Major = Minor Same

Industrial chemistry — Minor paper II Semester

Semester-II
Paper-1 (Theory)
Course Title: **Material Science and Techniques in Chemical Industries**

Programme: **Certificate in Materials and Techniques in Chemical Industries**	Year: First	Semester: Second
Paper-1: Theory		Subject: **Industrial Chemistry**
Course Code: **B190201T**	Course Title: **Material Science and Techniques in Chemical Industries**	

Course outcomes:

Currently, tremendous progress has been made in development of advanced materials for their environmenta applications and knowledge has been accumulated of the effects of these advanced materials on and thei applications in the environment security, recycling and reuse of raw materials and treatment agents, economi benefits, and potential problems to our society. Upon completion of this theory course students would gai knowledge of various materials, surface chemistry and interfacial phenomena, catalysis, metals and alloys cement, ceramics and corrosion, polymer, glass, advanced materials and material balance, material balance without chemical reactions, material balance involving chemical reactions.

Credits: 4	**Compulsory**
Max. Marks: 25+75=100	Min. Passing Marks:

Total No. of Lectures: 60h

Unit	Topics	No. of Lectures
I	**Advanced materials and Material balance:** A brief introduction of Nanomaterials, superconductors, biomaterials and fullerenes **Material balance without chemical reactions:** Flow diagram for material balance and material balance calculations for distillation, absorption, evaporation, extraction filtration, crystallization.	09h
II	**Material balance involving chemical reactions:** Concepts of stoichiometric equations, limiting reactant, excess reactant, percent excess, conversion, yield, selectivity and liquid phase reaction, gas phase reaction with or without recycle or bypass.	08h
III	**Utilities in chemical industry:** (i) A brief idea about water, steam and air, Boiler-types, and theire used in chemical industries. (ii) A brief idea about fans, blowers, compressors and vacuum pumps, reciprocating pumps, gear pumps, centrifugal pumps, ejectors used in chemical industries.	08h
IV	**Distillation, evaporation:** (i) Distillation- Introduction, principle, equipments and their applications of simple, fractional, steam, vacuum. (ii) Evaporation- Introduction, principle, equipments and their applications of short tube evaporator, and forced circulation evaporators, Falling film evaporators.	09h
V	**Filtration, extraction:** (i) Filtration- Introduction, principle, equipments and their applications of plate and frame press filters rotary drum filter, bed filter and centrifuges. (ii) Extraction- Introduction, principle, equipments and their applications of spray column, packed Column, soxhlet extractor, liquid-liquid extraction, acid-base extraction.	06h
VI	**Absorption and Drying:** (i) Absorption- Introduction, principle, equipments and their applications of Tray (Plate) towers for absorption, packed towers for absorption.	08h

	(ii) Drying- Introduction, principle, equipments, Purpose of drying, and their applications of equipment- tray dryer, rotary dryer, flask dryer, fluid bed dryer, drum dryer, spray dryer.	
VII	**Crystallization:** Introduction, Equilibrium solubility, nucleation and super saturation, equipment and their application of tank crystallizer, evaporator crystallizer and circulating liquid evaporator crystallizer.	08h
VIII	**Surface chemistry and ceramics:** (i) Surface chemistry- Adsorption isotherm, sols, gels, emulsions, micelles, aerosol, effect of surfactants. (ii) Ceramics- Introduction of ceramics, types, manufacturing processes and applications of ceramics.	04h