T1 engineering statics	T1 free-body diagram	T1 force
T1 magnitude	T1 direction	T1 line of action
T1 resultant	T1 newtons	T1 applied loads

T1 An interaction that can change an object's motion or shape.	T1 the isolated body with every external force drawn on it and nothing else	T1 The study of forces on bodies that are at rest, so all forces and moments balance.
T1 The straight line passing through a force's point of application in the direction of that force.	T1 Which way a vector points, given by an angle or a unit vector.	T1 The size or numerical value of a quantity.
T1 The external forces a design must carry: gravity, cables, contacts.	T1 The SI unit of force: 1 N accelerates 1 kg at 1 m/s^2.	T1 The vector sum of a set of forces; separate moments may also be needed to describe their effect on a rigid body.

T1 reactions	T1 centre of gravity	T1 statically determinate
T1 particle	T1 concurrent	T1 moment
T1 moment arm	T1 couple	T1 roller

T1 When the equilibrium equations alone are enough to find every unknown force.	T1 The point through which an object's resultant weight acts.	T1 Forces and, where constrained, moments exerted by supports on the body being analysed.
T1 The turning effect of a force about a pivot.	T1 Describes forces whose lines of action all pass through one point.	T1 a body whose size stops mattering for the question being asked
T1 A support that stops movement perpendicular to its surface only, giving one reaction force.	T1 Two equal and opposite parallel forces acting along different lines, producing a turning effect without a resultant force.	T1 The perpendicular distance from a point to the line of action of a force.

T1 pin	T1 fixed support	T1 two-force member
T1 truss	T1 tension	T1 compression
T1 method of joints	T1 method of sections	T1 zero-force members

T1 A member in equilibrium under exactly two external forces, which must be equal, opposite and collinear.	T1 A support that stops both movement and rotation, giving two forces and a moment.	T1 A support that stops movement in any direction but allows rotation, giving two force components.
T1 A pushing force that tends to shorten a member.	T1 A pulling force that tends to stretch a member.	T1 A structure of straight members joined at their ends, usually in triangles.
T1 Truss members carrying zero axial force under the specified loading conditions.	T1 Finding truss member forces by cutting through the truss and applying equilibrium to one part.	T1 Finding truss member forces by applying equilibrium at each joint in turn.

T1 frames and machines	T1 friction	T1 coefficient of static friction
T1 coefficient of kinetic friction	T1 impending slip	T1 distributed load
T1 centroid	T2 mathematical methods	T2 derivative

T1 The ratio of the maximum friction force to the normal force before sliding starts.	T1 A tangential contact force resisting relative sliding or its tendency.	T1 Structures with at least one member carrying more than two forces, analysed member by member.
T1 A load spread over a length, area or volume, described by the corresponding force density.	T1 The point just before sliding begins, when friction reaches its maximum value.	T1 The ratio of the friction force to the normal force while surfaces are sliding.
T2 the instantaneous rate of change, slope of the tangent	T2 Mathematical tools such as calculus, linear algebra, differential equations and statistics used to model engineering problems.	T1 The geometric centre of an area or shape.

T2 definite integral	T2 displacement	T2 volume of revolution
T2 eigenvalue	T2 eigenvector	T2 condition number
T2 basis	T2 natural frequency	T2 damping ratio

T2 The volume of a solid generated by rotating a plane region about an axis.	T2 the net change in position, s(b) minus s(a)	T2 the signed area under a curve between limits
T2 A measure of a problem's sensitivity to changes in its inputs; a large value warns of potential error amplification.	T2 A nonzero vector that a linear transformation multiplies by a scalar without changing its line.	T2 the scaling a matrix applies along an eigenvector direction
T2 Damping divided by critical damping for the specified vibration model.	T2 A frequency of free undamped oscillation; the angular natural frequency of an ideal mass-spring system is the square root of stiffness divided by mass.	T2 independent vectors that span the space; coordinates are basis-relative

T2 damped frequency	T2 resonance	T2 magnification factor
T2 truncation error	T2 round-off error	T2 gradient
T2 divergence	T2 curl	T2 flux

T2 For this forced-vibration model, steady displacement amplitude divided by the static displacement produced by the force amplitude.	T2 A large forced response when excitation is near a system's natural frequency, with the response depending on damping and the measured quantity.	T2 The oscillation frequency of an underdamped response, lower than its undamped natural frequency.
T2 the steepest-ascent vector of a scalar field	T2 Error introduced by representing or calculating numbers with limited precision.	T2 Error introduced by replacing an exact mathematical operation with a finite approximation.
T2 The surface integral of the normal component of a vector field.	T2 A vector operator describing local circulation or rotation in a vector field.	T2 the net outflow source strength of a vector field, pointwise

T2 divergence theorem	T2 uncertainty	T2 expanded uncertainty
T2 confidence interval	T2 propagation of uncertainty	T2 characteristic equation
T2 underdamped	T2 Euler method	T2 trapezoidal rule

T2 Combined standard uncertainty multiplied by a coverage factor selected for the intended coverage conditions.	T2 the quantified doubt attached to a measurement	T2 closed-surface flux equals the volume integral of the divergence
T2 An algebraic equation whose roots determine the response modes of a linear differential equation.	T2 Determining output uncertainty from input uncertainties, sensitivities and, where relevant, correlations.	T2 An interval produced by a method with a stated long-run probability of covering the true parameter.
T2 A numerical integration method approximating the function by straight lines between successive sample points.	T2 A first-order numerical method that advances a differential-equation solution using the slope at the start of a step.	T2 Having positive damping below the critical value, producing decaying oscillations in the passive second-order model.

T2 Simpson's rule	T2 Type A uncertainty	T3 dynamics
T3 particle	T3 position vector	T3 velocity
T3 acceleration	T3 trajectory	T3 projectile motion

T3 The study of motion and the forces and moments associated with it.	T2 the uncertainty computed from the statistics of repeated readings	T2 A numerical integration rule using quadratic interpolation over pairs of equal-width intervals in its standard composite form.
T3 the rate of change of position, a vector carrying both speed and direction	T3 the arrow from a fixed origin to the body, differentiated once for velocity	T3 a body whose size stops mattering for the question being asked
T3 Motion after launch; in the ideal model here, gravity is the only force and air resistance is neglected.	T3 the curve the position vector traces through space	T3 the rate of change of velocity - it exists on a curved path even at constant speed

T3 polar coordinates	T3 angular velocity	T3 normal force
T3 friction	T3 free-body diagram	T3 equation of motion
T3 work	T3 kinetic energy	T3 potential energy

T3 The component of a contact force perpendicular to the contact surface.	T3 The rate and direction of rotation, with angular speed usually measured in radians per second.	T3 A plane coordinate system specifying position by distance from an origin and angle from a reference direction.
T3 the statement that the force sum equals mass times acceleration	T3 the isolated body with every external force drawn on it and nothing else	T3 A tangential contact force resisting relative sliding or its tendency.
T3 Energy associated with a system's configuration, such as height in a uniform gravitational field or extension of an ideal spring.	T3 half m v squared, a scalar with no components and no direction	T3 Energy transferred by a force through displacement, calculated by integrating the force component along the displacement.

T3 spring constant	T3 energy method	T3 linear momentum
T3 impulse	T3 coefficient of restitution	T3 steady flow
T3 rigid body	T3 slider-crank mechanism	T3 instant centre

T3 the vector m v, conserved when the system boundary keeps external impulses out	T3 Using work and energy relations to determine motion without solving the full time-dependent force equations.	T3 The stiffness of a linear spring: restoring-force magnitude divided by displacement from its unstretched position.
T3 Flow in which conditions at each fixed location do not change with time.	T3 Relative separation speed divided by relative approach speed along the line of impact.	T3 the time integral of a force, equal to the momentum change it causes
T3 the point of a body's plane motion that has zero velocity at this instant	T3 the crank, rod and slider that convert rotation into reciprocating motion	T3 an idealised body keeping every pair of its points at a fixed distance

T3 rolling without slipping	T3 rotating frame	T3 mass moment of inertia
T3 torque	T3 angular acceleration	T3 angular momentum
T3 tipping	T4 engineering materials	T4 crystal structure

T3 The integral of squared perpendicular distance from a specified axis with respect to mass.	T3 a coordinate basis that turns with the body, with time-varying unit vectors	T3 the contact condition tying wheel to ground: v = omega r, contact point at rest
T3 The moment of linear momentum about a specified point; for fixed-axis rotation its axial component is moment of inertia times angular velocity.	T3 the rate of change of angular velocity, in radians per second squared	T3 The turning effect of a force, described by the cross product of position from the reference point and force.
T4 The ordered arrangement of atoms, ions or molecules in a crystalline material.	T4 The study and selection of materials through relationships between structure, processing and properties.	T3 Rotation about an edge of a support base that can lead to overturning.

T4 atomic packing factor	T4 dislocation	T4 grain boundary
T4 grain refinement	T4 engineering stress	T4 true stress
T4 Young's modulus	T4 yield strength	T4 toughness

T4 An interface between crystal grains with different lattice orientations.	T4 A line defect in a crystal lattice whose motion can produce plastic deformation.	T4 the geometric fraction of a unit cell filled by hard-sphere atoms
T4 Axial force divided by the current cross-sectional area in a uniaxial test.	T4 load divided by the original cross-sectional area, the reporting convention	T4 Reducing grain size, often to increase strength within a material's established Hall-Petch range.
T4 the energy per volume to fracture, the area under the stress-strain curve	T4 The stress associated with a specified onset of plastic deformation, often determined using a 0.2% offset criterion.	T4 the elastic proportionality between stress and strain

T4 ductility	T4 phase diagram	T4 eutectoid
T4 pearlite	T4 martensite	T4 lever rule
T4 strain hardening	T4 precipitate	T4 composite

T4 A solid-state reaction in which one solid phase forms two different solid phases, such as austenite forming ferrite and cementite.	T4 the map from composition and temperature to the phases present	T4 A material's capacity for plastic deformation before fracture, often assessed by elongation or reduction of area.
T4 the tie-line balance that weighs phase fractions from composition	T4 the supersaturated hard phase a quench traps, brittle until tempered	T4 the lamellar mixture of ferrite and cementite from slow cooling
T4 A material combining distinct constituents or phases to obtain a desired combination of properties.	T4 a fine second phase that impedes dislocations and raises strength	T4 strengthening by accumulated plastic strain, sigma = K eps^n

T4 rule of mixtures	T4 viscoelasticity	T4 glass transition
T4 ceramic	T4 Weibull modulus	T4 heat treatment
T4 quenching	T4 tempering	T4 casting

T4 The temperature range over which amorphous regions change between glassy and rubbery behaviour.	T4 Material behaviour combining an elastic response with time-dependent viscous deformation.	T4 Estimating composite properties from constituent properties and volume fractions under stated assumptions, such as equal strain or equal stress.
T4 Controlled heating and cooling used to change a material's structure and properties.	T4 A shape parameter describing strength variation in a Weibull model; higher values indicate less relative scatter.	T4 An inorganic, nonmetallic material, often stiff and brittle under ordinary service conditions.
T4 shaping by freezing liquid metal in a mould	T4 reheating quenched martensite to restore toughness at some strength cost	T4 Rapid cooling of a heated material; in suitable steel this can produce martensite.

T4 solidification	T4 fatigue	T4 corrosion
T4 material index	T5 thermodynamics	T5 state
T5 property diagram	T5 saturation dome	T5 quality

T4 Deterioration through chemical or electrochemical reactions with the environment.	T4 Damage and failure under repeated loading, which can occur below the monotonic yield stress.	T4 The transformation of a liquid into a solid.
T5 The macroscopic condition of a thermodynamic system described by its properties.	T5 The study of energy, heat, work, entropy and the constraints governing their transfer and conversion.	T4 the property combination that maximises performance for one load case
T5 The mass of vapour divided by the total liquid-vapour mixture mass, defined in the two-phase region.	T5 The dome-shaped boundary of the liquid-vapour two-phase region on suitable thermodynamic property diagrams.	T5 A graph relating thermodynamic properties and showing states or process paths.

T5 boundary work	T5 control volume	T5 isentropic
T5 entropy	T5 Carnot	T5 Rankine cycle
T5 vapor-compression cycle	T5 T–s diagram	T6 mechanics of materials

T5 Having constant entropy; reversible adiabatic processes are isentropic.	T5 A region selected for analysis whose boundary may be crossed by mass as well as energy.	T5 Work transferred by movement of a system boundary; quasistatic boundary work is the integral of pressure with respect to volume.
T5 A vapour power-cycle model using pumping, heat addition, expansion and heat rejection.	T5 An ideal reversible cycle between two temperature reservoirs, setting limiting heat-engine efficiency and refrigerator or heat-pump performance.	T5 A thermodynamic measure related to energy dispersal and the number of microscopic arrangements consistent with a system's macroscopic state.
T6 The study of stresses, strains, deformation and failure in loaded solid members.	T5 A graph of absolute temperature against specific entropy; a reversible path's area represents heat transfer per unit mass.	T5 A refrigeration-cycle model using compression, condensation, throttling and evaporation.

T6 normal stress	T6 strain	T6 Poisson's ratio
T6 torsion	T6 angle of twist	T6 flexure formula
T6 transverse shear	T6 Mohr's circle	T6 principal stress

T6 The negative ratio of transverse strain to axial strain under uniaxial loading in the elastic regime.	T6 The fractional change in a dimension, such as extension divided by original length.	T6 The force component perpendicular to a section per unit area, with a uniform average equal to axial force divided by area.
T6 The linear elastic bending relation giving axial stress from bending moment, distance from the neutral axis and second moment of area.	T6 The relative angular rotation between sections of a member undergoing torsion.	T6 Twisting of a member under a moment about its longitudinal axis.
T6 A normal stress acting on a principal plane, where shear stress is zero.	T6 A graphical representation of stress transformation used to find stresses on differently oriented planes.	T6 Shear stress associated with the transverse shear force in a beam, with a distribution depending on its cross-section.

T6 deflection	T6 elastic curve	T6 buckling
T6 eccentric loading		

T6 Loss of structural stability, often causing a compressed slender member to deflect sideways.	T6 The deflected shape of a beam's reference line under elastic bending.	T6 The displacement of a member from its original position, often measured transverse to a beam's axis.
		T6 Loading whose line of action does not pass through the section's centroid, producing bending as well as direct stress.