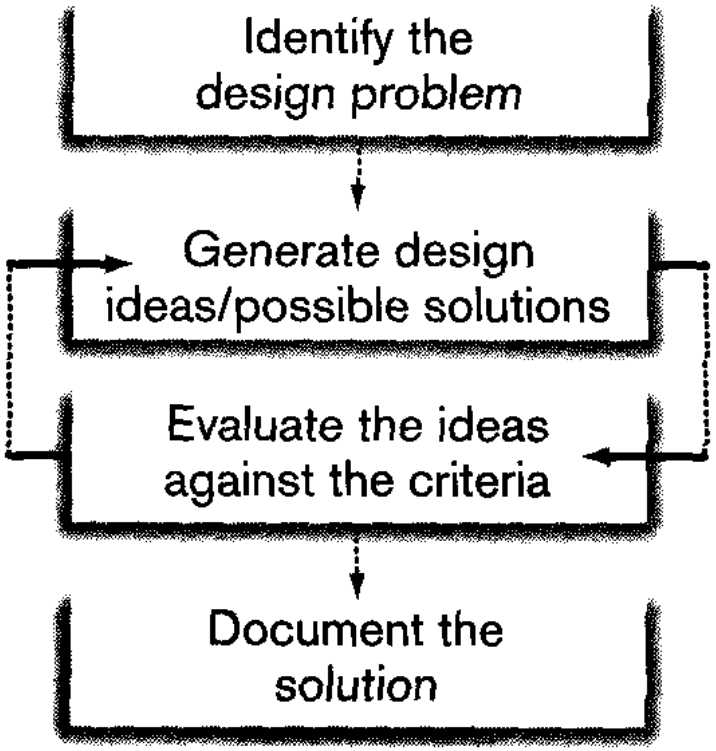


FIGURE 1.6
Simplified design model

The “Updated” Design Cycle

The Curriculum

Students are expected to solve problems using the design process to investigate, design, plan, create prototypes and evaluate their work. They are guided in order to acquire ***Life Skills*** such as:

- *Research*
- *Analytical Observations*
- *Problem Solving*
- *Practical and fine motor skills*
  (Manual Competency)

Through a 4 year series of Tech Ed courses, students are engaged with the following aspects of Technology:

- *Designing Skills*
- *Practical work with materials such as wood, metals, and plastics*
- *Electronics*
- *Structures*
- *Mechanisms*
- *Graphics and Drawing Skills*
- *Product Analysis*
- *Health and Safety Protocols*
- *Appreciation of the historical changes in Design*
- *Environmental and Social impact of Technology*

Career and Technology Education in PSD

CTE incorporates the following:

- *Consumer and Family Studies*
- *Business and Marketing*
- *Computer Sciences*
- *Technology Education*

CTE

Preparing Students for 21st Century Careers!

We are preparing students for jobs that do not yet exist.

If they are not yet defined,
what can we possibly know about these jobs?

The False Dichotomy

- Blue Collar / White Collar
- Post-Industrial Economy
- Knowledge Workers vs. Menial Labor
- Separating *Doing* from *Thinking*

- *Economic Success*
- *Psychic Distress*

What we do know about 21st Century Careers:

- “The World is Flat”
- An “Educational Arms Race” will not save us from the coming Economic Upheaval
- White Collar labor will be subjected to the same deconstruction as manual labor:
  - *Divided by sub-routines*
  - *Out-sourced*
  - *Automated*

The Real Dichotomy

- What types of work, labor, or services are electronically deliverable - with little or no negative impact on quality?
- What types of work, labor, or services are tied to specific physical locales or require real face to face interaction?
- The surgeon vs. the radiologist
- The accountant vs. TurboTax

Rule-Bound, computer-like hierarchies

vs.

Vague, ill-defined, ambiguous scenarios requiring Sound Judgment

What, then, is the indispensable *Human Element* of Work?

What I learned as a Diesel Mechanic

- Creativity:
  - Knowing what to do when the rules run out
  - A byproduct of *mastery*
  - It is cultivated through long practice

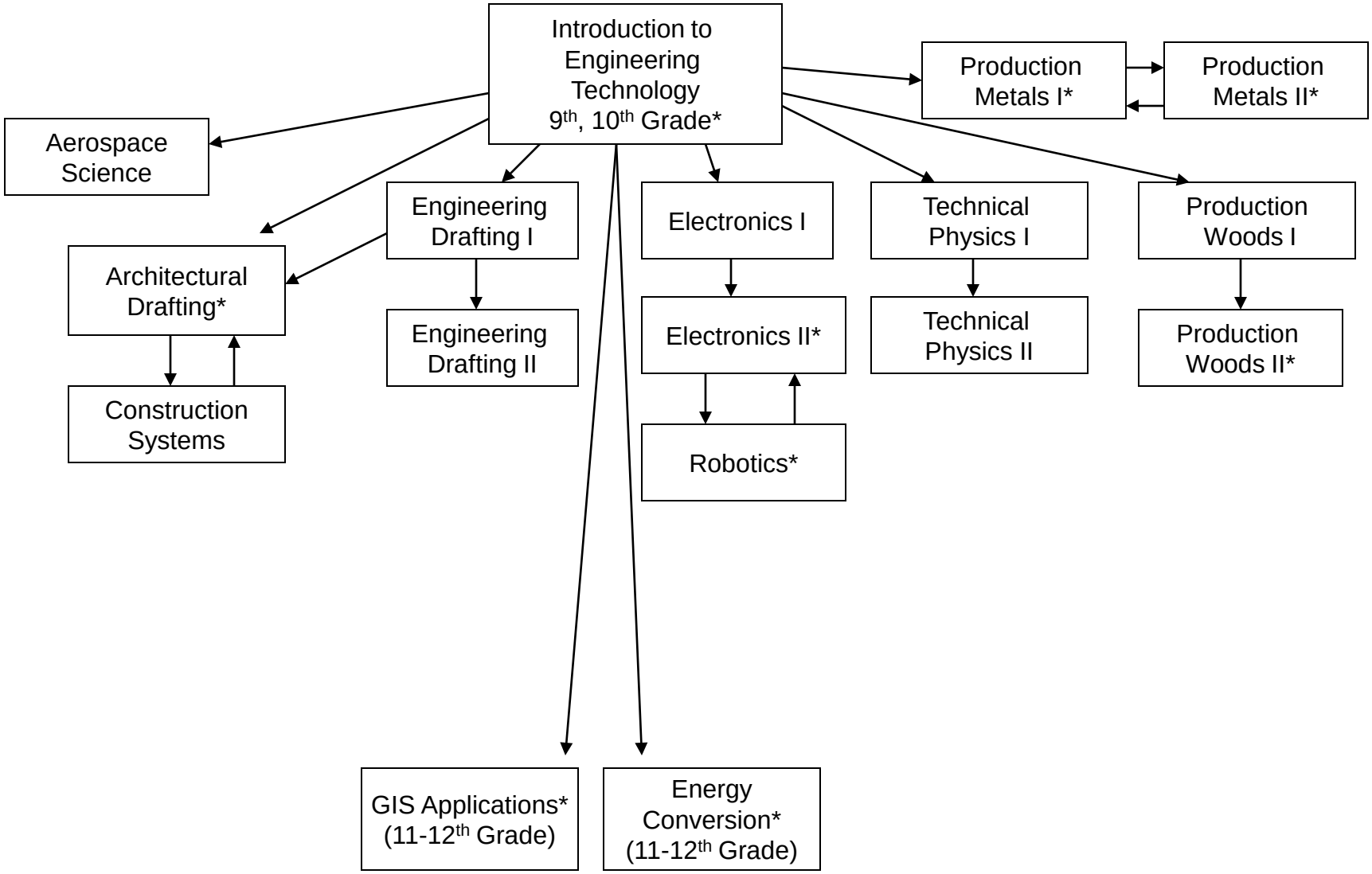
- Trouble Shooting is:
  - Not just problem solving
  - But *Problem Finding*

Real world problems present themselves with too much information.
A critical process is figuring out what is pertinent and what is not

Rationale and Purpose of Tech Ed

- Career Counseling and Vocational Training
- Honor labor of the Trades and Technicians
- An argument in favor of the “Useful Arts”
- Due credit to the cognitive richness of manual work
- To demonstrate that work that is straightforwardly useful can be intellectually stimulating and financially rewarding as well.

How can the PHS Tech Ed program be an asset to the GK-12 Project?



Intro to Engineering Concepts and Technology

Objectives:

1) Students will:

2) Demonstrate an understanding of and proficiency in the practical application of the Design Cycle to assist in creative problem solving. Specific steps to include: Investigation, Planning, Fabrication, and Evaluation.

3) Demonstrate an understanding of and proficiency in making and using working drawings.

4) Demonstrate an understanding of and proficiency in measurement, calculation, planning and lay-out techniques utilizing both the English and Metric systems.

5) Gain a Visual Literacy and apply elements of design to manufacturing projects.

6) Estimate and calculate the cost of materials and labor involved in various building scenarios.

7) Measure, layout, and machine materials within acceptable industrial tolerances.

8) Understand and follow all general safety procedures in the shop environment.

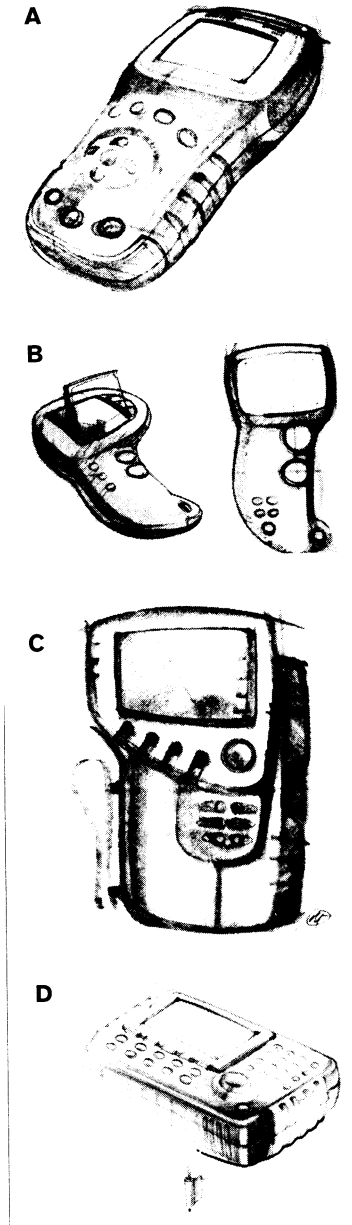
9) Understand and follow all specific safety procedures for the tools and machines used in the Tech. Lab for the completion of beginning projects.

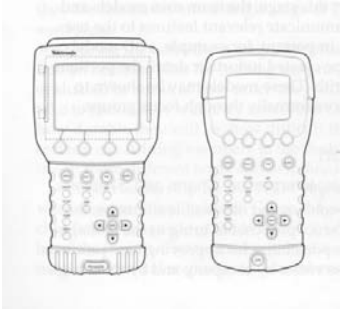
10) Demonstrate an understanding of the ethical considerations that are important in the development, selection, and use of technologies.

11) Demonstrate the good work habits and productivity necessary for success in a professional work force.

Product Development

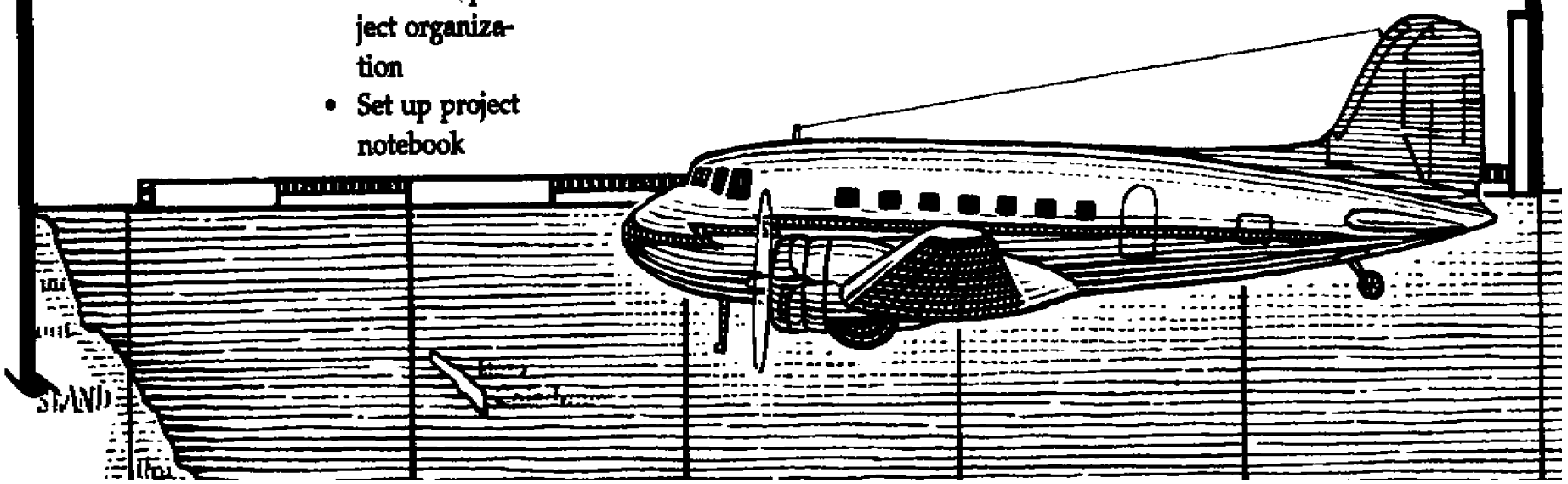
- Ideation:
  - During this stage the ability to draw a readable freehand sketch is vital to “selling” your idea.
- May work closely with industrial designers
- These drawings and models are often shown to clients for early feedback



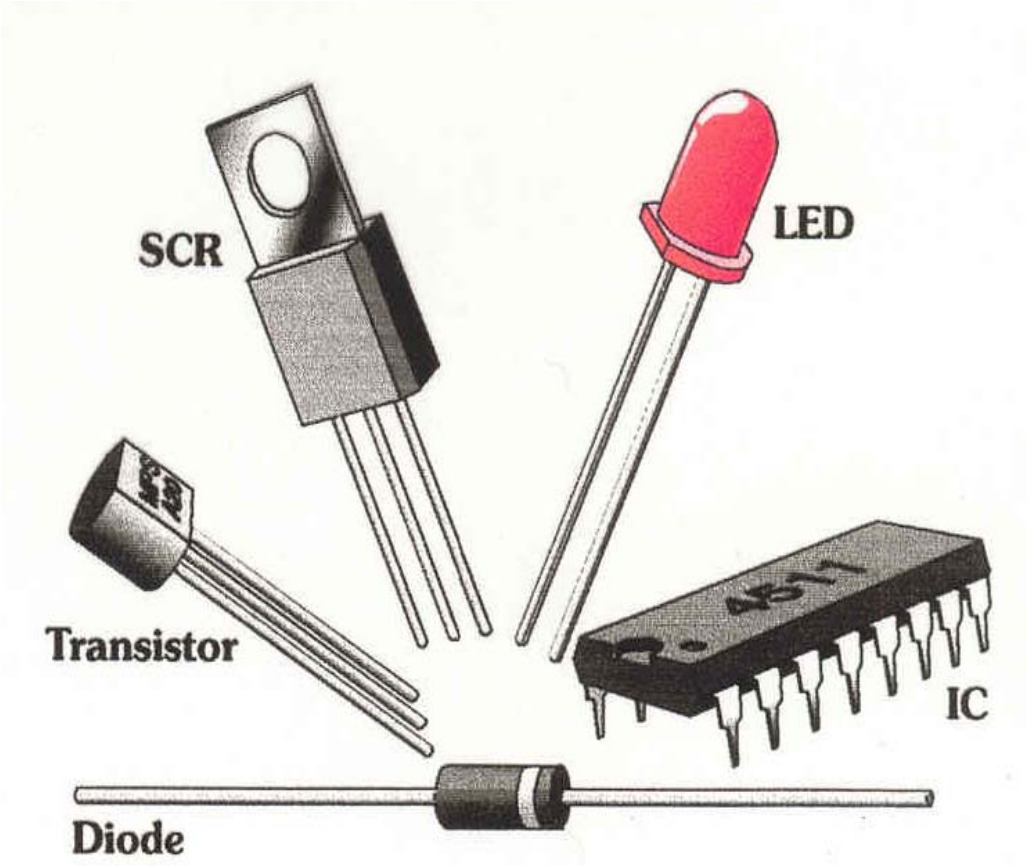


Project Life Cycle

Concept	Definition	Design	Development or Construction	Application	Post-Completion
• Marketing input • Investigation of technology, feasibility studies, etc. • Survey of competition	• Specify objectives • Establish PCT targets • Quality Assurance procedures • Set up control system • Establish project organization • Set up project notebook	• Architectural, engineering • Design reviews • Assessment reports • Revise cost & performance targets	• First units • Begin sales campaigns • Quality control procedures	• Install and field test • Begin de-staffing • Advertising begins • De-bug and redesign	• Final de-staffing • Post-mortem analysis • Final reports • Closeout



Electronics Fundamentals



Electronics Fundamentals

- **<u>Unit Overview:</u>**
- **Weeks 1-3: Introductions, the Structure of Matter, Units of Measure:** Perhaps the most important weeks in the course as we go through introductions: to each other, to the electronics lab environment and to general safety procedures. Introductions to the atomic structure of matter and the motion of sub-atomic particles. Introduce the electron-flow theory of electricity and the necessary requirements for an operating electrical circuit. Scientific notation and Metric Prefixes.

18. The name for a unit of measurement for a quantity of electricity is a Coulomb. This represents 6,240,000,000,000,000,000 or

    6.24 X 10 to the 18^{th} power.

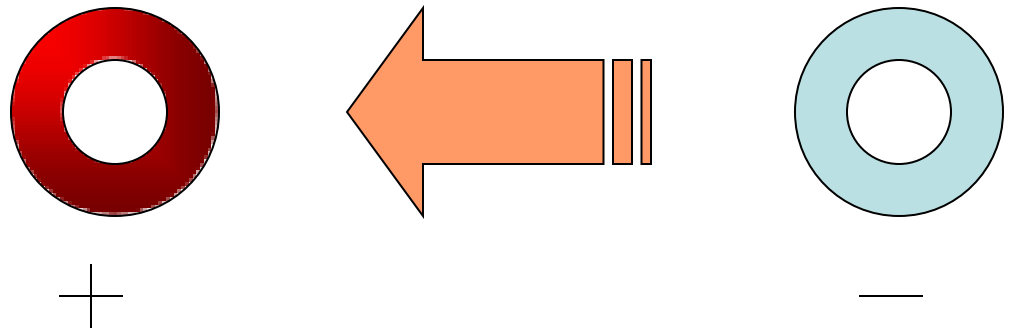
19. The two basic laws of electrostatic charges are

20. - Like charges repel

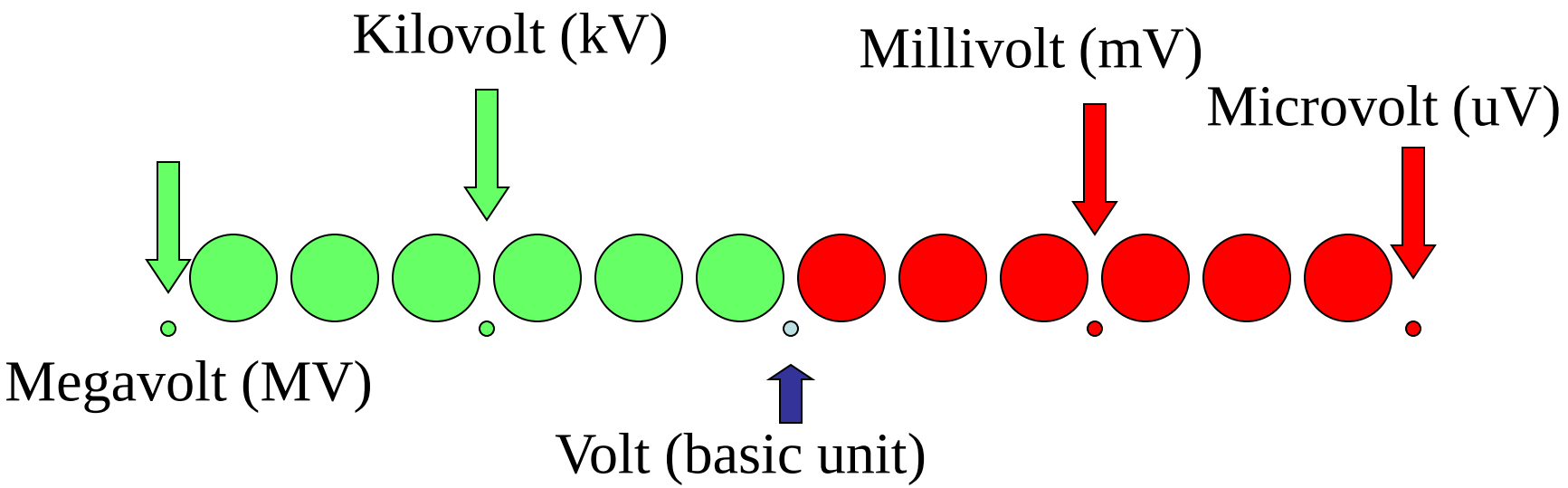
21. - Unlike charges attract.

22. The invisible lines of force that surround a charged body are called the electrostatic field.

If a conductor is connected between two different charges the electrons will flow from the negative charge to the positive charge. The electrons will continue to flow until there is no difference in potential.



This chart shows the relationship of all prefixes



Larger than basic unit

Smaller than basic unit

Electronics Fundamentals

- **Weeks 3-5: Solid State Components, Schematic Diagrams**. Students sink their teeth into the meat of the course as we investigate the structure of semi-conductors and the components this remarkable material allows us to create. Schematics demonstrate the importance and power of graphic communication. Circuitry gets more complex.
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Electronics Fundamentals

Electronics Fundamentals

- **Weeks 5-7: Ohm's Law, Energy, Power.** Students learn elements of circuit design. Apply simple calculations for current, resistance, voltage, and power in series circuits.
- **Weeks 7-10: Series-Parallel Circuits, Induction & Transformers.** Students reinforce planning and lay-out techniques, as they gain greater appreciation of the Schematic Diagrams and the benefits of planning ahead. Begin calculations for parallel circuits.

The Oscilloscope

- The oscilloscope is basically a graph-displaying device - it draws a graph of an electrical signal. In most applications the graph shows how signals change over time: the vertical (Y) axis represents voltage and the horizontal (X) axis represents time. The intensity or brightness of the display is sometimes called the Z axis. (See Figure 1.) This simple graph can tell you many things about a signal. Here are a few:
- You can determine the time and voltage values of a signal.
- You can calculate the frequency of an oscillating signal.
- You can see the "moving parts" of a circuit represented by the signal.
- You can tell if a malfunctioning component is distorting the signal.
- You can find out how much of a signal is direct current (DC) or alternating current (AC).
- You can tell how much of the signal is noise and whether the noise is changing with time.
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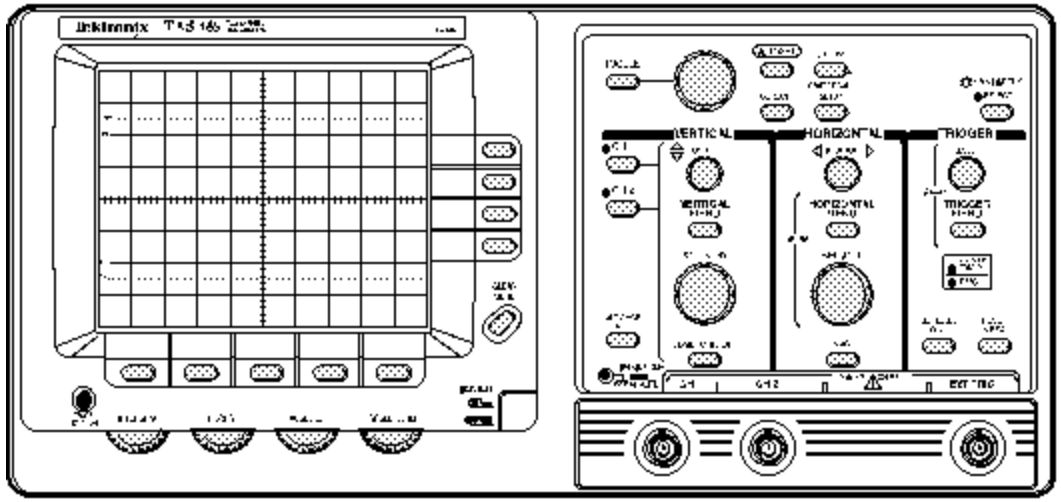
Figure 1: X, Y, and Z Components of a Displayed Waveform



Soldering Components for an Independent Project

Electronics Fundamentals

- **Weeks 10-13: Magnetism & Electromagnetism.** Students begin to explore the most complex and mysterious aspect of this course. Invisible lines of force, AC power generation.
- Introduction to more complex circuitry, and the design and lay-out of an Independent Project.
- **Weeks 13-Finish: Independent Electronics Project, Household Wiring.** Students will have the time to "catch-up" on all the required operations and then will be able to put their new skills to work and push their abilities to the next level as they design and build a project of their own. Or maybe two. Introduction to residential household wiring if time allows.

Impetus for joining the GK-12 Project

- Search for Inspiration
- Renewal of Course Content
- Tricks for short-circuiting student apathy
- Relevant connections to authentic real-world activities.