

McGraw Central School
Syllabus for Design and Drawing for Production

Course Description

Design and Drawing for Production is a course intended as an introduction to a broad range of technological fields. Each topic is presented as a real-life or modeled problem to be solved. To solve the problems, you will need to use knowledge and skill that you already have. You will also need to learn new things and new skills in order to solve the problems.

Contact Information

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(Email is the best way to contact me)

Course Objectives

At the end of this course, you will be able to:

- Demonstrate improvement in your ability to sketch ideas.
- Demonstrate safe practices in the lab.
- Analyze all types of technology to identify how the principles of statics inform design.
- Articulate how the laws of thermodynamics govern the design of technology.
- Analyze different types of technology in terms of mechanical operation.
- Describe the function of electricity within various technologies to the degree that you can make educated assumptions regarding operation.

Texts and Supplies

- You will need to have a sketchbook for sketching exercises and ideation (drawing solutions) If you prefer, you can make a sketchbook in class.
- Handouts will be given in class. A notebook or folder will help you organize.
- Activity supplies will be provided.

Grading System

Participation	20%
Exercises & Worksheets	20%
Unit Tests	20%
Projects	40%

Attendance Policy / Lateness / Late Work

- In order to do most of the work for this course, you must be in class. Therefore attendance is critical. Excessive absence will result in a significantly lower grade, unless excused, and other arrangements have been made.
- The policy for tardiness for this course is school policy: after three unexcused tardies, an after school detention will be assigned.
- Late projects will be accepted, but points will be deducted, depending on the circumstances.

Rules of Conduct

It is expected that all students will follow all school rules. Safety is the most important concept covered in this class, and any safety violations will be met with appropriate consequences.

Special Needs

Accommodations for testing or other academic assistance will be provided for students requiring these services.

Shop Time

Students wishing to work on projects outside of class must schedule time with Mr. Sanderson

Tentative Schedule

1. Safety in the Laboratory

- Importance of safety glasses
- Material Handling
 - Moving heavy objects
 - Handling chemicals
 - Handling hot substances
- Slip/trip/fall Hazards
- Electrical hazards
- Sharp tools
 - Cuts and punctures
- Other tools/equipment
- Housekeeping
 - Importance of shop organization
 - Cleanup procedures
 - Safe project storage
- Overhead hazards/falling objects

(Air Force Occupational and Environmental Safety, Fire Protection and Health Program, 2002)

2. Sketching and Visualization

- Tools
 - Types of pens/ pencils
 - Types of paper
- Sketching boxes
 - Review orthographic
 - Review oblique and isometric
 - Review perspective
- Sketching using the additive method
- Sketching using the subtractive method
- Sketching other shapes
- Visual artifact deconstruction
- Shading
- Communication
 - Signs
 - Diagrams
 - Graphic organizers
 - Instructions

(Hanks & Belliston, 1990)

3. Statics, and the Physics of Structures

Force

- Units of force
- Determining direction
- Determining magnitude
- Constructing vector diagrams
- Calculating net Force

Tension

Compression

Materials

- Strength-to weight ratios

- Breaking length

- Data tables

Equilibrium and moment

Live/Dead loads and allowable stress

Simple truss engineering

Building accurate and precise models

Testing models

Failure mode and effects analysis

Application in architecture

Application in transportation technology

Application in product design

(Zalewski & Allen,1998).

4. Mechanics and Simple Machines

- Units of work

- Calculating work

- Classical simple machines

 - Lever

 - Wheel and Axle

 - Pulley

 - Inclined Plane

 - Wedge

 - Screw

- Calculating mechanical advantage

- Application in transportation technology

 - Complex mechanisms

 - Calculating power

- Application in medical technology

 - Biomechanical systems

 - Peristaltic pumps

 - Life support systems

- Application in manufacturing systems

 - Deconstructing tools

5. Thermodynamics and Using Energy

Energy, entropy and the first law of thermodynamics
Units of energy
Forms of energy
 Mechanical
 Thermal
 Electrical
 Chemical
 Nuclear
 Radiant
Identifying types of energy conversion
What does renewable really mean?
Combustion engine types and functions
Precision work and modeling techniques
Constructing and troubleshooting an engine
Efficiency
(Pierce & Karwatka, 2010)

6. Electricity and Electronics

Electricity as a source of power
 Electron flow
 Direct Current
 Alternating Current
 Voltage
 Amperage
 Resistance
 Using Ohm's Law
 Wattage
Circuits
 Series circuits
 Parallel circuits
 Power supplies
 Testing circuits
Electromagnetism
 Relays and buzzers
 Electrical induction and transformers
Electrical energy conversion (electronics)
 Analog electronics
 Digital electronics
 Binary system
 Boolean logic
Programming
 Definitions
 Conditions
 Loops
 Languages

Physical computing
Electronic automation
Robotics

(Pierce & Karwatka, 2010)