

Gate 2014 Exam Syllabus for Chemical Engineering (CH)

General Aptitude (GA)-Multiple Choice Tests

- **This Paper Consists of Verbal Ability:** English grammar, verbal analogies, instructions, critical reasoning and verbal deduction, Sentence completion, Word groups.

ENGINEERING MATHEMATICS- Mathematical branch that includes mathematical methods and techniques that are generally employed in Industry and engineering

- **Linear Algebra: Branch of mathematics which does study of operation and it is applied to find an answer to equations.** It includes topics- Systems of linear equations, Eigen vectors and eigen values, Matrix algebra.
- **Calculus: Mathematical branch that studies change in a mathematical manner.** It includes topics- Functions of single variable, continuity, limit and differentiability, Mean value theorems, Evaluation of Improper and definite integrals, Total derivative, Partial Derivatives, Minima and maxima, curl, Divergence and Gradient, Vector identities, Surface, line and Volume integrals, Directional derivatives, Stokes, Green and Gauss theorems.
- **Differential equations: rate of change and slope of curves .** It includes topics-First order equations (non linear and linear), Higher order linear differential equations with constant coefficients, Euler's and Cauchy's equations, Laplace transforms, Solutions of one dimensional wave and heat equations and Laplace equation , Initial and boundary value problems
- **Complex variables: It comes under the category of analysis of complex.** It includes topics- Cauchy's integral theorem, Laurent and Taylor series, Analytic functions.
- **Probability and Statistics: Probability is the way to roughly judge the occurrence of a thing or to what extent a statement is true.** It includes topics-Definitions of probability and sampling theorems, Mean, mode, median and standard deviation, Poisson, Binomial and Normal distributions , Random variables, Conditional probability.
- **Numerical Methods: It consists of set of rules which uses numerical approximation to find an answer to the problems of mathematical analysis.** It includes topics-Numerical solutions of non-linear and linear algebraic equations Integration by Simpson's and Trapezoidal's rule, Multi-step and single methods for differential equations.

CHEMICAL ENGINEERING-

- Process Calculations and Thermodynamics: It deals with the physical relations in between heat and different energy forms. It includes topics-** Laws of conservation of mass and energy; use of tie components; recycle, degree of freedom analysis, bypass and purge calculations. Second and First laws of thermodynamics. First law application to close and open systems. Second law and Entropy. Thermodynamic properties of pure substances: equation of state and departure function, properties of mixtures: partial molar properties, excess properties and activity coefficients; fugacity; phase equilibria: chemical reaction equilibria, predicting VLE of systems.
- Fluid Mechanics and Mechanical Operations: It deals with fluids and other forces acting on them. It includes topics-** Fluid statics, non-Newtonian and Newtonian fluids, Bernoulli equation, energy balance, Macroscopic friction factors, dimensional analysis, shell balances, flow through pipeline systems, flow meters, compressors and pumps, packed and fluidized beds, elementary boundary layer theory, size separation and size reduction; hindered and free settling; cyclones and centrifuge; thickening and classification, mixing, filtration and agitation; conveying of solids.
- Heat Transfer: To generate, use, convert and interchange of thermal energy and heat between physical systems. It includes topics-** Convection, conduction and radiation, heat transfer coefficients, unsteady and steady heat conduction, condensation, boiling and evaporation; types of heat exchangers and their design.
- Mass Transfer: Net movement of mass from one location to another. It includes topics-** Fick's laws, mass transfer coefficients, molecular diffusion in fluids, film, penetration and surface renewal theories; momentum, mass and heat transfer analogies; stage wise and continuous contacting and stage efficiencies; NTU & HTU concepts design and operation of equipment for distillation, leaching, absorption, liquid-liquid extraction, humidification, drying, dehumidification and adsorption.
- Chemical Reaction Engineering: Reactor engineering that deals with chemical reactors.** It includes topics-Theories of reaction rates; kinetics of homogeneous reactions, interpretation of kinetic data, multiple and single reactions in ideal reactors, non-ideal reactors; single parameter model; residence time distribution, non-isothermal reactors; diffusion effects in catalysis; kinetics of heterogeneous catalytic reactions.
- Instrumentation and Process Control: Art of measurement, within a production or manufacturing area.** It includes topics-Measurement of process variables; Transducers, sensors and their dynamics, transfer functions and dynamic responses of simple systems, process reaction curve, controller modes (PI, P, and PID); control valves; analysis of closed loop systems including stability, frequency response and controller tuning, feed forward control, cascade
- Plant Design and Economics: Chemical engineers plan, represent and review plant projects on the basis of economical package.** It includes topics- Process design and sizing of chemical engineering equipment such as compressors, multistage contactors; heat exchangers; principles of process economics and cost estimation

including total annualized cost, cost indexes, payback period, rate of return, discounted cash flow, optimization in design.

- **Chemical Technology: It gives knowledge about all types of agro chemicals, drugs, organic and inorganic chemistry.** It includes topics- Inorganic chemical industries; NaOH, sulfuric acid, fertilizers (Ammonia, Urea, TSP and SSP); natural products industries (Paper and Pulp, Sugar, Fats and Oil); petroleum refining and petrochemicals; polyethylene, polypropylene, polymerization industries; PVC and polyester synthetic fibres.

