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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 WorkplaceFANUC |
| **Level I** | **1st Quarter**What is Engineering? Engineering DefinedProblem Solving with the Engineering Design ProcessEngineering KnowledgeEngineer Traits and SkillsEngineering TeamCareers in Engineering FieldsHistory of EngineeringIntroduction to Solidworks: CAD Modeling, Production Drawings. 3D PrintingLearning and Applying Fundamentals Sources of ElectricityConductors and InsulatorsResistorsMath: Unit Conversions using a Conversion ChartRounding NumbersEquivalent Electronic UnitsCadet Trainer/Electronics Fundamentals: Lab Project 1,2,4,9Solidworks Exercises: 1-9Projects: Engineering Discipline Poster, History of Engineering Timeline, Hologram, Build a Better Locker | **2nd Quarter**Engineering Design: Engineering Design Process, Engineering NotebooksIntroduction to Solidworks: CAD Modeling, Production Drawings, CAD Assembly, Assembly DrawingsPrecision Measurement Instruments: Rulers, Dial Calipers, MicrometersOhm’s LawSeries CircuitsParallel CircuitsMultimetersBasic Hydraulics TrainerMath: Ratios, Scale, Ohm’s LawCadet Trainer/Electronics Fundamentals: Lab Project 10,11, 18, 19, 20Solidworks Exercises: 10-12, AssemblyProjects: 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 DefinedProblem Solving with the Engineering Design ProcessEngineering KnowledgeEngineer Traits and SkillsEngineering TeamCareers in Engineering FieldsHistory of EngineeringIntroduction to Solidworks: CAD Modeling, Production Drawings. 3D PrintingLearning and Applying Fundamentals Sources of ElectricityConductors and InsulatorsResistorsMath: Unit Conversions using a Conversion ChartRounding NumbersEquivalent Electronic UnitsCadet Trainer/Electronics Fundamentals: Lab Project 1,2,4,9Solidworks Exercises: 1-9Projects: Engineering Discipline Poster, History of Engineering Timeline, Hologram, Build a Better Locker | **4th Quarter**Engineering Design: Engineering Design Process, Engineering NotebooksIntroduction to Solidworks: CAD Modeling, Production Drawings, CAD Assembly, Assembly DrawingsPrecision Measurement Instruments: Rulers, Dial Calipers, MicrometersOhm’s LawSeries CircuitsParallel CircuitsMultimetersBasic Hydraulics TrainerMath: Ratios, Scale, Ohm’s LawCadet Trainer/Electronics Fundamentals: Lab Project 10,11, 18, 19, 20Solidworks Exercises: 10-12, AssemblyProjects: 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 EngineeringDescribe Structural Forces, Loads, and ComponentsIdentify Different Types of BridgesUnderstand the Structure of a SkyscraperDescribe the Purpose of Land Surveying **Civil Engineering, Mid-Level:** Calculate Structural LoadDetermine 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 StrengthTest 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**

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| Define Mechanical Engineering.Identify Mechanical Engineering JobsIdentify and Explain Education Required To Become an ME |
| Define EnergyDefine WorkList the Six Simple MachinesDefine 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 LeverCalculate Mechanical Advantage of a First-Class LeverExplain Difference Between Actual and Calculated Mechanical AdvantageCalculate 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 EngineeringExplain Newton’s Laws of MotionUse Newton’s 2nd Law to Calculate Force Mass and AccelerationUse Newton’s Laws and Gravity to Calculate a Rocket’s Height Given its Mass and Amount of Force Applied Over TimeExplain the Roles of Fluid Mechanics and Aerodynamics in Aerospace EngineeringUnderstand the Laws of ConservationDescribe the Forces Acting on an Aircraft in FlightGive 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 LaunchCalculate Flight Time, Height and Range |
| **Level III** | **1st Quarter****Engineering Design Process:** Defining Problems and Brainstorming, Researching DesignsIntegrated CircuitsSolidworks: CAD Modeling ReviewAmatrol: Introduction to LeversMath: Tolerances and Color Code Cadet Trainer/Electronics Fundamentals: Lab Project 46Amatrol Applied Mechanism TrainerProject: Blink, Morse Code, Traffic LightFiber OpticsRelays and Solenoids Math: Circle Circumference and Area, Pythagorean Theorem, Right TrianglesLab Project 47, 48, 49Project: Simple Machine Legos, Cranes, Vibration Sensor, Controllable Servo | **2nd Quarter****Engineering Design Process:** Communicating Solutions – Engineering Drawings, Drawing Classifications, Drawing Guidelines, Industry GuidelinesModeling, Testing, & Final Outputs – Types of Modeling, Predictive Analysis, Engineering Economics, Design ImprovementAmatrol: Linkages, Cams, & Turnbuckles, Pulleys and Gear DrivesAmatrol Applied Mechanisms TrainerEnergy Conservation, Career OpportunitiesMath: Geometric Dimensioning and Tolerancing, Oscilloscope Voltage and Frequency Application Lab Project 50Project: 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 DesignsIntegrated CircuitsSolidworks: CAD Modeling ReviewAmatrol: Introduction to LeversMath: Tolerances and Color Code Cadet Trainer/Electronics Fundamentals: Lab Project 46Amatrol Applied Mechanism TrainerProject: Blink, Morse Code, Traffic LightFiber OpticsRelays and Solenoids Math: Circle Circumference and Area, Pythagorean Theorem, Right TrianglesLab Project 47, 48, 49Project: Simple Machine Legos, Cranes, Vibration Sensor, Controllable Servo | **4th Quarter****Engineering Design Process:** Communicating Solutions – Engineering Drawings, Drawing Classifications, Drawing Guidelines, Industry GuidelinesModeling, Testing, & Final Outputs – Types of Modeling, Predictive Analysis, Engineering Economics, Design ImprovementAmatrol: Linkages, Cams, & Turnbuckles, Pulleys and Gear DrivesAmatrol Applied Mechanisms TrainerEnergy Conservation, Career OpportunitiesMath: Geometric Dimensioning and Tolerancing, Oscilloscope Voltage and Frequency Application Lab Project 50Project: 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 RobotFANUC Certified Robot Operator CertificationManipulate the Robot with Teach Pendant and Record Simple Motions Such as Machine Loading and StackingPerform 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 CompletionFollow 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 PAGraphics 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 ElectronicsOSHA 10-Hour Certification for Manufacturing NOCTI PREP  | **4th Quarter**Capstone Senior Design ProjectAll Standards at Evaluation LevelNOCTI Testing |