

# Instructional Terminology

## AUTOMATION AND ROBOTICS 14.4201.00

### 1,2,3

**2D** - Measurement usually connected to the description and measure of two dimensional space length and width

**3D** - Measurement usually connected to the description of three dimensional space length, width and height

**3D Printing** - A printer that can create a solid object in three dimensional space from a digital model through layered printing

### A

**AC Power** - Alternating Current is standard electricity that comes from a wall outlet, it is named after of the wave it makes when switching (alternating) from positive to negative

**Additive Manufacturing** - A type of manufacturing specific to 3D printing and describes the building up of layers to make a solid object

**Artificial Intelligence** - (AI) Machines that simulates human intelligence they are programmed to learn, problem solve and mimic human actions

**Analog** - Data transfer using a nonstop signal that represents physical measurements like a radio wave signal

**Arc Flash** - An extreme bright light and intense heat that occurs as a result of welding equipment use. This flash is discharged as Ultra Violet radiation

**Assemblies** - The processes of putting together components to create a complete unit for a function

**Automated Guided Vehicle (AVG)** - A computer controlled wheeled vehicle that can operate without the assistance of a driver. it uses a combination of sensors and software to self-steer

**Autonomous** - A device that can operate without human guidance as a driverless self-propelled self-guided vehicle

### B

**Belt Drive** - A system where power is transmitted by a continuous adjustable stretchy belt

**Boolean Logic** - A form of algebraic centered around simple statements called Boolean Operators; "Or, "and, and " Not"

**Brazing** - A metal-joining method in which two or more metal items are joined together by melting and flowing a filler metal and flux which provides a suitable vapor environment into the joint, with the filler metal having a lower melting point than the adjoining metal pieces

**Brushless Motors** - Motors which use encased permanent magnets as a rotor and wound coiled wires as a stator; spins by its coils being energized to become electromagnetic in sequence; known for their long-life and reliability

## **C**

**Calibrate** - The act of checking, by comparison with a known standard, to determine the accuracy of a measuring instrument of any kind. It may also include the fine tuning of the instrument to bring it into alignment with the standard

**Center lines** - A real or imaginary line that is in the middle of the surface or sides of something

**Chain Drive** - A system where power is transmitted by a continuous adjustable chain

**Circuit** - Consists of a battery, ground, wires, switch, load, and a fuse or fusible link arranged in a closed loop, used to power lights, or equipment they can be either series or parallel

**CNC** (Computerized Numerical Control) - A computerized production method in which programmed software and code controls the movement of production and manufacturing equipment

**Components** - A part or element of a whole like a piece of equipment in an assembly, a part of an electrical circuit like a load or a switch

**Computer Aided Design (CAD)** - A component or part designed or prototyped with the aid of computer software which helps users create designs in either 2D or 3D so they can visualize their creation. CAD aids the development, change, and optimization of the design process

**Computer Aided Manufacturing (CAM)** - is a form of manufacturing process that uses computer software and automated equipment to create products with a high degree of accuracy and precision

**Constraints** - Specifies a certain demarcation, geometrical limitation or restriction of some type

**Current** - The flow of electrons in a circuit through a point over time, usually measured in amperes

## **D**

**Data Communication Protocols** - The rules that govern or control the transmission of data between two or more points

**DC Motor** - Direct current used to power a motor

**DC Power** - Electrical energy/current that consistently flows in one direction measured in volts

**Decision Flow Chart** - A visual tool that employs shapes and arrows to provide a clear understanding of choices and their subsequent results

**Degrees of Freedom** - Used in robotics to describe freedom of movement at a robot's joints (i.e. six joints means six degree of freedom)

**Density** - How loosely or tightly packed a material is placed in a space. Can be mathematically expressed as the mass divided by the volume of a substance

**Dexterity** - How well a someone can perform a task with their fingers or hands

**Digital** - Information in numeric form of either a 0 or a 1 used to transmit data of some type, is often contrasted with an analog signal

**Dimensioning** - The method of specifying a part's information by using of lines, number, symbols and notes usually for the purpose of manufacture

## **E**

**Electrical Drawings** - Specifies wire color, size, component symbols, what and where components are connected in a circuit; also referred to as a schematic

**Emergency Button** - A large electrical switch that immediately stops power flow to shut down a piece of equipment or machinery; also known as E-Stop Button or Kill Switch

**End-Effector** - Also called END of Arm Tool (EOAT) is a device at the end of a robotic arm

**End-of-arm tools** - Common tools include Grippers, Force torque Sensors, Material removal tools such as bits, Welding torches, and more

**Ethics** - Principles that govern behavior or conduct

## **F**

**Fail Safe** - An electronic or mechanical system that limits damage or harm. Examples could include the activation bar on a lawn mower that need to be held down to keep engine running

**Feedback Control Loop** - A mechanism that takes system output into consideration to enable system to adjust input to meet a desired outcome. Elements include 1. Input 2. Process being Controlled 3.

Output 4. Sensing Elements 5. Controller and Actuating Devices

**Flow Controls** - Protocol for transmitting and receiving unit of information. Example is If/Else statement in programming languages

**Flowchart** - Visual representation, using boxes or shapes that shows the sequence of steps to perform a process

**Force sensing** - A sensor used to measure compression, force, strain, and load

**Fusion 360** - A cloud base drafting platform produced by Autodesk

## **G**

**G Code** - Computer programming language used in computer-aided manufacturing to control automated machine tools

**Gear Ratio** - Ratio in relation to number of rotation of a driver gear to the number of rotations of a driven gear. Input speed is divided by input speed. Rotational speed and torque are inverse of each other

**Gear Train** - An arrangement of gears to increase either torque or speed

**Geometric Construction Techniques** - Drawing geometric figure using a compass and straight edge

## **H**

**Hidden lines** - Dashed lines used in drafting to show edges, surfaces and corners that cannot be seen

**Hydraulics** - The use of a liquid to produce mechanical force or control

## I

**Inductance** - the property of a component or circuit that resists changes in electrical current flow, often causing delays or opposition to rapid changes

**Isometric View** - A two-dimensional representation of a 3-dimensional object aligned to three axes

**Inertia** - A force that keeps stationary objects at rest and moving objects in motion. More speed or more mass results in more inertia

**Input gear** - Commonly referred to as drive gear, transmits power to the driven gear

**Input Module** - The main logic of an event system can be configured and customized

**Internet of Things** - Technology that connects and exchanges data with other devices and systems over the internet through the air or by means of fomites

## J

## K

## L

**Ladder Logic** - A programming language use in an industrial setting to control PLC's where sequential control is required

**Laser Cutting** - A non-contact process which utilizes a laser to cut materials, resulting in high quality, dimensionally accurate cuts

**Laws of Robotics** - Also known as Asimov's Laws. First Law: A robot may not injure a human being or, through inaction, allow a human being to come to harm. Second Law: A robot must obey the orders given it by human beings except where such orders would conflict with the First Law. Third Law: A robot must protect its own existence as long as such protection does not conflict with the First or Second Law

**Light curtains** - Used to safeguard people in the vicinity of moving machinery. Used to replace mechanical barrier to allow for mobility of the automated equipment

**Line weights** - Thickness of a line

**Limit Switch** - A device that detects physical contact or presence of an object and is used to signal to a machine or system when a certain position or point has been reached

**Linux** - An open source operating system

## M

**Machine Learning** - (ML) The use of data and algorithms to imitate critical thinking and decision making

**Machining** - Process of removing metal in a controlled manner to get a final shape and size, often with extreme precision

**Mass** - The amount of matter that makes up an object

**Material Properties** - Properties that impact the use of materials;

includes density, melting point, thermal conductivity, electrical conductivity, thermal expansion, and corrosion resistance

**Mechanical Advantage** - The ration of force that performs work to the force that is applied

**ML** - Also known as Machine Learning

**Modular software design** - Programming technique that separates the overall functionality of software into independent modules

## N

## O

**Operator** - Human involved in the setup, operation, and maintenance of a machine

**Orthographic** - Drawing in a third angle projection that show each side of a design without perspective. Used to show every angle to help manufacturers plan production

**Oscilloscope** - Tool used to display voltage signals as waveforms, giving a visual representation of the variation of voltage over time

**Output Gear** - Receives the force from the driving gear; Also known as driven gear

**Output Module** - Ttools that return the processor signals to the control devices like relays or motor starters, lights, etc.

## P

**Performance Data** - Data in which a given material or a piece of equipment performs during actual use

**Plasma Cutter** - A device that cuts through electrically conductive materials by means of an accelerated jet of hot plasma

**Pneumatics** - A technology system which allows air pressure to power and move something. It puts compressed air to practical use by moving applications like the tools and machinery used in the engineering, manufacturing and construction industries

**Pressure Sensor** - A device that measures the pressure of gases, liquids, fluid/gas flow, speed, water level and altitude; also known as pressure transducer, pressure transmitter, pressure sender, pressure indicator, piezometer or manometer

**Process Development** - An approach used to establish, implement, or improve a pre-existing manufacturing process

**Program Flow** - The sequence of execution of instruction in a program; also knows as Flow of program

**Programmable Logic Controller (PLC)** - A device (a machine or a computer) used to operate monitoring and control of industrial plant; also known as a control system

**Pulley** - A type of simple machine, which consists of a wheel over a rope, belt, chain or cable, runs

## Q

## R

**Rapid prototyping** - The process of creating a model to demonstrate the feasibility of a product or a function

**Resistance** - A property of a conductor by which it opposes a flow of charges and breaks up electrical energy away from the circuit. It is measured in ohms

**Robot Operating System (ROS)** - A collection of software libraries and tools that help you build robot applications

**Robotic Process Automation (RPA)** - A technology software that makes it easy to build, utilize, and manage software robots that emulate human actions interacting with digital systems and software

**Robotic Work Cell** - A designated area where robots, machinery, and equipment work together in a coordinated manner to perform specific tasks or operations

## **S**

**Safety fences** - Used to protect employees from hazards posed by industrial machinery

**Safety relays** - Tools or devices that implement safety functions

**Schematics** - A diagram of an electrical or mechanical system

**Sensors** - A device or tool that identifies and responds to a signal or stimulus

**Servos** - A type of control system which is a combination of many devices or operations which can control another system

**Software** - The brain for a computer or the program material for an electronic device that makes it run

**Solder Iron** - Works by melting a solder using the current flowing in the metallic tip of the tool

**SolidWorks** - A solid modeling computer-aided design (CAD) and computer-aided engineering (CAE) computer program published by Dassault System

**Speed** - A scalar quantity, which is defined as the change in distance with respect to time.

**Sprockets** - A cylindrical wheel with teeth projecting radially from the rim

**Statistical Process Control (SPC)** - Using data and analysis to monitor and manage the quality of a manufacturing or production process which helps ensure consistent and predictable outcomes by identifying variations and making adjustments as needed

**Stepper Motor** - A motor that rotates and in which the current pulses supplied to stator windings are transformed into discrete angular motions, or steps of a rotor

**Stored Energy** - Accumulated energy which can have many forms, including gravitational potential energy, pressurized gases and liquids, stored mechanical energy, and stored electrical energy

**Strength** - The potential of the material to resist physical forces on it

**Subtractive Manufacturing** - The various controlled machining and material removal processes that begin with solid blocks, bars, rods of plastic, metal, or other materials that are shaped by removing

material through cutting, boring, drilling, and grinding

## T

**Time/ Div** - A wheel that determines how long the electronic beam that draws the curve takes for moving from the left to the right edge of a division

**Tolerance** - The allowed variation from a given dimension

**Torque** - The product of a force and its perpendicular distance to a point of turning; Also known as the moment of force

## U

## V

**Vacuum** - A space without matter in it

**Velocity** - A vector quantity which is described as speed with direction

**Volt/OHM** - The unit of voltage over the unit of resistance

**Volts per Division** - A scaling factor that varies the size of the waveform on the screen (Volt/Div Setting)

**Voltage** - The difference in charge between two points measured in

volt (V)

**Viscosity** - The thickness of a liquid that impacts fluid flow; a fluid's friction.

Formula

$$F = \mu A \frac{u}{y}$$

$F$  = force

$\mu$  = viscosity of the fluid

$A$  = area of each plate

$\frac{u}{y}$  = rate of shear deformation

## W

**Welding** - A process of joining separate pieces of metal in a continuous metallic bond by means of heat, pressure or both forming a structure as the parts cool

**Work Envelope** - The distance that can be reached up, down, back, and to each side by the robot arms from its end-effector mounting plate

**Workplace Safety** - The working condition of a company and includes all factors that impact the safety, health, and well-being of employees. This can include environmental hazards, unsafe working conditions or processes, drug and alcohol abuse, and workplace violence. Workplace safety is monitored at the national level by the Occupational Safety and Health Administration (OSHA)

## X

## Y

## Z

