

**NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI-620015
DEPARTMENT OF CHEMICAL ENGINEERING**

COURSE OUTLINE						
Course Title	CHEMICAL REACTOR ANALYSIS AND DESIGN					
Course Code	CL 605	No. of Credits	L	T	P	C
			2	1	0	3
Department	Chemical Engineering	Faculty	Dr.P.Sivashanmugam			
Course Prerequisite	Knowledge in homogenous chemical reaction engineering, Fluid Mechanics, Heat transfer, and Mass transfer					
Course Coordinator(s) (if, applicable)	Dr.P.Sivashanmugam					
Other Course Teacher(s)/Tutor(s) E-mail	-	Telephone No.	0431-2503106			
Course Type	Core course					
COURSE OVERVIEW						
This course will give an idea in understanding the kinetics and design of catalytic and non-catalytic reactors						
COURSE OBJECTIVES						
<ol style="list-style-type: none"> 1. To understand the kinetics of non-catalytic chemical reaction and reactor design. 2. To understand the catalyst physical characterisation of surface area, pore volume, and pore size. 3. To understand the kinetics of catalytic chemical reaction and reactor design. 4. To understand the kinetics of fluid -fluid Chemical reaction and reactor design. 5. To understand the operation and troubleshooting of heterogeneous reactors. 						
COURSE OUTCOMES (CO)						
Course Outcomes			Aligned Programme Outcomes (PO)			
1. COURSE OUTCOME Upon completing the course, the student will be able to have awareness on catalyst physical properties and catalyst characterization acquire awareness on kinetics of catalytic reaction and reactor design. familiarize kinetics of non-catalytic reaction and reactor design familiarize with operation and troubleshooting of heterogeneous reactors.			PO1 , PO2 ,PO3 PO1, PO2, PO4, PO6, PO8, PO9 and PO10 PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO9, PO10 and PO11 PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO9, PO10 and PO11			

COURSE TEACHING AND LEARNING ACTIVITIES (* : It is likely that some of the classes will be lost due to holidays and hence the semester will go upto 14 weeks)

S.No.	Week	Topic	Mode of Delivery
1	Week 1	Overview of chemical reactor analysis and design Introduction non-catalytic reaction non-catalytic reaction mechanism and kinetics	Chalk and talk
2	Week 2	Kinetics expression developments of non-catalytic reaction Tutorial Problem solving and discussion Design of reactor for non-catalytic reaction	Chalk and talk
3	Week 3	Design of reactor for non-catalytic reaction Tutorial Problem solving and discussion Catalytic reaction Introduction	Chalk and talk
4	Week 4	Basics of physical and chemical adsorption Catalytic reaction mechanism Adsorption theory	Chalk and talk
5	Week 5	Tutorial Problem solving Surface area determination Pore volume and pore size determination	Chalk and talk
6	Week 6	Tutorial Problem solving and discussion Catalytic reaction mechanism Tutorial Problem solving and discussion	Chalk and talk
7	Week 7	Catalytic poison Cycle test -I Kinetics expression developments for Catalytic poison Tutorial Problem solving	Chalk and talk
8	Week 8	External transport process (resistance) External transport process (resistance) for different reactors Tutorial Problem solving and discussion	Chalk and talk
9	Week 9	Internal transport process-diffusions Internal transport process- Internal transport process and effective thermal conductivity Effectiveness factor and Thiele modulus	Chalk and talk

10	Week 10	Effectiveness factor and Thiele modulus Tutorial Problem solving and discussion Non-isothermal effectiveness factor	Chalk and talk
11	Week 11	Design of reactor for catalytic reaction Design of reactor for catalytic reaction Tutorial Problem solving and discussion	Chalk and talk
		Cycle test -II	
12	Week 12	Fluid-Fluid reactions –Introduction Fluid-Fluid Reactions Kinetic expression developments Fluid-Fluid reactions Kinetic expression developments	Chalk and talk
13	Week 13	Tutorial Problem solving and discussion Design of reactor for Fluid-Fluid reactions Fluid-Fluid reactions	Chalk and talk
14	Week 14	Tutorial Problem solving and discussion Seminar part talk and discussion Overview of ideas learnt in this course	Chalk and talk
		Semester Examination	

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	I cycle test	5 th week since commencement	1 hour	20%
2	II cycle test	10 th week since commencement	1 hour	20%
3	Retest (Only for Absentees)	10 th week since commencement	1 hour	20%
4	Seminar	12 th week		10 %
5	End semester examination	16 th week since commencement	1 hour	50%

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

1. O. Levenspiel, *Chemical Reaction Engineering*, 3rdEdn., Wiley Eastern, New York, 1999.
2. J.M. Smith, *Chemical Kinetics*, 3rdEdn., McGraw Hill, New York, 1981.
3. H. Scott Fogler, *Elements of Chemical Reaction Engineering*, 4thEdn., Prentice Hall of India Ltd., 2008.
4. J.J. Carberry, *Chemical and Catalytic Reaction Engineering*, McGraw Hill, New York, 1976.
5. R. Aris, *Elementary Chemical Reactor Analysis*, PHI, 1969.
6. G.F. Froment, K.B. Bischoff, *Chemical Reactor Analysis and Design*, 2nd ed., John Wiley, New York, 1990.

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)

- 1) Feed back is planned to be collected twice; once in the mid semester and one at the end of course as soon as classes are over.
- 2) The academic performance of the students will be assessed based on 2 cycle tests (each 20 marks), one final examination (50 marks) and seminars (10 marks).
- 3) Suitable mapping of Cos with Pos will be made and attainment will be calculated.
- 4) Reassessment after the declaration of endsem result will be conducted for those candidates who failed in the course or those who were absent in endsem assessment test on medical ground

COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)

- 1) It is expected that the students will not indulge in any form of malpractice in Examinations. Seminar presentation will focus on the emerging trends.
- 2) Attendance of 75% and above is expected. The 25% allowance is given for absence due to illness/institute related activities (sports/competitions/seminars etc)

Additional Course policy

1. Student who have missed the first or second or both the cycle test(s) can register with the concerned faculty for the RE-TEST Exam which shall be conducted soon after the second cycle test, but before the End semester examination. The weightage for Retest is 20% and time duration is 1 hour. The portions for Retest includes both the cycle test(s) portions.
2. Mandatory classes (after the semester examinations of the current session) should be attended by the students, whose attendance falls below 75% and but above 50% in this subjected concerned.
3. Students who have less than 50% of attendance have to redo the subject.
4. Students who have failed in the semester examination with F Grade, those completed

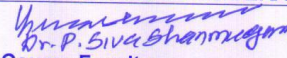
mandatory classes and those have missed the end semester examination shall take reassessment (supplementary examination).


5. The passing minimum should be 35.

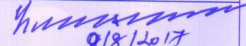
ADDITIONAL COURSE INFORMATION

eg.: The Course Coordinator is available for consultation at times that are displayed on the coordinator's office notice board. Queries may also be emailed to the Course Coordinator directly at psiva@nitt.edu

FOR SENATE'S CONSIDERATION


Dr. P. Siva Shanmuga
Course Faculty _____


CC-Chairperson _____


HOD _____ 8/8/2017