**ALIGARH MUSLIM UNIVERSITY, ALIGARH**

**FACULTY OF ENGINEERING & TECHNOLOGY**

**SYLLABUS FOR**

# MASTER OF TECHNOLOGY (M.TECH.) – CHEMICAL ENGINEERING

1. **Engineering Mathematics** : Matrix algebra, Systems of linear equations, Eigen values and elgenvectors, Functions of single variable, Limit, continuity and differentiability, Maxima and minima, Gradient, Divergence and Curl, First order equations, higher order linear differential equations with constant coefficients, initial and boundary value problems.
2. **Numerical Methods in Chemical Engineering** : Error analysis, nonlinear equations, simultaneous linear equations, data analysis, numerical differentiation and integration, and ordinary differential equations.
3. **Fluid Mechanics** : Continuum concept, Fluid Static and Kinematics, Dimensional Analysis and Similitude, Drag and Boundary layer theory, Flow meters, Pipes and tube size and specification, valves and fittings, Performance characteristics of centrifugal pump.
4. **Chemical Engineering Thermodynamics** : The first and second laws of thermodynamics, Important thermodynamic properties and thermodynamic processes. Heat engine and Carnot's engines, Fugacity and Fugacity Coefficient, Raoult' Law, Activity Coefficient, Refrigeration and liquefaction processes.
5. **Fluid Particles Operations** : Size reduction and size separation, packed and fluidized beds, centrifuges and cyclones, thickening and classification, mixing and agitation, conveying of solids etc.
6. **Transport Phenomena** : Transport properties, shell balanced approach to momentum, energy and species transport with and without source.
7. **Heat Transfer** : Modes of heat transfer, Dimensionless numbers in the study of heat transfer, Types, Design and application of heat exchangers, Boiling of liquids, Boiling curve and condensation of vapors, Heat transfer studies in packed and fluidized bed.
8. **Mass Transfer** : Fick's laws, molecular diffusion in fluids, mass transfer theories; momentum, heat and mass transfer analogies; stage-wise and continuous contacting and stage efficiencies; design and operation of equipment for distillation, absorption, leaching, liquid-liquid extraction, drying humidification, dehumidification and adsorption.
9. **Chemical Reaction Engineering** : Rates Laws and Stoichemetry, Design of Ideal reactions, Design of Non-isothermal and Non-Ideal Reactors, Catalysis and Catalytic Reactors.
10. **Process Control and Instrumentation** : Static and Dynamic Characteristics of instrument, Instrumentation for measurement of Temperature, pressure, flow, level, concentration and ph, process variables, process modeling, linearization of model, transfer functions and dynamic responses of simple systems, close loop system analysis, frequency response, system stability, and controller tuning.
11. **Chemical Technology / Chemical Process Industries** : Choice of Raw Material, Recent Production and Consumption trends, Manufacturing processes of various industrial chemicals (Aromatic, Alcohols, Acetones, Aldehydes), Alkalis, Acids & Gases; Hydrogenation of Oils, Rubber, Plastics and Fibers, Fertilizers, Pesticides, Cement Glass & Dyes; Petroleum and Petrochemical Industries.
12. **Process Engineering and Plant Design** : Principles and approaches to process synthesis, process engineering and process development, Flowsheet preparation, selection of plant site and plant layout etc. General design consideration for a process plant, utilities in process industries, process economic, essential aspects of safety and hazards.

13. **Industrial Pollution Control** : Industrial pollution from Chemical process industries, characterization of emission and effluents, Environmental laws, waste managements.
14. **Process Calculation** : Laws of conservation of mass and energy, use of tie components, degree of freedom analysis, material and energy balance for non-reactive and reactive processes, recycle, bypass and purge calculation.