Auxiliary Concept: Dynamics

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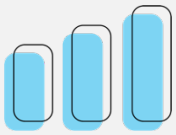
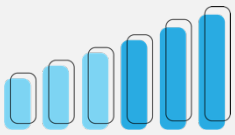
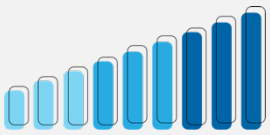
Engineering Literacy Dimension: Engineering Knowledge
Domain: Engineering Sciences
Overview: *Dynamics* concerns the analysis of objects that are accelerating as a result of acting forces. This indicates that the sum of all forces acting upon the object under investigation is not equal to zero. Dynamics can be divided into two main areas, kinetics and kinematics. Kinetics focuses on the study of forces that cause motion, such as gravity or torque, while kinematics focuses on the study of describing motion using quantities such as time, velocity, and displacement without the concern of the forces involved. Dynamics is important to Engineering Literacy, as it is the basis on which engineering professionals analyze physical systems that are in motion. For example, the application of dynamics enables professionals to solve problems where the forces are not in equilibrium by relating the forces and moments acting on a body to the resulting motion.

Performance Goal for High School Learners
I can, when appropriate, draw upon the knowledge of *Dynamics* content, such as (a) *kinetics*, (b) *kinematics*, (c) *mass moments of inertia*, (d) *force acceleration*, (e) *impulse momentum*, and (d) *work, energy, and power*, to analyze the forces within a dynamic system to solve problems in a manner that is analytical, predictive, repeatable, and practical.

	 Basic	 Proficient	 Advanced
KINEMATICS	I can describe the motion of particles and bodies under acceleration, using appropriate examples.	I can explain factors determining the motion of particles and bodies in different conditions (e.g. constant or inconstant acceleration) in terms of position, velocity, and acceleration.	I can assess position, velocity, and acceleration of a particle or body experiencing acceleration, using equations and correct units.
MASS MOMENTS OF INERTIA	I can describe the role of mass moments of inertia in rotational kinetics, using appropriate examples.	I can explain factors determining the mass moments of inertia of particles and bodies (e.g. angular momentum, angular velocity, acceleration, etc.).	I can determine the mass moments of inertia of a particle or body in a rotating dynamic system, using mathematical equations and correct units.
FORCE ACCELERATION	I can describe the relationship between force and acceleration, using appropriate examples.	I can explain how force is formed by mass and acceleration, using Newton's laws and mathematical equations.	I can determine the net force of a particle or body experiencing acceleration, using mathematical equations and correct units.

Auxiliary Concept: Dynamics Cont.

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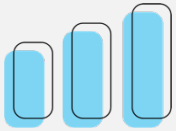
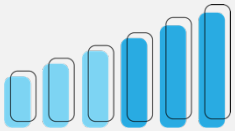
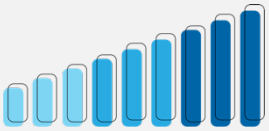
	 Basic	 Proficient	 Advanced
IMPULSE MOMENTUM	I can describe the relationship between impulse and momentum, using appropriate examples.	I can explain how momentum is changed, using Newton's laws and mathematical equations.	I can determine the momentum and impulse of a particle or body experiencing acceleration, using mathematical equations and correct units.
WORK, ENERGY, AND POWER	I can describe the relationship between work, kinetic energy, and power, using appropriate examples.	I can explain how work, energy, and power are determined, using Newton's laws and mathematical equations.	I can determine the work, energy, and power of a particle or body experiencing acceleration, using mathematical equations and correct units.