

Branch

CHEMICAL

Semester

5

Course Code

Course Name

SEPARATION PROCESSES I

<b>Course Outcome 1</b>	The students will be able to identify principles of mass transfer.	<b>Teach Hrs</b>	<b>Marks</b>
<b>Learning Outcome 1</b>	Student will be able to understand separation processes	4	10
<b>Contents</b>	Overview of chemical engineering separation process, Mechanism of separation: mechanical separations and mass transfer operations, Classification of Mass Transfer Operation, steady state operation ,unsteady state operation, stagewise operations, continuous contact (differential contact) operation, Direct contact of two immiscible phases Gas-gas, Gas-liquid, Gas-solid, Liquid- liquid, Liquid- solid and Solid- solid, Phase separated by membrane		
<b>Method of Assessment</b>	Pen paper test		
<b>Learning Outcome 2</b>	Student will be able to select appropriate mass transfer operation for a particular mixture	4	10
<b>Contents</b>	Choice of separation method, introduction to distillation absorption, humidification , drying, crystallization, leaching , extraction, and adsorption with driving force, mixtures for which they are suitable and areas of applications.		
<b>Method of Assessment</b>	Pen paper test		
<b>Course Outcome 2</b>	The students will be able to apply principles of diffusion.		
<b>Learning Outcome 1</b>	Student will be able to explain basics of diffusion	4	10
<b>Contents</b>	Introduction, Difference between diffusion and effusion, understanding diffusion through kinetic theory of gases, Mean free path, impact of pressure and temperature on rate of diffusion, Molecular and turbulent diffusion, Types of molecular diffusion, Difference between molecular and turbulent diffusion, Rate of diffusion, Diffusion of substance due to bulk and relative motion, Fick's law of diffusion,		

	Diffusivity		
<b>Method of Assessment</b>	Theory exam		
<b>Learning Outcome 2</b>	Student will be able to calculate rate of diffusion in different phases under steady state conditions.	8	15
<b>Contents</b>	Steady state molecular diffusion in fluids (gases and liquids) at rest and in laminar flow. Molecular diffusion in gases for equimolar counter diffusion, and for diffusion of a component in a non diffusing substance. Molecular diffusion in liquid for equimolar counter diffusion and diffusion of a component in a non diffusing substance. Steady state molecular diffusion in multi component mixture, effective mean diffusivity, simple numerical problems,		
<b>Method of Assessment</b>	Theory Exam		
<b>Learning Outcome 3</b>	The students will be able to calculate diffusivity of gases and liquids.		
<b>Contents</b>	Calculation of diffusivity of gases and liquids applying fundamental principles and equipments based on them	9	20
<b>Method of Assessment</b>	Laboratory Test by observation		
<b>Course Outcome 3</b>	Student will be able to apply principles of distillation for the separation of binary liquid mixtures.		
<b>Learning Outcome 1</b>	Student will be able to explain laws related to distillation.	4	10
<b>Contents</b>	1 Definition, driving force and underlying principles of distillation . Binary and multi component distillation. More volatile and less volatile component, volatility and relative volatility . Dalton's and Rault's law with reference to distillation. Concept of partial pressure, vapor pressure & total pressure		
<b>Method of Assessment</b>	Paper Pen Test		
<b>Learning Outcome 2</b>	Student will be able to plot T-X-Y diagram and X-Y diagrams.	9	20
<b>Contents</b>	Phase equilibrium in distillation (practical determination of X-Y data), Vapor-liquid equilibrium diagram, boiling point composition diagram. Azeotrope,		
<b>Method of Assessment</b>	Laboratory Test by observation.		
<b>Learning</b>	Student will be able to calculate Distillation characteristics of	4	10

<b>Outcome 3</b>	volatile components.		
<b>Contents</b>	volatility and relative volatility . Calculation of equilibrium data from relative volatility and from vapor pressure data of pure components, Simple numerical problems on above topics		
<b>Method of Assessment</b>	Theory Exam		
<b>Learning Outcome 4</b>	Students will be able to use different methods of distillation according to need.	15	25
<b>Contents</b>	<p>Methods of distillation : <b>Differential distillation</b>, equilibrium distillation, steam distillation, azeotropic distillation, <b>extractive distillation</b>, and rectification.</p> <p>Differential distillation: Principle, Equipments and its operation fields of application, Rayleigh equation, Use of graphical integration for calculation based on Rayleigh equation</p> <p>Equilibrium distillation: Principle, Equipments and its operation fields of application, Calculation of residue and distillate composition, Difference between differential distillation &amp; equilibrium distillation</p> <p>Steam distillation : Use of open steam in distillation Reason advantage, disadvantages, application and calculation of steam requirement.</p> <p>Azeotropic distillation : azeotropic mixture and difficulty in its separation, principle, and Description of the method by suitable examples minimum and maximum boiling azeotrope.</p> <p>Extractive distillation: need to carry out extractive distillation, principle and Description of the method by suitable examples</p> <p>Difference between azeotropic and extractive distillation</p> <p>Continuous Rectification: Principle of continuous distillation, Distillation column used for used for continuous rectification. Distillate and waste, Reboiler and condenser, Partial and total condensation. Down comer and weir, Use of multiple feed and side streams</p>		
<b>Method of Assessment</b>	Theory exam		
<b>Learning Outcome 5</b>	Students will be able to operate different types of distillation apparatus.	15	20
<b>Contents</b>	operation of batch distillation, sieve tray ,bubble cap tray column, vapour liquid equilibrium apparatus and glass distillation column to generate data, and to calculate different parameters		
<b>Method of Assessment</b>	Laboratory Test by observation.		
<b>Course Outcome 4</b>	Student will be able to calculate reflux ratio , number of plates, water and steam requirements for the column		
<b>Learning Outcome 1</b>	Student will be able to number of plates, water and steam requirements for the column	11	25
<b>Contents</b>	Overall and component balance, Reflux and reflux ratio, Importance of reflux in purity of product,		

	<p>calculation of No. of plates: Introduction to Mc Cabe Thiele Method, Lewis Sorrel Method, and Ponchon Sevrin method, Assumption in McCabe and Lewis sorrel method: Assumptions of No heat losses, No heat of mixing and dilution, equimolal latent heat of vaporization and Equimolal counter diffusion, rectifying and stripping section and reason to naming so, nomenclature in rectifying and stripping section, Top and bottom operating line and their equations. Intersection of operating lines of rectifying and stripping sections. Equation of q line, slope of q line for various types of feed. Location of feed plate, Calculation of number of plates in rectifying and stripping section of the column and location of feed plate Mc Cabe Thiele method for different feed conditions, and calculation of water and steam requirement</p>		
<b>Method of Assessment</b>	Theory exam		
<b>Learning Outcome 2</b>	The students will be able select appropriate reflux ration for a particular operation.	8	20
<b>Contents</b>	<p>Minimum reflux ratio : operation of column at minimum reflux ratio, calculation of minimum reflux ratio by graphical method and Underwood and Fenske equation.</p> <p>Total reflux: Definition, what happens when the column is operated at total reflux, Calculation of no of plates at total reflux by Fenske equation</p> <p>Optimum reflux ratio: Factor affecting the selection of optimum reflux ratio, graphical selection of optimum reflux ratio.</p>		
<b>Method of Assessment</b>	Theory exam		
<b>Learning Outcome 3</b>	Student will be able to explain importance of optimum parameter selection for the smooth running of column.	5	10
<b>Contents</b>	<p>Construction, merits and demerits of sieve tray, bubble cap tray and valve tray and their comparison. Problem encountered in the operation of tray columns: Entrainment, weeping, conning, dumping, priming, loading and flooding.</p> <p>Efficiency of distillation column: overall efficiency, Murphree plate efficiency and point efficiency.</p>		
<b>Method of Assessment</b>	Theory Exam		
<b>Course Outcome 5</b>	Student will be able to control operation of absorption in packed and plate towers.		
<b>Learning Outcome 1</b>	Student will be able to correlate different types of mass transfer coefficients.	6	10

<b>Contents</b>	Definition and driving force for absorption, Equilibrium solubility of a gas in a liquid and concept of highly soluble, moderately soluble and almost insoluble gas. Henry's law, Solubility curve and operating line, Mass transfer coefficients : definition and explanation, Concept of gas film, liquid film and overall mass transfer coefficient & their interrelations. nomenclature of different types of mass transfer coefficients based on driving force. Choice of solvent for absorption		
<b>Method of Assessment</b>	Theory Exam		
<b>Learning Outcome 2</b>	Student will be able to explain construction and working of equipments for absorption.	6	15
<b>Contents</b>	Packed tower for absorption: Detailed study of construction and working of packed tower. Characteristics of tower packing. types of tower packing : random and regular packing. their characteristics merits and demerits. Different types of random packings : construction, and figure. Channelling in packed tower and methods to minimise it. Construction, working and main feature of venturi scrubber and wetted wall column.		
<b>Method of Assessment</b>	Theory Exam		
<b>Learning Outcome 3</b>	Student will be able to operate absorption equipments.	12	20
<b>Contents</b>	Operation of wetted wall column and packed bed absorption column and generation of data.		
<b>Method of Assessment</b>	Laboratory test by observation		
<b>Learning Outcome 4</b>	Student will be able to calculate height of packed tower required for desired separation.	6	15
<b>Contents</b>	Height of column for isothermal non reaction absorption, derivation of Equation for calculation of tower height based on HTU and NTU, Minimum liquid gas ratio, different types of NTU, HTU based on different driving force. absorption factor, HETP, Simple numerical problems		
<b>Method of Assessment</b>	Theory Exam		

<b>RGPV (Diploma Wing ) Bhopal</b>	<b>SCHEME FOR LEARNING OUTCOME</b>	<b>Branch Code</b>			<b>Course Code</b>			<b>CO Code</b>	<b>LO Code</b>	Format No. 4
		<i>C</i>	<i>0</i>	<i>2</i>				<i>1</i>	<i>1</i>	

<b>COURSE NAME</b>	SEPARATION PROCESSES I
<b>CO Description</b>	The students will be able to identify principles of mass transfer.
<b>LO Description</b>	Student will be able to understand separation processes

**SCHEME OF STUDY**

<b>S. No.</b>	<b>Learning Content</b>	<b>Teaching – Learning Method</b>	<b>Description of T-L Process</b>	<b>Teach Hrs.</b>	<b>Pract. /Tut Hrs.</b>	<b>LRs Required</b>	<b>Remarks</b>
1	Overview of chemical engineering separation process, Mechanism of separation: mechanical separations and mass transfer operations, Classification of Mass Transfer Operation, steady state operation ,unsteady state operation, stagewise operations, continuous contact (differential contact) operation, Direct contact of two immiscible phases Gas-gas, Gas-liquid, Gas-solid, Liquid- liquid, Liquid- solid and Solid-solid, Phase separated by membrane	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken.	3	1	Suggested text book handouts power point	

**SCHEME OF ASSESSMENT**

<b>S. No.</b>	<b>Method of Assessment</b>	<b>Description of Assessment</b>	<b>Maximum Marks</b>	<b>Resources Required</b>	<b>External / Internal</b>
1	Pen paper test	Theory question related to the learned content will be asked in the test paper	10	Test Paper + Rating Scale	Internal

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

Nil

RGPV (Diploma Wing ) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		C	0	2				1	2	

<b>COURSE NAME</b>	SEPARATION PROCESSES I
<b>CO Description</b>	The students will be able to identify principles of mass transfer.
<b>LO Description</b>	Student will be able to select appropriate mass transfer operation for a particular mixture.

**SCHEME OF STUDY**

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Choice of separation method, introduction to distillation absorption, humidification , drying, crystallization, leaching , extraction, and adsorption with driving force, mixtures for which they are suitable and areas of applications	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken.	3	1	Suggested text book handouts power point	

**SCHEME OF ASSESSMENT**

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Paper Pen Test	Theory question related to the learned content will be asked in the test paper	10	Test Paper + Rating Scale	Internal

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

Nil

RGPV (Diploma Wing ) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		C	0	2				2	1	

<b>COURSE NAME</b>	SEPARATION PROCESSES I
<b>CO Description</b>	The students will be able to apply principles of diffusion.
<b>LO Description</b>	Student will be able to explain basics of diffusion

**SCHEME OF STUDY**

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Introduction, Difference between diffusion and effusion, understanding diffusion through kinetic theory of gases, Mean free path, impact of pressure and temperature on rate of diffusion, Molecular and turbulent diffusion, Types of molecular diffusion, Difference between molecular and turbulent diffusion, Rate of diffusion, Diffusion of substance due to bulk and relative motion, Fick's law of diffusion.	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken.	4	1	Suggested text book handouts power point .	

**SCHEME OF ASSESSMENT**

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Theory Exam	Theory questions related to the learned content will be asked in the university question paper	10	Question paper	External

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

Nil



RGPV (Diploma Wing ) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		C	0	2				2	2	

<b>COURSE NAME</b>	SEPARATION PROCESSES I
<b>CO Description</b>	The students will be able to apply principles of diffusion.
<b>LO Description</b>	Student will be able to calculate rate of diffusion in different phases under steady state conditions

#### SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	eady state molecular diffusion in fluids (gases and liquids) at rest and in laminar flow. Molecular diffusion in gases for equimolal counter diffusion, and for diffusion of a component in a non diffusing substance. Molecular diffusion in liquid for equimolal counter diffusion and diffusion of a component in a non diffusing substance. Steady state molecular diffusion in multi component mixture, effective mean diffusivity, simple numerical problems	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken.	6	2	Suggested text book handouts power point	

#### SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Theory exam	Theory question (including simple numerical problem) related to the learned content will be asked in the test paper	15	question paper	External

#### ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Nil

<b>RGPV (Diploma Wing ) Bhopal</b>		<b>SCHEME FOR LEARNING OUTCOME</b>			<b>Branch Code</b>			<b>Course Code</b>			<b>CO Code</b>	<b>LO Code</b>	Format No. 4
					<i>C</i>	<i>0</i>	<i>2</i>				<i>2</i>	<i>3</i>	
<b>COURSE NAME</b>		SEPARATION PROCESSES I											
<b>CO Description</b>		The students will be able to apply principles of diffusion.											
<b>LO Description</b>		The students will be able to calculate diffusivity of gases and liquids.											
<b>SCHEME OF STUDY</b>													
<b>S. No.</b>	<b>Learning Content</b>	<b>Teaching –Learning Method</b>	<b>Description of T-L Process</b>	<b>Teach Hrs.</b>	<b>Pract. /Tut Hrs.</b>	<b>LRs Required</b>	<b>Remarks</b>						
1	Calculation of diffusivity of gases and liquids applying fundamental principles and equipments based on them	Lab - demonstration	Faculty will explain the content in lab and demonstrate how to take reading		9	Experiment Setup Lab Manual							
<b>SCHEME OF ASSESSMENT</b>													
<b>S. No.</b>	<b>Method of Assessment</b>	<b>Description of Assessment</b>	<b>Maximum Marks</b>	<b>Resources Required</b>			<b>External / Internal</b>						
	Laboratory Test by observation	Examiner will ask to students to take reading and then calculate in front of him and will asses correctness of result	20	Rating Scale			External						
<b>ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)</b>													
Nil													

RGPV (Diploma Wing ) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code			Course Code			CO Code	LO Code	Format No. 4
					C	0	2				3	1	
<b>COURSE NAME</b>		SEPARATION PROCESSES I											
<b>CO Description</b>		Student will be able to apply principles of distillation for the separation of binary liquid mixtures.											
<b>LO Description</b>		. Student will be able to explain laws related to distillation											
<b>SCHEME OF STUDY</b>													
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks						
1	Definition, driving force and underlying principles of distillation . Binary and multi component distillation. More volatile and less volatile component, volatility and relative volatility . Dalton’s and Roul’t’s law with reference to distillation. Concept of partial pressure, vapor pressure & total pressure	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken.	3	1	Suggested text book handouts power point							
<b>SCHEME OF ASSESSMENT</b>													
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required			External / Internal						
	Paper Pen Test	Theory question related to the learned content will be asked in the test paper	10	Test Paper + Rating Scale			Internal						
<b>ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)</b>													
Nil													

RGPV (Diploma Wing ) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code			Course Code			CO Code	LO Code	Format No. 4
					C	0	2				3	2	
<b>COURSE NAME</b>		SEPARATION PROCESSES -I											
<b>CO Description</b>		Student will be able to apply principles of distillation for the separation of binary liquid mixtures.											
<b>LO Description</b>		Student will be able to plot T-X-Y diagram and X-Y diagrams											
SCHEME OF STUDY													
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks						
1	Phase equilibrium in distillation (practical determination of X-Y data), Vapor-liquid equilibrium diagram, boiling point composition diagram .Azeotrope,	Lab - demonstration	Faculty will explain the content in lab and demonstrate how to take reading	0	9	Experiment Setup Lab Manual							
SCHEME OF ASSESSMENT													
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required			External / Internal						
	Laboratory Test by observation	Students will be asked to take reading and then calculate the result. The correctness of result will be assessed	20	Rating Scale			Internal						
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)													
Nil													

RGPV (Diploma Wing ) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code			Course Code			CO Code	LO Code	Format No. 4
					C	0	2				3	3	
<b>COURSE NAME</b>		SEPARATION PROCESSES I											
<b>CO Description</b>		Student will be able to apply principles of distillation for the separation of binary liquid mixtures.											
<b>LO Description</b>		Student will be able to calculate Distillation characteristics of volatile components.											
<b>SCHEME OF STUDY</b>													
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks						
1	volatility and relative volatility . Calculation of equilibrium data from relative volatility and from vapor pressure data of pure components, Simple numerical problems on above topics	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken.	3	1	Suggested text book handouts powerpoint							
<b>SCHEME OF ASSESSMENT</b>													
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required			External / Internal						
	Theory Exam	Theory questions related to the learned content will be asked in the university question paper	10	Question paper			External						
<b>ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)</b>													
Nil													

RGPV (Diploma Wing ) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		C	0	2				3	4	

<b>COURSE NAME</b>	SEPARATION PROCESSES - I
<b>CO Description</b>	Student will be able to apply principles of distillation for the separation of binary liquid mixtures.
<b>LO Description</b>	Students will be able to use different methods of distillation according to need.

### SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	<p>Methods of distillation : <b>Differential distillation</b>, equilibrium distillation, steam distillation, azeotropic distillation, <b>extractive</b> distillation, and rectification.</p> <p>Differential distillation: Principle, Equipments and its operation fields of application, Rayleigh equation, Use of graphical integration for calculation based on Rayleigh equation</p> <p>Equilibrium distillation: Principle, Equipments and its operation fields of application, Calculation of residue and distillate composition, Difference between differential distillation &amp; equilibrium distillation</p> <p>Steam distillation : Use of open steam in distillation Reason advantage, disadvantages, application and calculation of steam requirement.</p> <p>Azeotropic distillation : azeotropic mixture and its difficulty in its separation, principle, and Description of the method by suitable examples minimum and maximum boiling azeotrope.</p> <p>Extractive distillation: need to carry out extractive distillation, principle and Description of the method by suitable examples</p> <p>Difference between azeotropic and extractive distillation</p> <p>Continuous Rectification: Principle of continuous distillation, Distillation column used for used for continuous rectification.</p> <p>Distillate and waste, Reboiler and condenser, Partial and total condensation. Down comer and weir, Use of multiple feed and side streams</p>	Traditional Lecture Method	<p>Faculty will explain learning content.</p> <p>To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken.</p>	11	4	Suggested text book handouts power point	

### SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Theory Exam	Theory questions related to the learned content will be asked in the university question paper	25	Question paper	External
<b>ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)</b>					
Nil					

RGPV (Diploma Wing ) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				C	0	2				3	5	
<b>COURSE NAME</b>		SEPARATION PROCESSES I										
<b>CO Description</b>		Student will be able to apply principles of distillation for the separation of binary liquid mixtures.										
<b>LO Description</b>		Students will be able to operate different types of distillation apparatus										
<b>SCHEME OF STUDY</b>												
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks					
1	operation of batch distillation, sieve tray ,bubble cap tray column, vapour liquid equilibrium apparatus and glass distillation column to generate data, and to calculate different parameters	Lab - demonstration	Faculty will explain the content in lab and demonstrate how to take reading	0	15	Experiment Setup Lab Manual						
<b>SCHEME OF ASSESSMENT</b>												
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required			External / Internal					
	Laboratory Test by observation	Examiner will ask to students to take reading and then calculate in front of him and will asses correctness of result	20	Rating Scale			External					
<b>ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)</b>												
Nil												



RGPV (Diploma Wing ) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		C	0	2				4	1	

<b>COURSE NAME</b>	SEPARATION PROCESSES I
<b>CO Description</b>	Student will be able to calculate reflux ratio , number of plates, water and steam requirements for the column
<b>LO Description</b>	Student will be able to calculate number of plates, water and steam requirements for the column.

#### SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Overall and component balance, Reflux and reflux ratio, Importance of reflux in purity of product, calculation of No. of plates: Introduction to McCabe Thiele Method, Lewis Sorrel Method, and Ponchon Sevrin method, Assumption in McCabe and Lewis sorrel method: Assumptions of No heat losses, No heat of mixing and dilution, equimolar latent heat of vaporization and Equimolar counter diffusion, rectifying and stripping section and reason to naming so, nomenclature in rectifying and stripping section, Top and bottom operating line and their equations. Intersection of operating lines of rectifying and stripping sections. Equation of q line, slope of q line for various types of feed. Location of feed plate, Calculation of number of plates in rectifying and stripping section of the column and location of feed plate McCabe Thiele method for different feed conditions, and calculation of water and steam requirement	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken.	11	4	Suggested text book handouts power point	

#### SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
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	Theory Exam	Theory questions related to the learned content will be asked in the university question paper	25	Question paper	External
<b>ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)</b>					
Nil					

RGPV (Diploma Wing ) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		C	0	2				4	2	

<b>COURSE NAME</b>	SEPARATION PROCESSES I
<b>CO Description</b>	Student will be able to calculate reflux ratio , number of plates, water and steam requirements for the column
<b>LO Description</b>	The students will be able select appropriate reflux ration for a particular operation

#### SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Minimum reflux ratio : operation of column at minimum reflux ratio, calculation of minimum reflux ratio by graphical method and Underwood and Fenske equation. Total reflux: Definition, what happens when the column is operated at total reflux, Calculation of no of plates at total reflux by Fenske equation Optimum reflux ratio: Factor affecting the selection of optimum reflux ratio, graphical selection of optimum reflux ratio.	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken.	6	2	Suggested text book handouts power point	

#### SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Theory Exam	Theory questions related to the learned content will be asked in the university question paper	20	Question paper	External

#### ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Nil

RGPV (Diploma Wing ) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				C	0	2				4	3	
<b>COURSE NAME</b>		SEPARATION PROCESSES I										
<b>CO Description</b>		Student will be able to calculate reflux ratio , number of plates, water and steam requirements for the column										
<b>LO Description</b>		. Student will be able to explain importance of optimum parameter selection for the smooth running of column.										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks					
1	Construction, merits and demerits of sieve tray, bubble cap tray and valve tray and their comparison. Problem encountered in the operation of tray columns: Entrainment, weeping, conning, dumping, priming, loading and flooding. Efficiency of distillation column: overall efficiency, Murphree plate efficiency and point efficiency.	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken.	4	1	Suggested text book handouts power point						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required			External / Internal					
	Theory Exam	Theory questions related to the learned content will be asked in the university question paper	10	Question paper			External					
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Nil												

RGPV (Diploma Wing ) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		C	0	2				5	1	

<b>COURSE NAME</b>	SEPARATION PROCESSES I
<b>CO Description</b>	Student will be able to control operation of absorption in packed and plate towers.
<b>LO Description</b>	Student will be able to correlate different types of mass transfer coefficients.

#### SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Definition and driving force for absorption, Equilibrium solubility of a gas in a liquid and concept of highly soluble, moderately soluble and almost insoluble gas. Henry's law, solubility curve and operating line, Mass transfer coefficients : definition and explanation, Concept of gas film, liquid film and overall mass transfer coefficient & their interrelations. nomenclature of different types of mass transfer coefficients based on driving force. Choice of solvent for absorption	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken. Students will be asked to take reading and then calculate the result. The correctness of result will be assessed	4	2	Suggested text book handouts power point	

#### SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Theory Exam	Theory questions related to the learned content will be asked in the university question paper	10	Question paper	External

#### ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Nil

RGPV (Diploma Wing ) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				C	0	2				5	2	
<b>COURSE NAME</b>		SEPARATION PROCESSES I										
<b>CO Description</b>		Student will be able to control operation of absorption in packed and plate towers.										
<b>LO Description</b>		Student will be able to explain construction and working of equipments for absorption.										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks					
1	Packed tower for absorption: Detailed study of construction and working of packed tower. Characteristics of tower packing. types of tower packing : random and regular packing. their characteristics merits and demerits. Different types of random packings : construction, and figure. Channelling in packed tower and methods to minimise it. Construction, working and main feature of venturi scrubber and wetted wall column	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken	4	2	Suggested text book handouts power point						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required			External / Internal					
	Theory Exam	Theory questions related to the learned content will be asked in the university question paper	15	Question paper			External					
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Nil												

RGPV (Diploma Wing ) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				C	0	2				5	3	
<b>COURSE NAME</b>		SEPARATION PROCESSES I										
<b>CO Description</b>		Student will be able to control operation of absorption in packed and plate towers.										
<b>LO Description</b>		Student will be able to operate absorption equipments.										
<b>SCHEME OF STUDY</b>												
S. No.	Learning Content		Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks				
1	Operation of wetted wall column and packed bed absorption column and generation of data.		Lab - demonstration	Faculty will explain the content in lab and demonstrate how to take reading.		12	Experiment Setup Lab Manual					
<b>SCHEME OF ASSESSMENT</b>												
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required			External / Internal					
	Laboratory Test by observation	Examiner will ask to students to take reading and then calculate in front of him and will asses correctness of result	20	Rating Scale			Internal					
<b>ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)</b>												
Nil												

RGPV (Diploma Wing ) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				C	0	2				5	4	
<b>COURSE NAME</b>		SEPARATION PROCESSES I										
<b>CO Description</b>		Student will be able to control operation of absorption in packed and plate towers.										
<b>LO Description</b>		Student will be able to calculate height of packed tower required for desired separation.										
<b>SCHEME OF STUDY</b>												
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks					
1	Height of column for isothermal non reaction absorption, 3 derivation of Equation for calculation of tower height based on HTU and NTU, Minimum liquid gas ratio, different types of NTU, HTU based on different driving force. absorption factor, HETP, Simple numerical problems	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken	4	2	Suggested text book handouts power point						
<b>SCHEME OF ASSESSMENT</b>												
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required			External / Internal					
	Theory Exam	Theory questions related to the learned content will be asked in the university question paper	15	Question paper			External					
<b>ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)</b>												
Nil												



**SUBJECT – SEPARATION PROCESSES I**  
**V SEMESTER CHEMICAL ENGINEERING**  
**LIST OF EXPERIMENTS**

S.No.	Name of experiments
1.	Determination of distillation characteristics of a binary mixture
2.	Determination of relative volatility of a binary mixture
3.	Verification of Rayleigh equation of a binary mixture
4.	Study and live demonstration of sieve tray column
5.	Study and live demonstration of bubble cap column
6.	Differential distillation of binary mixture
7.	Calculation of vaporization efficiency for steam distillation
8.	To find out rate of diffusion
9.	To find out diffusion coefficient for liquid-liquid diffusion
10.	To find out diffusion coefficient of vapor in air diffusion
11	Study of differential types of packing and packed tower
12	To find out rate of absorption of a gas in a liquid in a packed column