

GLOSSARY

- acceleration** -rate of change of velocity, symbol is a
- accelerometer** -instrument that directly measures acceleration. Used in impact testing and car crash studies.
- accelerometry** -measurement of acceleration by an accelerometer
- accuracy** -ability of an instrument or transducer to obtain the true measure of a quantity, same as validity in statistics
- ammeter** -device for measuring current or amperage
- ampere** -SI unit of electrical current; equals one coulomb of charge per second
- amplifier** -device for increasing the magnitude of an analog signal
- amplify** -increase a signal's magnitude, opposite of attenuate
- analog** -(a) a voltage varying signal (b) a continuous signal (c) opposite of digital, as in analog vs. digital signal, timepiece or computer
- analog signal** -a continuous electrical signal which has the same characteristics as another physical signal (e.g., force, pressure, acceleration)
- analog-to-digital (A/D)** -process by which an analog signal is converted to a digital one suitable as input to a digital computer or device
- analogue** -same as analog
- anthropometry** -measurement of human physical dimensions and the relationships these measurements have with athletic performance
- attenuate** -reduce signal magnitude, opposite of amplify
- biomechanics** -science which studies the influence of forces on living bodies
- body segment parameters** -inertial or physical properties of body segments, especially mass, density, location of centre of mass or centre of gravity and moment of inertia
- capacitor** -electrical component that stores electrical charge, symbol is C
- cinematography** -(a) recording of images on film, (b) study of the factors which influence the quality of recording of film images
- circuit diagram** -formal means of representing an electric circuit, in which standard icons and straight lines are employed
- concentric contraction** -a contraction where the muscle force is directed towards the centre of the muscle, i.e., muscle shortens while contracting
- contraction** -in muscle, the state when it has been induced internal (neurally) or externally (electrically) to shorten, requiring neural or electrical stimulation and chemical energy, in the form of adenosine triphosphate (ATP) or creatine phosphate (CP), and producing an EMG signal and force in the tendon. Note muscle can shorten (concentric), lengthen (eccentric) or remain the same length (isometric) and still be in a state of contraction, however, a muscle can produce a force passively without being in contraction.
- coulomb** -SI unit of charge, corresponding to about 6.25×10^{18} electrons
- decibel** -unit for describing the ratio of two powers or intensities or for comparison to a reference power or intensity, abbreviated dB. Used in electronics and acoustics. For intensities, $n \text{ dB} = 20 \log_{10}(I_1/I_2)$. For powers, $n \text{ dB} = 10 \log_{10}(P_1/P_2)$. For example, an amplifier gain (intensity) of 1000 = $20 \log_{10}(1000/1) = 60 \text{ dB}$, a power gain of 20 dB is a gain of 100.

- digital** -numeric, can be represented by a number suitable for use by digital computers
- digital-to-analog (D/A)** -process by which a digital signal can be converted to an equivalent analog (voltage varying) signal
- digitizer** -device for converting positional information to digital form, usually associated with quantifying motion from filmed or videotaped images
- direct dynamics** -derivation of kinematics from forces and moments of force
- distortion** -any error introduced to an analog signal, see amplitude, frequency, and phase distortion
- dynamics** -mechanics of bodies in motion, see inverse and direct dynamics
- dynamometry** -measurement of forces, moments of force or mechanical power
- eccentric thrust** -an impulsive force with a line of action which does not pass through the centre of gravity of the body causing angular acceleration
- eccentric contraction** -a contraction where the muscle force is directed away from the centre of the muscle, i.e., muscle lengthens while contracting
- electrocardiography (ECG)** -recording of electrical potentials produced by cardiac muscles
- electrogoniometer (elgon)** -a goniometer which measures joint angles electronically, often consisting of a potentiometer with two armatures
- electromyogram (EMG)** -recording from an electromyograph
- electromyograph** -device for measuring the electrical potentials produced by skeletal muscles, usually consisting of a differential amplifier with high input impedance (10 MO) and high common mode rejection (>80 decibels)
- electromyography** -recording of electrical potentials produced by skeletal muscles
- ensemble** -group of related data, especially temporally related, a history, a digitized signal
- ergometer** -device for measuring mechanical work or permitting human exercise (exercise machine), e.g., bicycle or rowing ergometers
- ergometry** -measurement of mechanical work
- ergonomics** -(a) study of factors influencing human work especially in occupational settings, (b) literally, work economics, (c) “fitting the task to the worker”
- event** -unique instant in time, e.g., heel-strike in walking, ball contact in striking or impacting activities or the “catch” in rowing, etc.
- gain** -in an amplifier, the ratio of the original voltage to the amplified voltage
- ground** -electrical reference point assigned zero voltage
- goniometer** -device for measuring joint angles, see electrogoniometer
- impedance** -sum of all effects on current flow, including resistance and capacitance
- input impedance** -resistance between the input of a circuit and its ground
- invert** -in electronics, to take the negative of a voltage
- inverse dynamics** -computation of forces or moments of force from a body’s kinematics and inertial properties
- isokinetic contraction** -contraction of a joint where the joint angular speed is constant (cf. isovelocity contraction)
- isometric contraction** -constant length contraction meaning a muscle contraction where the muscle has no appreciable change in its length

isotonic contraction -(a) a contraction of an excised (*in vitro*) muscle where the muscle contracts against a constant load (b) weight lifting, that is, a whole muscle (and joint) contraction against a constant load, such as a weight, barbell or dumbbell (c) a contraction where a muscle contracts against an artificially produced constant load

isovelocitv contraction -a muscle contraction in which the muscle shortens or lengthens at constant velocity or speed

jerk -rate of change of acceleration, sometimes called jolt, symbol is j

kinematics -study of motion without regard to its cause(s), quantities of motion, e.g., velocity, speed, acceleration, angular displacement, etc.

kinesiology -science which studies the causes of human motion and the factors that influence human motion

kinetics -study of the causes of motion, study of forces and moments of force and their characteristics, such as, work, energy, impulse, momentum, power, etc.

linearity -ability of a transducer to produce an output signal that is directly proportional to the input amplitude -the closeness of the relationship between a transducer's input and output signals to a straight line fit as measured statically or at low frequency. Measured by Pearson's product-moment correlation coefficient (r) which is the same as a linear least-squares curve fit

linear potentiometer -resistor arranged with a fixed connection on each end and a sliding connection between the two ends, so that translation of the sliding connection alters the resistance between it and each end

mechanics -science which studies the influence of forces on bodies

moment -(a) perpendicular distance from a point to a line or surface, radius, moment arm, as in moment of force, moment of momentum, moment of inertia (b) short for moment of force

motion analysis system -a system for collecting and processing the motion of sensors or markers attached to a body

noise -any unwanted, random or systematic, component in a waveform. Random noise, which is uncorrelated with the true signal, may be reduced by filtering or averaging. Systematic noise is caused by interference produced by external sources and may be reduced in a variety of ways including removal of the source of the interference or shielding.

normal -(a) perpendicular to a surface or line (b) perpendicular to tangential

normalize -a form of scaling involving division of a set of numbers by a factor such as body weight, cycle time, maximum force, etc.

ohm -SI unit of electrical resistance, symbol is Ω

Ohm's Law -law stating the linear relation between voltage and current in a linear circuit, $V=i R$

operational amplifier -specific type of electronic component that amplifies a voltage

oscilloscope -device for recording signals on cathode ray tubes (CRTs)

oscillograph -device for recording signals on paper, e.g., strip-chart or pen recorder, UV recorder

parallel -in electronics, a connection scheme in which corresponding ends of two or more devices are connected so that electrical current branches through one or the other

phase - period of time, e.g., swing phase, recovery phase

phase angle -amount of lead or lag of a sinusoidal waveform compared to a second sinusoidal

- waveform of the same frequency, used in a Fourier series, measured in degrees or radians
- potentiometer** -electronic device which permits variable resistance, used in elgons, amplifier controls, volume controls, etc.
- precision** -ability of device to produce the same measurement repeatedly, same as statistical reliability or repeatability
- radial** -in direction away from centre of radius of curvature of a path, direction perpendicular to transverse
- refine** -process of scaling or otherwise transforming digitized motion picture data to real units in a known frame-of-reference
- resistance** -in electronics, effect of a particular device or component that is directly proportional to the voltage applied across it
- resistivity** -material property that expresses the electrical resistance per unit length
- resistor** -device that limits current flow in direct proportion to the voltage across it
- rigid body** -a group of particles occupying fixed positions with respect to each other, a theoretical body which is undeformable and has fixed inertial properties
- rotary potentiometer** -resistor arranged with a fixed connection on each end and a sliding connection between the two ends, so that rotation of the device alters the resistance between the sliding connection and each end
- scale** -alter the magnitude of a digital signal, multiplication by a constant, cf. normalize, refine
- series** -in electronics, a connection between two or more components in which one follows the other so that all current must pass through each component
- signal** -information content of a waveform, opposite of noise
- statics** -mechanics of bodies at rest or uniform (constant linear) motion
- strain** -change in length divided by resting length; normalized deformation
- strain gauge** -a resistor-based device designed to be attached to the surface of a material so that its resistance changes as the material deforms
- stress** -loading force per cross-sectional area, in kilopascals; normalized load force
- tangent** -(a) line which is perpendicular to the normal of a surface or curve (b) slope of a line or rise/run (c) tangent of an angle ($\tan ?$), ratio of opposite to adjacent sides of a right triangle
- tangential** -direction that is parallel to the tangent line of curved path, perpendicular to the normal
- telemetry** -transmission of signals by radio signals
- temporal** -relating to time, in time domain
- tensor** -mathematical or physical quantity possessing a specified system of components for every coordinate system, a generalized vector with more than three components each of which is a function of the coordinates of an arbitrary point in space of an appropriate number of dimensions
- transducer** -a device that is actuated by power from one system and supplies power, usually in another form, to a second system -a device which changes one form of energy to another. An input transducer converts a physical signal, such as, force, temperature, power, etc. to an electrical signal, usually voltage. An output transducer converts an electrical signal to a physical quantity, e.g., loud speakers, oscillographs and multimeters.

transduction -process of converting a physical dimension into a voltage

vector -mathematical expression possessing magnitude and direction, which add according to the parallelogram law, e.g., force, acceleration, displacement, but not finite rotations, cf. scalars

velocity -vector rate of change of displacement includes direction of motion, symbol is v

voltage -SI unit of electrical potential, equal to one joule of energy per coulomb of charge, symbol is V

voltage divider -circuit of two or more resistors in series, the object being to employ or measure voltage at an intermediate point

voltage drop -voltage across a resistor

voltmeter -device that measures voltage

waveform -any continuously varying quantity consisting of signal and/or noise components

Wheatstone bridge -electrical circuit comprising two parallel pairs of series-connected resistors