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| **Erie High School** | | **Pre-Engineering Curriculum Map**  **CIP Code #15.9999** | | **Industry Standards**  Top Three Takeaways from OSHA Chief's Testimony Regarding OSHA Enforcement  During the COVID-19 Pandemic | Law and the Workplace  FANUC |
| **Level I** | **1st Quarter**  What is Engineering?  Engineering Defined  Problem Solving with the Engineering Design Process  Engineering Knowledge  Engineer Traits and Skills  Engineering Team  Careers in Engineering Fields  History of Engineering  Introduction to Solidworks: CAD Modeling, Production Drawings. 3D Printing  Learning and Applying Fundamentals Sources of Electricity  Conductors and Insulators  Resistors  Math:  Unit Conversions using a Conversion Chart  Rounding Numbers  Equivalent Electronic Units  Cadet Trainer/Electronics Fundamentals: Lab Project 1,2,4,9  Solidworks Exercises: 1-9  Projects: Engineering Discipline Poster, History of Engineering Timeline, Hologram, Build a Better Locker | **2nd Quarter**  Engineering Design:  Engineering Design Process, Engineering Notebooks  Introduction to Solidworks: CAD Modeling, Production Drawings, CAD Assembly, Assembly Drawings  Precision Measurement Instruments: Rulers, Dial Calipers, Micrometers  Ohm’s Law  Series Circuits  Parallel Circuits  Multimeters  Basic Hydraulics Trainer  Math: Ratios, Scale, Ohm’s Law  Cadet Trainer/Electronics Fundamentals: Lab Project 10,11, 18, 19, 20  Solidworks Exercises: 10-12, Assembly  Projects: Engineering Design Process Poster, Catapults, Toolbox Racer, Sandwich CAD Assembly, Precision Measurement: Reverse Engineering a Block, Breadboarding, Soldering Electronic Kits | **3rd Quarter**  What is Engineering?  Engineering Defined  Problem Solving with the Engineering Design Process  Engineering Knowledge  Engineer Traits and Skills  Engineering Team  Careers in Engineering Fields  History of Engineering  Introduction to Solidworks: CAD Modeling, Production Drawings. 3D Printing  Learning and Applying Fundamentals Sources of Electricity  Conductors and Insulators  Resistors  Math:  Unit Conversions using a Conversion Chart  Rounding Numbers  Equivalent Electronic Units  Cadet Trainer/Electronics Fundamentals: Lab Project 1,2,4,9  Solidworks Exercises: 1-9  Projects: Engineering Discipline Poster, History of Engineering Timeline, Hologram, Build a Better Locker | **4th Quarter**  Engineering Design:  Engineering Design Process, Engineering Notebooks  Introduction to Solidworks: CAD Modeling, Production Drawings, CAD Assembly, Assembly Drawings  Precision Measurement Instruments: Rulers, Dial Calipers, Micrometers  Ohm’s Law  Series Circuits  Parallel Circuits  Multimeters  Basic Hydraulics Trainer  Math: Ratios, Scale, Ohm’s Law  Cadet Trainer/Electronics Fundamentals: Lab Project 10,11, 18, 19, 20  Solidworks Exercises: 10-12, Assembly  Projects: Engineering Design Process Poster, Catapults, Toolbox Racer, Sandwich CAD Assembly, Precision Measurement: Reverse Engineering a Block, Breadboarding, Soldering Electronic Kits |
| **Level II** | **1st Quarter**  **Engineering Safety and OSHA**  **Civil Engineering, Low level:**  Define Civil Engineering  Describe Structural Forces, Loads, and Components  Identify Different Types of Bridges  Understand the Structure of a Skyscraper  Describe the Purpose of Land Surveying  **Civil Engineering, Mid-Level:**  Calculate Structural Load  Determine if a Structure is in Equilibrium Create a Full Body Diagram of a Structure Identify and Defend if a Struss is Stable or Unstable    **Civil Engineering, High Level (POU):**  Build a Free-Standing Bridge Structure  Use Free Body Diagram to Analyze It Determine Its Structural Strength  Test and Report Using the Design Process and Structural Analysis | **2nd Quarter**  **Manufacturing**  **Low level**  Define Manufacturing Engineering  Explain How Raw Materials are Harvested  Define the Manufacturing Processes  List Applications of Production Management  List and Describe the Main Areas of Production Control  **Mid-Level**  Write a Detailed Description of an Actual Manufacturing  **High Level**  Design a Manufacturing Project and Follow it Through to Completion  Follow the Design Process and Provide Written Design Notebook  Create a Sketch  Create a Prototype  Create Mass Repeatable Production of Product  Apply Process and Quality Control to Refine Product  Create Written Process Control | **3rd Quarter**  **Mechanica**l  **Low level**   |  | | --- | | Define Mechanical Engineering.  Identify Mechanical Engineering Jobs  Identify and Explain Education Required  To Become an ME | | Define Energy  Define Work  List the Six Simple Machines  Define Mechanical Advantage | | Summarize the Components of  Mechanical and Fluid Power Systems | | Describe Principles of Mechanical Power | | Give Examples of Mechanical  Engineering Applications |   **Mid-Level**  Identify and Explain the Differences between Classes of Lever  Calculate Mechanical Advantage of a First-Class Lever  Explain Difference Between Actual and Calculated Mechanical Advantage  Calculate Efficiency of a Simple Machine and Output with Appropriate Units  **High Level (POU)**  Build One of the Six Simple Machines (Design in CAD, Calculate MA, Build with Materials/3D Printer, Calculate AMA, then Efficiency | **4th Quarter**  **Aerospace and Kinematics**  **Low Level**  Define Aerospace Engineering  Explain Newton’s Laws of Motion  Use Newton’s 2nd Law to Calculate Force Mass and Acceleration  Use Newton’s Laws and Gravity to Calculate a Rocket’s Height Given its Mass and Amount of Force Applied Over Time  Explain the Roles of Fluid Mechanics and Aerodynamics in Aerospace Engineering  Understand the Laws of Conservation  Describe the Forces Acting on an Aircraft in Flight  Give Examples of Aerospace Engineering Applications  **Mid-level**  (Calculate Speeds, Times and Mass of C02 Race Car)  **High Level POU**  Use the Science Behind Aerospace Engineering to Accurately Build and Predict the Motions of a Model Rocket That We Will Launch  Calculate Flight Time, Height and Range |
| **Level III** | **1st Quarter**  **Engineering Design Process:**  Defining Problems and Brainstorming, Researching Designs  Integrated Circuits  Solidworks: CAD Modeling Review  Amatrol: Introduction to Levers  Math: Tolerances and Color Code  Cadet Trainer/Electronics Fundamentals: Lab Project 46  Amatrol Applied Mechanism Trainer  Project: Blink, Morse Code, Traffic Light  Fiber Optics  Relays and Solenoids  Math: Circle Circumference and Area, Pythagorean Theorem, Right Triangles  Lab Project 47, 48, 49  Project: Simple Machine Legos, Cranes, Vibration Sensor, Controllable Servo | **2nd Quarter**  **Engineering Design Process:**  Communicating Solutions – Engineering Drawings, Drawing Classifications, Drawing Guidelines, Industry Guidelines  Modeling, Testing, & Final Outputs – Types of Modeling, Predictive Analysis, Engineering Economics, Design Improvement  Amatrol: Linkages, Cams, & Turnbuckles, Pulleys and Gear Drives  Amatrol Applied Mechanisms Trainer  Energy Conservation, Career Opportunities  Math: Geometric Dimensioning and Tolerancing, Oscilloscope Voltage and Frequency Application  Lab Project 50  Project: Mini Coin Car Design/Assembly, Trebuchets, Tractor Pull, Adjustable RGB, Relay/Fan, Infrared controlled LED Matrix | **3rd Quarter**  **Engineering Design Process:**  Defining Problems and Brainstorming, Researching Designs  Integrated Circuits  Solidworks: CAD Modeling Review  Amatrol: Introduction to Levers  Math: Tolerances and Color Code  Cadet Trainer/Electronics Fundamentals: Lab Project 46  Amatrol Applied Mechanism Trainer  Project: Blink, Morse Code, Traffic Light  Fiber Optics  Relays and Solenoids  Math: Circle Circumference and Area, Pythagorean Theorem, Right Triangles  Lab Project 47, 48, 49  Project: Simple Machine Legos, Cranes, Vibration Sensor, Controllable Servo | **4th Quarter**  **Engineering Design Process:**  Communicating Solutions – Engineering Drawings, Drawing Classifications, Drawing Guidelines, Industry Guidelines  Modeling, Testing, & Final Outputs – Types of Modeling, Predictive Analysis, Engineering Economics, Design Improvement  Amatrol: Linkages, Cams, & Turnbuckles, Pulleys and Gear Drives  Amatrol Applied Mechanisms Trainer  Energy Conservation, Career Opportunities  Math: Geometric Dimensioning and Tolerancing, Oscilloscope Voltage and Frequency Application  Lab Project 50  Project: Mini Coin Car Design/Assembly, Trebuchets, Tractor Pull, Adjustable RGB, Relay/Fan, Infrared controlled LED Matrix |
| **Level IV** | **1st Quarter**  **Low Level Pegasus Training Robot**  Demonstrate the Safe, Manual Operation of a FANUC Industrial Robot  FANUC Certified Robot Operator Certification  Manipulate the Robot with Teach Pendant and Record Simple Motions Such as Machine Loading and Stacking  Perform Software Simulations to Verify Correct Motion and Timing of Programs | **2nd Quarter**  **Mid-Level**  Write a Detailed Description of an Actual Manufacturing Process that Demonstrates Understanding of Engineering and Manufacturing    **High Level**  Design a Manufacturing Project and Follow it Through to Completion  Follow the Design Process and Provide Written Design Notebook  Create a Sketch  Create a Prototype  Create Mass Repeatable Production of Product  Apply Process and Quality Control to Refine Product  Create Written Process Control  NOCTI PREP | **3rd Quarter**  Engineering Fundamentals and Safety    Disaster Problem Solving, Design Process, and Teamwork    Engineering Technologies/Technicians PA  Graphics and Modeling    Knowledge of Manufacturing and Manufacturing Systems    Describe the Work that Each Machine Performs    Power, Energy, and Green Technology    Machine Controls and Automated Systems    Materials    Basic Electricity and Electronics  OSHA 10-Hour Certification for Manufacturing  NOCTI PREP | **4th Quarter**  Capstone Senior Design Project  All Standards at Evaluation Level  NOCTI Testing |