



INSTRUCTION DIVISION
FIRST SEMESTER 2016-2017
Course Handout (Part II)

Date: 02/08/2016

In addition to part-I (General Handout for all courses appended to the timetable) this portion gives further specific details regarding the course.

Course No. : **CHE G619**
Course Title : **Process Intensification**
Instructor-in-Charge : **SURESH GUPTA**

1. Course Description

A brief review of the process intensification (PI), includes philosophy and principles of PI; equipments and methods for PI; few examples of their applications on the commercial scale, such as multifunctional reactors, hybrid processes, monolithic reactors, high gravity reactors etc.; industrial practice of PI – methodology and applications; PI by process synthesis; PI by plant safety. This course will terminate with several design projects on real life problems.

2. Scope and Objective

Engineers at many universities and industrial research centers are working on novel equipments and techniques that potentially lead to compact, safe, energy-efficient and environment-friendly sustainable processes. Chemical engineers all over the world are working towards these goals. An entirely new discipline “Process Intensification” focuses these issues. This course gives the basic overviews of origin, need, ways (method and equipments) and applications of process intensification (commercialized and under development), PI by process synthesis and plant safety.

3. Text Book (TB)

1. David Reay, Colin Ramshaw, Adam Harvey. “Process Intensification: Engineering for Efficiency, Sustainability and Flexibility”, Second Edition, Elsevier Ltd., USA, 2013.

4. Reference Books (RB)

1. Andrzej Stankiewicz, Jacob A. Moulijn. “Re-engineering the chemical processing plant: process intensification” Marcel Dekker, Inc., New York, 2004.

5. Course Plan

Lect. No.	Learning Objectives	Topics to be covered	Ref. Chap./Sec.#(Book)
1 – 3	Concept of Process Intensification (PI)	History, Philosophy, Principles, Definition, need of process Intensification	Chapter 1 & 2 (TB) and Chapter 1 (RB)
4 – 9	Mechanisms Involved in Process Intensification	Introduction, Intensified heat and mass transfer, electrically enhanced processes, micro fluidics, pressure	Chapter 3 (TB) and Chapter 1 (RB)





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10 – 14	Compact and Micro-heat exchangers	Introduction, Compact heat exchangers, Micro-heat exchangers, what about small channels?, Nano-fluids	Chapter 4 (TB) & Chapter 4 (RB)
15 – 21	Reactors	Principles, Spinning disc reactors, Oscillatory baffled reactors, Micro-reactors, Micro-reactors, Field-enhanced reactors, Reactive separations, Membrane reactors, Supercritical operations	Chapter 5 (TB) and Chapter 3, 5, 6, 9, 10 (RB)
22 – 25	Intensification of Separation Processes	Introduction, Distillation, Centrifuges, Membranes, Drying, Precipitation & Crystallization, Electrolysis	Chapter 6 (TB) and Chapter 2, 8, 9 (RB)
26 – 30	Intensified Mixing	Introduction, Inline mixers, Mixing on a spinning disc, Induction-heated mixer	Chapter 7 (TB) and Chapter 7 (RB)
30 – 37	Industrial Practice and applications	Methodology, Application in various industries such as Petrochemicals and fine chemicals, offshore processing, miscellaneous	Chapter 8, 9, 10 (TB) and Chapter 12 (RB)
38 – 40	PI by improvement in existing plant and process synthesis	De-bottle-necking, Principles, Design, Integrated plants	Chapter 11 (RB)

Evaluation Scheme

Evaluation Component	Duration	Weightage	Date & Time	Nature of Component
Mid semester test	90 min.	25%	<TEST_1>	CB
Project	-	10%		OB
Surprise tests (5 out of 6)	-	10%		CB/OB
Assignments	-	20%		OB
Comprehensive Examination	3 hr.	35%	<TEST_C>	CB/OB

- Chamber consultation hours will be announced in the class.
- The notices will be displayed on the Chemical Engineering Group notice board and on Nalanda.
- Make-up will be granted for genuine cases only. Prior permission of IC is compulsory.

Instructor-in-Charge
CHE G619



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