**POE (Principles of Engineering) Course Outline:**

**Unit 1: Definition and Types of Engineering**

Lesson 1.1 Engineers as Problem Solvers

1.1.1 Past, Present and Future

Lesson 1.2 Engineering Team

Lesson 1.3 Careers in Engineering

1.3.1 Engineering

1.3.2 Engineering Technology

1.3.3 Distinction between Engineering and Engineering Technology

**Unit 2: Communication and Documentation**

Lesson 2.1 Sketching

Lesson 2.2 Technical Writing

2.2.1 Engineer’s Notebook

2.2.2 Technical Reports

2.2.3 Style

Lesson 2.3 Data Representation and Presentation

Lesson 2.4 Presentations

**Unit 3: Design Process**

Lesson 3.1 Design Process

3.1.1. Problem Identification

3.1.1.1. Design Brief

3.1.2. Problem Analysis

3.1.3. Information Gathering

3.1.4. Alternative Solutions and Optimization

3.1.5. Modeling

3.1.6. Testing and Evaluation

3.1.7. Presentation of Solution

**Unit 4: Engineering Systems**

Lesson 4.1 Mechanisms

4.1.1. Mechanical Advantage

4.1.2. Simple Machines

4.1.2.1. Levers

4.1.2.2. Inclined Plane

4.1.2.3. Wedge

4.1.2.4. Wheel and Axle

4.1.2.5. Pulley

4.1.2.6. Screw

4.1.3. Gears

4.1.4. Cams

4.1.5. Linkages

Lesson 4.2 Thermodynamics

4.2.1 Units

4.2.2 Forms of Energy

4.2.2.1 Mechanical

4.2.2.2 Chemical

4.2.2.3. Electromagnetic

4.2.2.4. Nuclear

4.2.2.5. Thermal

4.2.2.6. Solar

4.2.3 Energy Conversion

 4.2.4 Cycles

4.2.4.1 Open

4.2.4.2 Closed

4.2.5 Efficiency

4.2.6 Energy Loss

4.2.6.1. Conduction

4.2.6.2. Convection

4.2.6.3. Radiation

4.2.7 Heat Engines

4.2.7.1 Steam

4.2.7.2 Internal Combustion

4.2.7.3 Turbines

Lesson 4.3 Fluid Systems

4.3.1. Hydraulic Systems

4.3.1.1 Pascal’s Law

4.3.1.2Components

4.3.2. Pneumatic Systems

4.3.2.1 Boyle’s Law

4.3.2. 2Components

Lesson 4.4 Electrical Systems

4.4.1. Electrical Theory

4.4.1.1. Sources of Electromotive Force

4.4.1.2. Ohms Law

4.4.1.3. Kirchhoff’s Laws

4.4.1.4. Watt’s Law

4.4.2. Metering Devices

4.4.3. Motors and Generators

4.4.3.1. DC Motor

4.4.3.1.1. Permanent Magnet

4.4.3.1.2. Electromagnet

4.4.3.1.3. Components

4.4.3.2. DC Generator

4.4.3.3. AC Generator

4.4.3.3.1. Single Phase

4.4.3.3.2. Three Phase

4.4.3.4. AC Motor

4.4.3.4.1. Synchronous

4.4.3.4.2. Induction

4.4.3.5. Transformers

4.4.3.5.1 Single Phase

4.4.3.5.2. Multi-Phase

4.4.3.6. Electric Transmission Systems

Lesson 4.5 Control Systems

4.5.1. Open Loop System

4.5.2. Closed Loop System

4.5.2.1 Sensors and Actuators

4.5.2.2. Basic Concept of Automation, FMS and System

Integration Programming

4.5.2.3 Flow Chart

4.5.2.4 PLC – Programmable Logic Control

**Unit 5: Statics and Strength of Materials**

Lesson 5.1 Statics

5.1.1 Strength of Shapes

5.1.2 Forces

5.1.3 Static Equilibrium

5.1.4 Vectors

5.1.5 Free body Diagrams

5.1.6 Moments

5.1.7 Reaction Forces

5.1.8 Trusses

5.1.9 Bridges

Lesson 5.2 Strength of Materials

5.2.1. Properties of Areas

5.2.1.1. Center of Gravity

5.2.1.2. Moments of Inertia

5.2.1.3. Calculating Mass Properties Using CAE Tools

5.2.2. Stress

5.2.3. Strain

5.2.4. Deflection

**Unit 6: Materials and Materials Testing in Engineering**

Lesson 6.1 Categories of Materials

6.1.1. Metals

6.1.2. Alloys

6.1.3. Nonmetals

6.1.4. Composites

Lesson 6.2 Properties of Materials

6.2.1. Chemical Properties

6.2.2. Physical Properties

6.2.3. Mechanical Properties

6.2.4. Dimensional Properties

Lesson 6.3 Production Processes

Lesson 6.4 Quality Assurance

6.4.1 Engineering Statistics

6.4.2 Precision Measurement Tools and Techniques

6.4.3 Statistical Process Control

Lesson 6.5 Material Testing

6.5.1. Nondestructive Inspection and Testing

6.5.2. Destructive Testing

**Unit 7: Engineering for Reliability**

Lesson 7.1 Reliability

7.1.1. Determining Failure Rates

7.1.2. Identifying Critical Components

7.1.3 Redundancy

7.1.4 Risk Analysis

7.1.5 Factors of Safety

7.1.6 Liability and Ethics

Lesson 7.2 Case Studies

**Unit 8: Kinematics**

Lesson 8.1 Linear Motion

8.1.1. Displacement

8.1.2. Velocity

8.1.3 Acceleration

Lesson 8.2 Trajectory Motion

**POE Methods of Assessment:**

The evaluation of projects needs to be on going and cumulative with the use of performance, portfolio, test, and self-report assessments. Evaluators may be teachers, students, or outside experts. These assessments should be check marks of how the students are meeting the standards set in the course and help direct the accomplishment of the project itself.

**Project Assessment** should include but is not limited to:

   Presentation

   Written/Oral Report

o     Daily Journal

o     Engineering Notebook

o     Multimedia

   Graphic Representation

o     Orthographic representation

o     Pictorial representations

o     Schematics

o     Sketches

o     Photos

o     Diagrams

o     Video Clips

o     Graphs and Charts

o     Statistical Analysis

   Final Product

o     Constructed Models

o     Computer Models

o     Computer Simulations

o     New standards

o     New system

o     New process

o     New legislation

o     New theories

   Performance skills

o     Breadboarding

o     Use of the Multimeter

o     Computer Applications (Word Processing, Spreadsheet, PowerPoint®)

o     Measurement

o     Construction

***Grading Scale:***

A = 90 to 100%

B = 80 to 89%

C = 70 to 79%

D = 60 to 69%

F = 0 to 59%

**Classroom Rules:**

* **WE WILL RESPECT ONE ANOTHER**
  + Coarse language is unacceptable
  + Inappropriate physical contact is unacceptable
* **WE WILL BE PUNCTUAL**
  + Be in room and on task on time everyday
* **WE WILL BE PREPARED**
  + Bring text, paper, pencil and eraser everyday
* **WE WILL BE PROFESSIONAL**
  + Stay seated and working
  + Quietly raise hands for help
  + Maintain quiet room for everyone’s benefit
  + Dress according to school codes
  + Damage or destroy nothing
  + Do not leave seats or room until officially dismissed

**Consequences:**

* + VERBAL WARNING
  + LOSS OF BONUS POINTS
  + REFERRAL AND PARENTAL NOTIFICATION
  + PRINCIPAL DISCIPLINARY ACTION(S)
* *Consequences may not always occur in this order. Disturbances will result in appropriate consequences*.

**Parents:**

If you have any questions or concerns about your student’s achievement, or if there is anything that I should know that might help me to teach your student, please feel free to contact me [gregory.taylor@slps.org](mailto:gregory.taylor@slps.org) throughout the school year.

I am here to prepare your child for college and/or the adult working environment. Good citizenship is highly emphasizes and factored in the grades using cooperative activities, peer and self assessments. Whether this is a freshman or up to a senior level course, citizenship and work ethic shall be emphasized and expected. Any help you might offer will be greatly appreciated and utilized. Thank you.

Finally there is an expectation that you will assume the responsibility of maintaining a current phone number with me, or the main office, to ensure my ability to contact you with issues of concern, or excellence, as necessary throughout the year.

I have read and understand the rules and regulations for Mr. Taylor’s class:

***Parent phone for immediate discretionary contact: ( ) -***

Parent Signature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Student Signature\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Print Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_\_\_\_\_\_\_\_

Returning this portion of the syllabus document completed and signed in a prompt manner is the ***first assignment*** of the year and ***does carry point value*** for your student grade. Failure to complete this will result in a PAN *(parental appearance notification).*

Thank you for all of your support.