Topics Needed
for the Engineering Admission Exam (2027/2028)

A- Objective

The aim of admission exam is to assess candidates' aptitude and foundational scientific knowledge required for success and admission to the Faculty of Engineering. It evaluates conceptual understanding, analytical reasoning, and the abilities of students in solving problems in mathematics, physics, and chemistry, in addition to general cognitive and critical-thinking skills.

B- Admission Exam Detailed Topics

Part I: Critical Thinking and Analytical Skills

This part measures the ability of students to apply logic in solving problems and to reason in novel situations. The different main topics related to this part are:

- **Analytical Reasoning:** Quantitative puzzles, proportional reasoning, and deductive logic.
- **Verbal and Abstract Reasoning:** analogy, classification and pattern recognition.
- **Spatial Reasoning:** Visualization of geometrical configurations and measuring the degree of mental rotation.
- **Quantitative Aptitude:** Time, speed, distance, and numerical manipulation.
- **Critical Thinking:** Data Interpretation and problem solving based on inference.

Part II – Mathematics

This part assesses the mathematical competency of Lebanese Secondary Scientific students. The different main topics related to this part are:

- **Algebra:** logarithmic functions, exponential function, inequalities, polynomials, linear and quadratic equations.
- **Functions and Graphs:** Domain and range, composite functions, and inverse functions.
- **Trigonometry:** Trigonometric equations, law of sines and cosines, and trigonometric identities.
- **Calculus:** Limits, derivatives, Integrals (definition, properties, methods of integration, and applications of the integral calculus (maxima and minima, area between two curves)).
- **Probability and Statistics:** Probability theory, probability distributions, descriptive statistics (mean, median, variance), permutations and combinations.

- **Analytic Geometry and Vectors:** Scaling a vector**,** Vector operations, distances and applications, and geometric shapes (planes, circles, and straight lines).
- **Differential Equations:** Simple first-order equations, exponential growth and exponential decay.
- **Complex Numbers:** Algebraic representation, and geometric interpretation of complex numbers

Part III – Physics

This part assesses the comprehension of students of fundamental physical laws and their applications. The main topics related to this part are:

- **Mechanics:** Kinematics, Newton's laws, work-energy theorem, and law of conservation of momentum.
- **Electricity and Magnetism:** Ohm's law, capacitors and inductors, electromagnetic induction, and alternating current (AC) theory.
- **Waves and Oscillations:** Simple harmonic motion, and resonance.
- **Optics:** Diffraction, interference and Fresnel double slit experiment.
- **Modern Physics:** Photoelectric effect, atomic models, X-rays and nuclear structure.
- **Units and Measurement:** Dimensional analysis and SI standards.

Part IV – Chemistry

This part evaluates chemical understanding, emphasizing conceptual and quantitative reasoning. The main topics required to this part are:

- **Atoms:** Structure, electron configuration, periodic classification of elements, valence electron, Lewis's dot symbol, mole of atoms.
- **Molecules:** Definition, classification (diatomic, polyatomic, molecular element, molecular compound), atomicity, polarity (of diatomic), stability (octet and duet rule), covalent bonding, VSEPR, mole of molecules.
- **Ions:** Types (cations, anions), ionic compound, ionization equation, mole of ions.
- **Chemical reactions:** Transformations, representation by equation, stoichiometry (limiting/excess reagents), chemical calculations, factors that affect rate, kinds of reactions, percent purity and percent yield.
- **Water:** Natural and pure water, physical properties and importance, aqueous solution characteristics, concentration of aqueous solutions (molar, mass %, solubility), dilution problems.
- **Electrochemistry:** Oxidation, reduction, redox couples, gamma rule, redox half-reaction, electrochemical cells and batteries.

- **Rate of reaction and kinetic factors:** Rate of formation and rate of disappearance of a substance, Graphs of kinetics data, average rate, instantaneous rate and initial rate, Factors influencing reaction rate, rate constant, Half – life of a reaction, Catalysis.
- **Equilibrium:** Homogeneous equilibrium, Equilibrium constants, Shifting equilibria: Le Chatelier's Principle.
- **Organic Chemistry:** Elemental analysis, Hydrocarbons, Aliphatic hydrocarbons, Organic Compounds containing oxygen or nitrogen and isomerism, Alcohols (Definition and general formula, Nomenclature, Structure and isomerism, Chemical properties), Aldehydes and ketones, Carboxylic acids and derivatives (Definition and general formula, Nomenclature, Chemical reactions, Acids derivatives)
- **Acid – Base Reactions in Aqueous Solutions. The pH scale:** Definitions and Measurement of pH, pH of the solution of strong acid, pH of a solution of strong base, Study of the pH changes that occur during the reaction between a solution of strong, acid and a solution of strong base, Equivalence point, Acid – Base titration, Weak acid, weak base, conjugate acid /base pair