COURSE #: CHE 344 (4 credits)	**COURSE TITLE:** Reaction Engineering & Design
TERMS OFFERED: Winter	**PREREQUISITES:** CHE 330: Chemical & Engineering Thermodynamics, ChE 342: Heat and Mass Transfer
TEXTBOOKS/REQUIRED MATERIAL: Fogler, Elements of Chemical Reaction Engineering, 6th Edition, Pearson Education, 2020.	**COGNIZANT FACULTY:** Singh, Kamcev, Fogler, Thurber
INSTRUCTOR: Singh	**FACULTY APPROVAL:** 2019-11-05
CoE BULLETIN DESCRIPTION: Fundamentals of chemical reaction engineering. Rate laws, kinetics, and mechanisms of homogeneous and heterogeneous reactions. Analysis of rate data, multiple reactions, heat effects, bioreactors, Safety (Runaway Reactions). Design of industrial reactors.	**COURSE TOPICS:** (number of hours in parentheses) 1. Mole Balances (4) 2. Rate Laws and Stoichiometry (6) 3. Isothermal Reactor Design (10) 4. Analysis of Data (2) 5. Multiple Reactions (4) 6. Multiple Reactions (4) 7. Energy Balances (8) 8. Safety (2) 9. Catalysis (3) 10. Bioreactions and reactors (1)

COURSE STRUCTURE/SCHEDULE: Lecture: 2 per week @ 2 hours each	
COURSE OBJECTIVES	Links shown in brackets are to course outcomes that satisfy these objectives. 1. To train students how to analyze chemical reactors and reaction systems. [a-f, i] 2. To provide practice at developing critical and creative thinking skills related to reaction engineering. [c, f-h] 3. To provide experience for students to solve open-ended reaction engineering problems in teams. [f-g] 4. To provide practice with computer software and simulation relating to chemical reaction engineering. [f]
COURSE OUTCOMES	Links shown in brackets are to ABET student outcomes 1-7. a. Describe the algorithm that allows the student to solve chemical reaction engineering problems through logic rather than memorization. [1] b. Size isothermal and non-isothermal reactors for homogeneous and heterogeneous reactions, with considerations for safety. [1, 2, 5] c. Analyze multiple reactions carried out both isothermally and non-isothermally in flow, batch, and semi-batch reactors to determine selectivity and yield. [1, 5] d. Determine the reaction order and specific reaction rate from experimental data. [6] e. Describe the steps in a catalytic mechanism and how one goes about deriving a rate law, mechanism, and rate-limiting step that are consistent with experimental data. [1, 2,6] f. Carry out computer simulation of reactors with multiple reactions with heat effects. [1, 2] g. Work together to solve both open-ended and closed-ended reaction engineering problems. [1, 5] h. Write questions that demonstrate critical and creative thinking on reaction and reactor safety. [1, 5] i. Use relevant theory to describe the molecular basis for elementary chemical reaction rates. [1]
ASSESSMENT TOOLS	1. Home problem assignments assess outcomes a-i 2. Examinations assess outcomes a-f, i 3. Open ended problem assesses outcome g 4. End of term course evaluation provides student self-assessment of outcomes a-i