

Topics of the February-March 2022 Enrollment Examination for the
Department of Quantum Science and Energy Engineering

Subject	Topics
Mathematics A	Differential and Integral Calculus, Linear Algebra, Vector Analysis
Mathematics B	Ordinary Differential Equations, Partial Differential Equations, Fourier Series and Fourier Transforms, Laplace Transforms
Thermodynamics	Basic Laws of Thermodynamics, Processes of Ideal Gases, Conversion Cycles between Heat and Work, Phase Transitions, General Relations among Quantities of State, Available Energy (Exergy)
Fluid Dynamics	Ideal Fluid Flow, Vortex Dynamics, Reynolds Similarity Law, Momentum Theorem, Pipe Flow, Boundary Layer
Strength of Materials	Simple Stress, Combined Stresses, Torsion of Shafts, Shearing Force and Bending Moment in Beams, Stresses in Beams, Deflection of Beams, Statically Indeterminate Beams, Strain Energy and Energy Methods, Buckling of Bars, Thermal Stress
Dynamics of Mechanical Systems	Systems with One Degree of Freedom, Systems with Two Degrees of Freedom, Systems with Multiple Degrees of Freedom
Control Engineering	Laplace Transform, Transfer Function, Time Response, Frequency Response, Stability, PID Control, Pole Placement, State Equation, Transfer Matrix, Controllability, Observability, Realization, Design, Optimal Regulator, Observer