

**SWAMI VIVEKANAND UNIVERSITY, SIRONJA,  
SAGAR (M.P.)**



**SYLLABUS**

**For**

**B.Tech. in Chemical Engineering  
Semester - VI**

**Swami Vivekanand University, Sironja Sagar  
2013-2014**

# SCHEME OF B.TECH CHEMICAL SEM- VI

SUBJECT CODE	SUBJECT
BT-601	Mass Transfer Operation -II
CH-602	Chemical Process Industries-II
CH-603	Process Equipment Design-I
CH-604	Pollution Control & Safety Management
CH-605	Computer Aided Process Synthesis
CH-606	Software lab-IV
CH-607	SELF STUDY (INTERNAL ASSESSMENT)
CH-608	SEMINAR / GROUP DISCUSSION (INTERNAL ASSESSMENT)

SUBJECT CODE	THEORY				PRACTICAL			CREDIT	TOTAL	TH- THEORY MS- MID SEM  TW- THEORY TERM WORK PR- PRACTICAL LW- LAB WORK PQ- PRACTICAL QUIZ G - GRADE GP- GRADE POINT  F\$-ABSENT #-GRACE
	TH	MS	TQ	TW	PR	LW	LQ			
	MAX MIN	MAX MIN	MAX MIN	MAX MIN	MAX MIN	MAX MIN	MAX MIN	TH PR	MAX	
BT-601	70 22	20 -	10 -	- -	- -	- -	- -	4 -	100	
CH-602	70 22	20 -	10 -	- -	- -	- -	- -	4 -	100	
CH-603	70 22	20 -	10 -	- -	30 9	20 -	- -	4 2	150	
CH-604	70 22	20 -	10 -	- -	30 9	20 -	- -	4 2	150	
CH-605	70 22	20 -	10 -	- -	30 9	20 -	- -	4 2	150	
CH-606	- -	- -	- -	- -	30 -	20 -	- -	- 2	50	
CH-607	- -	- -	- -	- -	- -	- -	50 -	- 2	50	
CH-608	- -	- -	- -	- -	- -	- -	50 -	- 2	50	





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## **Text Book:**

1. Shreve's chemical process industries- George Austin.
2. DRYDENS outlines of chemical technology for the 21<sup>st</sup> century, third edition by M Gopalarao & Marsal Sitting, pub East-West Press

## **Reference Books:**

1. Biotechnology, Chemical feedstock and Energy utilization-D. F. Gibbs.

4.	<b>Drying:</b> Equilibrium relationship, Drying operations and equipments, Equilibrium moisture, Bound moisture, unbound moisture, free moisture etc., Hysteresis in Drying, Batch drying, rate of drying, time of drying, Cross-circulation drying, concept of <i>NoG</i> and <i>HoG</i> , Drying at low temperature, Freeze drying etc. Mechanism of various drying operations, Batch & continuous drying equipments-Tray dryer, Tunnel dryer, Rotary dryers, Spray dryers, Fluidized bed dryer, etc.	10
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## Practical and Term-work:

Experiments based on the above topics

## Text Book:

“Mass transfer operation” by R.E. Treybal, Mc-Graw Hill international

## Reference Books:

- 1 “Mass Transfer” by Sherwood, Pigford & Wilke, Mc-Graw Hill international
- 2 “Chemical Engineering”, Volume-2, 4<sup>th</sup> edition by Coulson & Richardson
- 3 Perry’s Chemical Engineers handbook, 7<sup>th</sup> edition by Perry & Green, Mc-Graw Hill international
- 4 Unit Operations of Chemical Engg. By W.L. McCabe, J. C. Smith & Harriott, 6<sup>th</sup> edition Mc-Graw Hill international



4.	<b>Process design of Absorbers:</b> Introduction, Criteria for selection among different types of absorption equipment, Process Design of packed tower type absorber: Determination of actual amount of solvent, Selection of packing, Determination of tower diameter & pressure drop, Determination of $N_{toG}$ , $H_{toG}$ & height of packing, Process design & selection criteria of liquid distributors, redistributors & packing support, Process design of Spray chamber or spray tower type absorber, Venturi Scrubber, Process design of falling film absorber.	12
5.	<b>Process design of Extractor:</b> Industrial applications of liquid-liquid extraction, choice of solvent, Process design of counter current multistage extractor, Selection criteria among different types of extractor, Process design of mixer-settler type extractor & packed tower type extractor, Guidelines for the design of other types of extractors	12

## Text Book:

1. "Introduction to Process Engineering and Design" by S B Thakore and B I Bhatt, Tata McGraw Hill, 1<sup>st</sup> Edition, 2007.

## Reference Books:

1. Coulson & Richardson's Chemical Engineering - Vol. 6 by R.K.Sinnott, Asian Book Pvt. Ltd. (publisher)
2. Applied Process Design for Chemical and Petrochemical plants, Vol. 1 to 3 by E.E.Ludwig, Gulf Publishing Company





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4. Fault and Event Tree Analysis for Risk Prediction 5. Source Models Models of Accidental Release of Toxic/Flammable liquids and vapors, Models of flow of liquids and vapors through pipes. 6. Dispersion Models: Mathematical Models for prediction of Dispersion patterns for toxic/flammable materials released into atmosphere, various types of "plume" and "puff" models of dispersion.	9
7. Nature of fires and explosion Calculation of Blast damage due to over-pressure, prevention of fires and explosions. 8. Control of Major Chemical Hazards, Emergency Control and disaster planning. 9. Introduction to various personal protective equipments 10. Instruments for safety : Pressure safety valve, Rupture disc , Interlocks etc..	10

## Text Books:

1. Frank P Lees, "Loss Prevention in Process Industries" Volume 1, 2 & 3
2. Industrial Organization and Economics by T.R. Banga & S.C. Sharma

## Reference Books:

1. Environment Engg. by Metcalf and Eddy
2. Environmental Pollution Control Engineering By C.S.Rao

## B.Tech. Chemical Engg. Semester -VI

Subject Name: **Computer Aided Process Synthesis**

### Detailed Process Synthesis - Algorithmic Methods:

Sr. No	Course Content	Total Hrs.
1.	<b>The Design Process-</b> Design Opportunities, Steps in Product Process Design, Environmental Protection, Safety Considerations, Engineering Ethics, Role of Computers. Reactor Design and Reactor Network Synthesis- Objectives, Reactor Models, Reactor Design for Complex Configurations, Reactor Network Design Using the Attainable Region.	12
2.	<b>Synthesis of Separation Trains-</b> Objectives, Criteria for Selection of Separation Methods, Selection of Equipment, Sequencing of Ordinary Distillation for the Separation of Nearly Ideal Fluid Mixtures, Sequencing of Operations for the Separation of Non-ideal Fluid Mixtures, Separation Systems for Gas Mixtures, Separation Sequencing for Solid-Fluid Systems.	15
3.	<b>Heat and Power Integration-</b> Objectives, Minimum Utility Targets, Networks for Maximum Energy Recovery, Minimum Number of Heat Exchangers, Threshold Approach Temperature, Optimum Approach Temperature, Superstructures for Minimization of Annual Costs, Multiple Utilities, Heat-integrated Distillation Trains, Heat Engines and Heat Pumps.	30
4.	<b>Optimal Design and Scheduling of Batch Processes-</b> Objectives, Introduction, Design of Batch Process Units, Design of Reactor-separator Processes, Design of Single Product Processing Sequences, Design of Multi-Product Processing Sequencing.	15

## **Text Books:**

1. Warren D. Seider, J. D. Seader, Daniel R. Lewin, "Product and Process Design Principles: Synthesis, Analysis, and Evaluation", 2nd Edition, Wiley(2003)
2. Systematic Methods of Chemical Process Design by Lorens T Biegler, E. I. Gnacio Grossmann Arthur W Westerberg, PHI International.

## **Reference Books:**

1. T.F. Edgar and D.M. Himmelblau, "Optimization of Chemical Processes", Chemical Engg. Series, McGraw Hill
2. Richard G. Brereton, "Chemometrics: Data Analysis for the Laboratory and Chemical Plant", April 2003 Wiley