

Teaching Scheme and Syllabus

For

Bachelor of Technology

In

Chemical Engineering

with

Honors



Department of Chemical Engineering

**Sardar Vallabhbhai National Institute of Technology**

### **Honors in Chemical Engineering**

Sr. No.	Semester	Subject	Code	Scheme	Credit
1.	IV	PROCESS INTENSIFICATION	CH220	3-1-0	4

L	T	P	C
3	1	0	4

### 1. Course Outcomes:

At the end of the course, the students will be able to

CO1	Identify the scope for process intensification in chemical processes and operations.
CO2	Explain the concept of process intensification and the methodologies for PI.
CO3	Explain the operating principle of intensified technologies and its implementation.
CO4	Analyse the range of potential applications of intensified equipment.
CO5	Analyse the range of potential applications of intensified operation/process.
CO6	Appraise process challenges using intensification technologies and solve case studies.

### 2. Syllabus:

<b>INTRODUCTION &amp; PROCESS INTENSIFICATION TECHNIQUES</b>	<b>(06 Hours)</b>
Historical background & Philosophy, Principles and Domains of Process Intensification (PI), Benefits of Intensified Processes, PI Toolbox – Equipments and Methods, Active and Passive Techniques.	
<b>COMPACT HEAT EXCHANGERS</b>	<b>(06 Hours)</b>
Heat transfer intensification, Printed circuit heat exchangers, Foam heat exchangers, Micro-heat exchangers, etc.	
<b>HIGH GRAVITY FIELDS</b>	<b>(06 Hours)</b>
Process fundamentals, Rotating packed bed, Design, Applications and Scale-up.	
<b>INTENSIFIED MIXING &amp; REACTORS</b>	<b>(10 Hours)</b>
PI in stirred tanks, Spinning disc reactors, Structured reactors, Microchannel reactors.	
<b>REACTIVE SEPARATIONS</b>	<b>(07 Hours)</b>
Reactive distillation, Reactive absorption, Reactive extraction, Reactive membrane separations.	
<b>ENHANCED FIELDS</b>	<b>(05 Hours)</b>
Energy based intensifications, Sonochemistry, Microwaves, Electrostatic fields.	
<b>CASE STUDIES-APPLICATION AREAS</b>	<b>(05 Hours)</b>
Methodology and Applications, Typical case studies from industrial sectors.	
<b>Tutorial problems based on the topics covered during the theory classes.</b>	<b>(15 Hours)</b>
<b>(Total Contact Time: 45 Hours + 15 Hours = 60 Hours)</b>	

### 3. Books Recommended:

1.	Reay D., Ramshaw C., Harvey A., "Process Intensification: Engineering for Efficiency, Sustainability and Flexibility", 2nd Edition, Butterworth-Heinemann, 2013.
2.	Boodhoo K., Harvey A., "Process Intensification Technologies for Green Chemistry", John Wiley & Sons, 2013.
3.	Stankiewicz A., Moulijn J.A., "Re-Engineering the Chemical Processing Plant: Process Intensification", Marcel Dekker, 2004.
4.	Keil F. J., "Modeling of Process Intensification", WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim, 2007.
5.	Stankiewicz A., Gerven T. V., Stefanidis G., "The Fundamentals of Process Intensification", Wiley VCH 2019.