Classification of Educational Contents in the Field of Mechanical Engineering

Area/ Field			Key words
Basic	Mathematics	Basic Mechanics will be integrated in each area/field. Design is an advanced concept within each area/field.	Differentiation and integration
			Linear algebra
			Complex functions
			Differential equations
			Determinant
			Eigenvalue and eigenvector
	Physics		Equilibrium of forces
			Composition and decomposition of forces
			Moment of force
			Center of gravity and distributed force
			Laws of motion
			Motions of point mass and rigid body
			Work and energy
			Friction
			Momentum and impulse
Foundational	Materials and structures		Tensile, compressive and shearing stress/strain
			Elasticity and plasticity
			Combined stress
			Multi-axial stress
			True stress/strain
			Yield criterion and plastic constitutive equation
			Torsion and bending
			Buckling
			Strain energy and energy principle
			Strength and allowable stress of materials
			Structures and microstructures of materials
			Characteristics and functions of industrial materials
			Fracture
	Motion and vibration		Free vibration
			Forced vibration
			Transient vibration
			Resonance
			Damped vibration
			One-degree-of-freedom vibration system
			Two-degree-of-freedom vibration system
			Dynamic vibration absorber
			Machine elements
			Motion transmission mechanism
			Non-uniform motion mechanism
	Energy and fluid flow		Quantity of state (property) and quasi-static process
			Equation of state

			Entropy
			First and second laws of thermodynamics
			Exergy and effective utilization of energy resource
			Cycle
			Mixing
			Phase change
			Heat transfer (heat conduction, convective and radiative heat transfers)
			Heat exchanger
			Characteristics of fluids
			Fluid statics
			Conservation laws of mass, momentum and energy
			Laminar and turbulent flows
			Similarity law
			Ideal fluid
			Viscous fluid
			Boundary layer
			Drag force and flow resistance
			Vortex motion and dynamics
			Fluid machinery
	Information and measurement /control		Transfer function
			Feedback control
			Transient response
			Frequency response
			Phase compensation
			Stability
			Root locus
			PID (proportional-integral-derivative) control
			Fundamentals of measurement
			Sensor
			Actuator
			Electrical and electronic circuit
			State equation and state feedback
			Fundamentals of computer application
	Processing and production		Machining method / Cutting method
			Machine tool
			Precision machining
			Micro-nano processing
			Surface processing
			Plastic working
			Consolidation/ joining
			Die assembly
			Rapid prototyping
			Production management

	Mechanical systems as applications of mechanical engineering disciplines		industrial equipment and apparatus
			chemical plant
			fluid machinery
			thermal instrument
			internal combustion
			power system
			transportation machinery
			robotics
			information and media equipment
			medical, welfare and bio equipment
			resources and environment system
			space equipment and system