

Department of Chemical Engineering			
Reactor Design (64441)			
Total Credits	3		
major compulsory			
Prerequisites	P1 : Chemical Reaction Engineering (64320) OR Chemical Reaction Engineering (64421)		
Course Contents			
This course capitalizes on students knowledge acquired from the prerequisite courses. Topics covers the fundamentals tools and factors affecting reactor's design, analysis of performance, yields, selectivity of batch, plug flow and continuous flow of stirred tank reactors operating different types of reactions. The concept of non-ideal reaction analysis, including residence time distributions, back-mixing and dispersion models, mass and energy limitations in heterogeneous reaction systems, catalyst effectiveness, reactor stability and sensitivity to operating parameters.			
Intended Learning Outcomes (ILO's)		Student Outcomes (SO's)	Contribution
1	By the end of the course, students will be able to apply knowledge of calculus, differential equation, numerical techniques to solve reactor design problems.	A	10 %
2	By the end of the course, students will be able to interpret and analyze published heterogeneous data in finding the rate limiting steps.	B	30 %
3	By the end of the course, students will be able to design an isothermal and non isothermal reactor to meet desired needs in terms of volume and conversion, selectivity for multiple reactions.	C	30 %
4	By the end of the course, students will be able to identify, formulate, & solve non homogeneous and non-ideal reactor engineering problems.	E	30 %
Textbook and/ or References			
1- H.Scott Fogler Elements of Chemical Reaction Engineering, Fourth edition, 2006, ISBN 0-13-253220-4			
Assessment Criteria		Percent (%)	
First Exam		20 %	
Second Exam		20 %	
Homeworks		15 %	
Final Exam		45 %	
Course Plan			
Week	Topic		
1	Introduction to reactor design		
2-4	Multiple reactions: Definitions, type of reactions, maximizing the desired products in series reactions, algorithm for solution of complex reactions multiple reactions in PFR, complex reactions of Ammonia Oxidation.		
5-9	Steady State Non isothermal reactor design: Rationale, The energy balances, adiabatic operation, Steady state reactors, with heat exchange, equilibrium conversion, CSTR with heat effect, Multiple steady state First Midterm Exam		
9-13	Catalysis and Catalytic reactors: Catalysis, steps in catalytic reactors, Synthesizing rate		

	law, mechanism and rate-limiting step. Second midterm Exam
14-15	Non Ideal Mixing: residence time distributions, back-mixing and dispersion models, mass and energy limitations in heterogeneous reaction systems, catalyst effectiveness, reactor stability and sensitivity to operating parameters
16	Final Exam