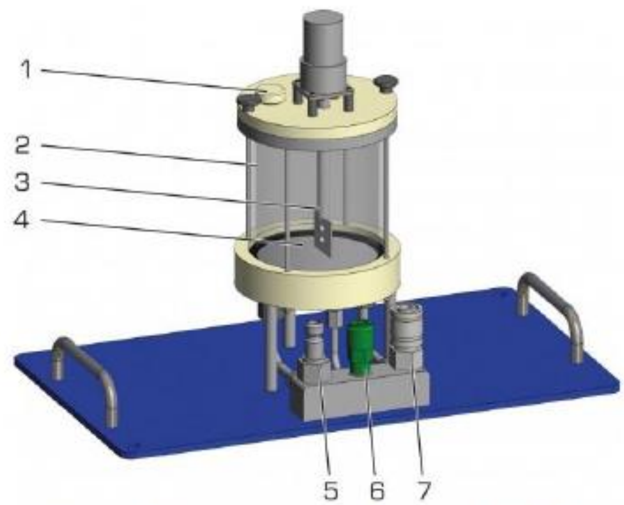
Resources of Reaction Engineering lab and PC Lab (CHE 433)

Equipment overview of Reaction lab

a) Batch reactor



b-

c- Figure 1. Batch Reactor (CE 310.04 of GUNT)

1. Hole for sensor for conductivity and temperature (included in CE 310), 2. stirred tank reactor, 3. stirer, 4. Chambered bottom as heat exchanger, 5. water supply, 6. product drain, 7. water drain

b) CSTR

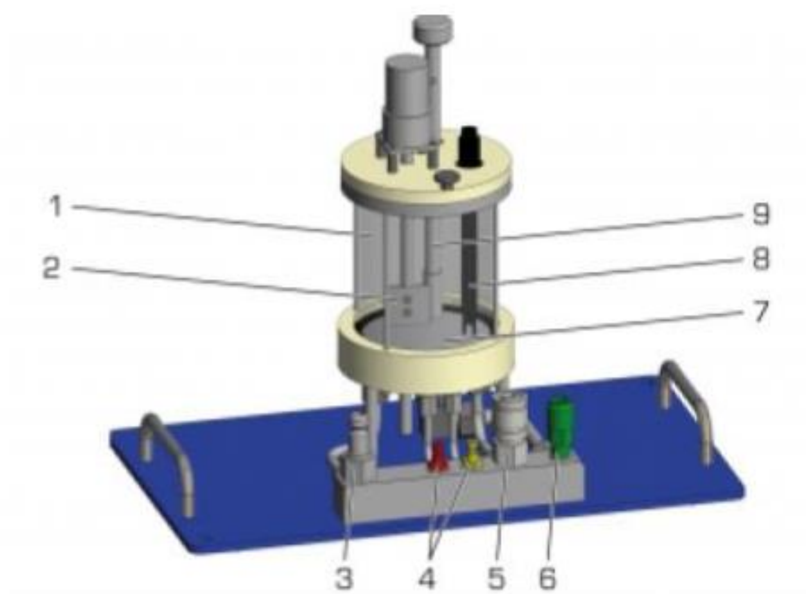


Figure 2. CSTR (CE 310.01 of GUNT)

stirred tank reactor, 2. stirrer, 3. water supply, 4. reactants A/B supply, 5. water drain, 6. product drain, 7. chambered bottom as heat exchanger, 8. sensor for conductivity and temperature (included in CE 310), 9. height-adjustable overflow.

C) Plug flow reactor (PFR)

c- Plug flow reactor

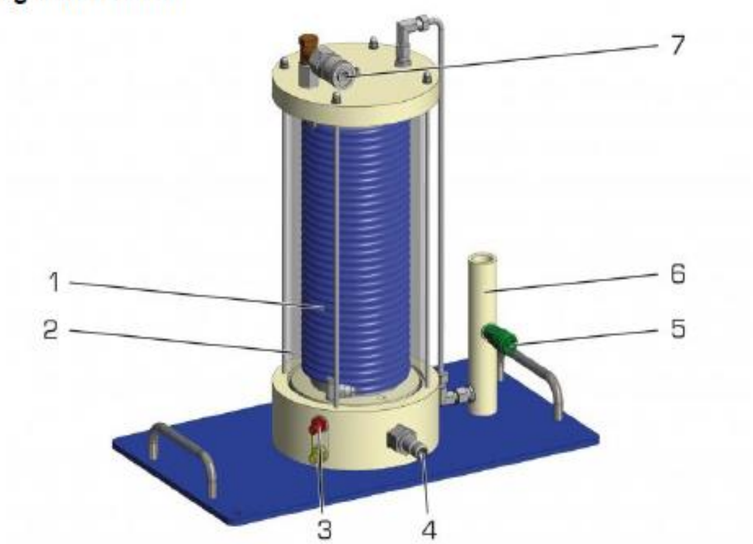


Figure 3. Tubular Reactor (CE 310.02 of GUNT)

tubular reactor, 2. double jacket, 3. reactants A/B supply, 4. water supply, 5. product drain, 6. sleeve for sensor for conductivity and temperature

D)

d- CSTR in series

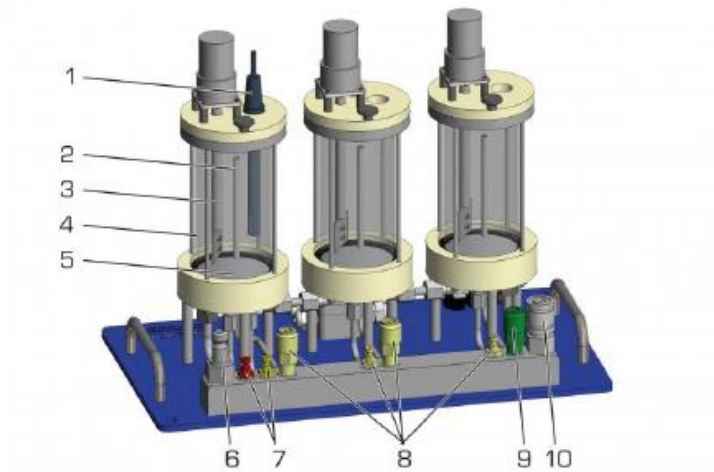
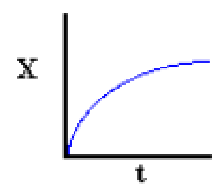


Figure 4. Tubular Reactor (CE 310.02 of GUNT)

1.sensor for conductivity and temperature, 2. overflow, 3. stirrer, 4. stirred tank, 5. chambered bottom as heat exchanger, 6. water supply, 7. reactants A/B supply, 8. intermediate delivery, 9. product drain, 10. water drain

e) Mole balances for different reactors

Mole balance for different reactors types

Reactor	Differential	Algebraic	Integral	
Batch	$N_{A0}\frac{dX}{dt} = -r_A V$		$t = N_{A0}\int_0^X \frac{dX}{-r_A V}$	
CSTR		$V = \frac{F_{A0}X}{-r_A}$		
PFR	$F_{A0}\frac{dX}{dV} = -r_A$		$V = F_{A0}\int_0^X \frac{dX}{-r_A}$	
PBR	$F_{A0}\frac{dX}{dW} = -r'_A$		$W = F_{A0}\int_0^X \frac{dX}{-r'_A}$