

Subject Areas for MSc. Admission Exams

Chemical Engineering and Bioengineering Chemical Engineering and Bioengineering - DD

Master programmes, Faculty of Chemical Engineering

An applicant for MSc study must have a bachelor-level knowledge of chemistry, mathematics, physics, and chemical engineering. Discussion during the examination may require the general knowledge of other disciplines at the most rudimentary bachelor level.

Mathematics

1. Derivatives. Geometrical and physical meaning of derivatives.
2. Indefinite and definite integrals. Its meaning.
3. Differential equations and applications.
4. Systems of linear algebraic equations.
5. Partial derivatives and the gradient of functions of two variables. Geometrical meaning of the gradient.
6. Inner (dot) product of vectors, the norm of the vector. Cross product and its properties.
7. Taylor series.

Physics and Physical chemistry

1. Physical quantities and units – scalar and vector quantities, vector algebra, International System of Units SI
2. Particle motion: Force, Newton's laws, work, power, kinetic and potential energy. Conservation of mechanical energy and linear momentum.
3. Object motion: Vector quantities of rotational motion, moment of inertia, torque, and angular momentum. Work, power, and energy in rotational motion. Rolling motion of rigid bodies. Static equilibrium conditions, centre of gravity.
4. Fluid mechanics: Hydrostatic pressure, Archimedes' law, Bernoulli's equation, real liquid flow.
5. The first and second laws of thermodynamics and their meaning.
6. Enthalpy and its calculation.
7. Chemical potential and its use in predicting phase and reaction equilibria.

Chemical Engineering

1. Material balances: intensive and extensive quantities, system and its boundaries, time (period) of balancing, stream, accumulation, source/sink (generation/consumption).
2. Fluid flow: laminar and turbulent flow, Reynolds number, continuity equation, Bernoulli equation, transport of fluids in pipes.
3. Mechanisms of heat transfer: convection, conduction, heat transfer in heat exchangers, and calculation of heat transfer area.
4. Chemical reactors: material balances of a batch reactor with ideal mixing, a continuously stirred tank reactor with ideal mixing, and a tubular reactor with plug flow.
5. Basic description of unit operations: sedimentation, filtration, distillation, extraction, ...