Subject Code: 09CH0304

Subject Name: Reactor and Boiler Operation Skill

Semester: 3rd

Objective: To study about Reactor and Boiler Operation for getting well developed skill for working, construction and operation of different types of reactors and boilers used in Chemical Processes Industries.

Credits Earned: 4 Credits

Course Outcomes: After completion of this course, student will be able to understand:

1. Working and operation of different types of Boilers used in process industries.
2. Working and operation of different types of Reactors used in chemical industries.
3. Identify accessories of boiler
4. Identify mounting of boiler

Pre-requisite of course: Basic concepts of units and dimensions, mass fraction mole fraction, material balance.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	Mid Sem (M)	Internal (I)	Practical Exam (V)	Term work (TW)	
0	0	4	4	00	30	20	25	25	100

Contents:

Unit	Topics	Contact Hours
1	**Generation of steam:** Introduction and definition of steam, Types of Steam, vaporization, basic of boiling and evaporation, Properties of steam and terminologies, heat energy basic related to production of steam,	08
2	**Basic of Boiler:** Classification of boiler according to tube content, furnace condition, pressure of steam, mobility of boiler and heat source, Importance of steam trap, Circulation of water, different types of cycle for boiler	12
3	**Types of boiler and their working and construction:** Basic technologies related to different boilers, simple vertical boiler, Cochran boiler, Babcock and Wilcox boiler, Different types of mountings and accessories of boiler, Application of boiler in industries.	15

4	**Batch Reactor & Semi Batch Reactor:** Mass and energy balances around a volume element. Performance equation of Batch reactor design equation. Concept of semi batch reactor.	07
5	**Mixed Flow Reactor:** Mass and energy balances around an element. Performance equation of Mixed flow reactor design equation effect of concentration and temperature on conversion.	07
6	**Plug Flow Reactor:** Mass and energy balances around an element. Performance equation of Plug flow reactor design equation.	07
	Total Hours	**56**

References:

- **Text Book:**

1. Fundamental of Mechanical Engineering by R.B. Varia : Atul Prakashan

- **Reference Book:**

1. Elements of Mechanical Engineering by N.M. Bhatt: Mahajan Publication.
2. Elements of Mechanical Engineering by N.V. Rachchh: McGraw-Hill Publication.

List of Experiments:

1. Working and construction of Cochran boiler.
2. Working and construction of Babcock and wilcox boiler.
3. To study of construction and working of mountings of boiler
4. To study of construction and working of accessories of boiler
5. Working and construction of plug flow reactor.
6. To find out the conversion of plug flow reactor using its performance equation.
7. Working and construction of batch reactor.
8. To find out the conversion of batch reactor using its performance equation.
9. Working and construction of Continues stirred reactor and mixed flow reactor.
10. To find out the conversion of Continues stirred reactor using its performance equation.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyse	Evaluate	Create
20%	40%	20%	20%	-	-

Instructional Method:

a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.