

Department of Chemical Engineering			
Unit Operations Lab (64468)			
Total Credits	1		
major compulsory			
Prerequisites	P1 : Unit Operations (64462) OR Unit Operation (64362) P2 : Practical Analytical Chemistry (23215)		
Course Contents			
This Lab course aims at helping students acquire practical knowledge of industrial unit operations. Experiments conducted include distillation, absorption, stripping, falling film evaporative separation, extraction, and spray drying.			
Intended Learning Outcomes (ILO's)		Student Outcomes (SO's)	Contribution
1	Design&conduct experiments, as well as to analyze &interpret data related to equilibrium in distillation, extraction, gas absorption and evaporation.	B	70 %
2	Communicate effectively by writing technical reports about each conducted experiment in unit operation lab.	G	10 %
3	Use the techniques, skills &modern engineering tools necessary for engineering in order to present and calculate the operational parameters based on experimental data of equilibrium using excel spread sheets and related software.	K	10 %
4	Show An understanding of professional ðical responsibility during performing the experiments and in writing the reports.	F	10 %
Textbook and/ or References			
Text book: Laboratory manual, References: 1. McCabe, Smith and Harriott, Unit operations, 3rd Edition 2. C.J. Geankoplis, Transport processes and unit operation, 3rd Edition. 3. Robert E.Treybal, 3rd Edition, Masstransfer operations McGraw-Hill Book Company ISBN 0-07-065176-0			
Assessment Criteria		Percent (%)	
Mid. Term Exam		15 %	
Quizzes		10 %	
Laboratory Work		35 %	
Final Exam		40 %	
Course Plan			
Week	Topic		
1_4	Gas absorption measurements: 1. Hydrodynamics measurements on packed column, first by dry column then with water/air system 2. Mass transfer measurement with carbondioxide/water system. Analysis on gas side by using gas analysis equipment provided 3. Calculation rate of absorption of carbon dioxide into water from analysis of liquid solution 4. Calculation rate of absorption of carbon dioxide into caustic soda solution from analysis of liquid solution flowing down absorption column 5. Showing the amount of carbon dioxide removed from the air stream equals the amount taken by caustic soda solution. And Mass transfer measurement with carbondioxide/water system. Analysis on liquid side by using gas analysis equipment provided		
5_8	Liquid/liquid extraction Experiments: 1. Determination of distribution coefficient 2. Basic operation of liquid /liquid absorption colpumn. 3. Overall mass balance and mass transfer coefficient with the aqueous phase as the continuous medium 4. Overall mass balance and mass transfer coefficient with the aqueous phase as the continuous medium and		

	Determination of solvent recovery
9_12	Experiments on distillation unit: Batch distillation: 1. Determination the pressure drop over the distillation column for various boil-up rates. 2. Using refractometer for determining mixture composition 3. Determination overall column efficiency 4. Distillation at constant reflux ratio, variation of top and bottom composition with time 5. Steady state distillation of binary mixture , McCabe- Thiele/Ponchon Sarvorit determination no of theoretical plates. 6. Effect on column performance of feed plate location
13_1 4	Evaporation Demoneatration and operating of the evaporator and steam generator Evaporation experiment, by deionized water for investigation heat and material balances
15	Steam distillation Demonstrative experiment on extraction of essential oil