#### RGPV (DIPLOMA WING) BHOPAL

# OBE CURRICULUM FOR THE COURSE

FORMAT - 3

Sheet No.

Branch

CHEMICAL

Semester

6

**Course Code** 

Course Name SEPA

**SEPARATION PROCESSES II** 

Course	Student will be able to Monitor environment and working	Teach	Marks
Outcome 1	parameters of humidifying and de humidifying apparatus	Hrs	
Learning	Student will be able to Identify the method of expressing	11	15
Outcome 1	relative saturation of air.		
Contents	Humidification and Dehumidification: Definition and Terminology, Absolute Humidity, Molal Humidity, Relative and Percentage humidity, Definition and expression for them. Relation between Percentage and Relative humidity. Humid heat and Humid volume. Enthalpy for pure substances and Total enthalpy, VLE and Dew point, Adiabatic saturation temperature, Equation for adiabatic cooling lines, Wet bulb and Dry bulb temperature, Difference between adiabatic saturation temperature and wet bulb temperature. Theory of wet bulb temperature, Relation of wet bulb and dry bulb temperature with humidity and other thermal properties of air		
Method of Assessment	Theory Exam(external)		
Learning Outcome 2	Student will be able to operate humidifying and dehumidifying equipments and use humidity chart	10	15
Contents	Psychrometric chart and its application, Lewis relation, Measurement of Humidity, Psychometric and hygrometric method: Wet bulb Temperature and Dew point temperature psychometric method. Cooling Tower: Classification, Operations and working details, Applications, Industrial Humidifier: Operations and working details, Numerical problems based on humidity of air, Psychometric chart		
Method of Assesment	Theory Exam(external)		
Learning Outcome 3	Student will be able to determine properties of air and operate humidifying equipment.	9	10
Contents	Determination of different properties of air by dry bulb temperature method and de point method, operation of cooling tower and humidifier		

Method of	Laboratory test by observations(external)		
Assessment			
Course	Student will be able to Operate various types of drying		
Outcome 2	equipments and control conditions required for optimum drying		
Learning Outcome 1	Student will be able to Indentify different types of moisture and their role in drying	14	15
Contents	<b>Drying: Definitions,</b> Bone dry solid, Moisture content (wet and dry basis), Free and Equilibrium moisture , Bound and Unbound Moisture, Equilibrium between drying air and moisture content of solids, Direct and Indirect Dryer, Batch and Continuous Dryer, Mechanism of air solid contacting in dryer: Cross circulation, through circulation, shower drying, fluidized bed drying and pneumatic conveying. Rate of drying, Constant drying conditions, Conditions of drying air affecting drying rate, Nature of material affecting drying rate: mechanism of moisture movement within a solid, Constant and falling rate period, critical moisture content, Calculation of total drying time for cross circulation drying. shrinkage and casehardening		
Method of Assessment	Theory Exam(external)		
Learning Outcome 2	the students will be able to understand and describe drying mechanism in different dryers.	8	10
Contents	Application, Features, Construction, Working, Advantages and Disadvantages of following dryers: Tray dryer, Truck dryer Tunnel dryer, Rotary dryer, Drum dryer, Double drum dryer, cylinder dryer, fluidized bed dryer, and spray dryer		
Method of	Theory Exam(external)		
Assessment			
Learning Outcome 2	Students will be able to operate drying equipments.	6	10
Contents	Plot drying rate curve for drying of in a tray dryer and fluidized bed dryer and rotary dryer and calculate drying time, Determine the Critical Moisture Content of a given material & find out its equation for constant and falling rate period		
Method of Assessment	Laboratory test by observations(external)		
Course Outcome 3	Student will be able to classify and compare different mechanism of crystallization and the equipments used in crystallization		

Learning	Students will be able to understand mechanism of	9	10
Contents	Crystallization: Introduction, Saturated and super saturated solutions, Crystallization from vapour, liquid melt and solution, Solubility Curve, Importance and objective of industrial crystallization, Theory of solubility and crystallization : Methods to achieve super saturation: Cooling a solution or melt, Evaporation, Adiabatic evaporative cooling, salting, precipitation, Crystal geometry, lattice arrangement, some common crystal shapes		
Method of Assessment	Theory Exam(external)		
Learning Outcome 2	Student will be able to Select methods to achieve super saturations of solution.	11	20
Contents	<b>Crystallization Process:</b> Nucleation and Crystal Growth, Methods of nucleation: Classification, Spurious and Primary nucleation, Secondary nucleation types of primary and secondary nucleation, Mechanism of Crystal Growth : Miers theory and Delta L ( $\Delta$ L) law, Effect of heat on size and growth of crystal, Particle Size Distribution of Crystals, Crystallizing Equipments: Agitated batch crystallizers, Swenson Walker crystallizers, Batch and Continuous vacuum crystallizers Caking of crystals and its prevention, Numerical problems		
Method of Assessment	Theory Exam(external)		
Learning Outcome 3	Student will be able to Determine the crystal yield.	9	10
Contents	Determination of crystallizer yield, and construction and operation of agitated batch crystallizer and Swension Walker Crystallizer		
Method of Assessment	Laboratory test by observations. (external)		
Course Outcome 4	Student will be able to separate efficiently different components of a mixture by using leaching methods		
Learning Outcome 1	Identify the primary variables and parameters that determine the performance of leaching operations	5	10
Contents	<b>Leaching:</b> Definitions and industrial application of leaching, Elutriation and percolation, Preparation of Solid, Percolation tanks and agitated vessels, Principle of leaching process, Rate of leaching, Effect of temperature on leaching, Equilibrium in leaching		

Method of	Pen Paper test (internal)		
Assessment			
Learning	Students will be able to select suitable process for leaching	8	10
Outcome 2			
Contents	Type of leaching process: stationary and moving bed leaching Advantage and disadvantages, Desirable characteristic of solvent, Concept of variable and constant underflow, construction and Operations of Leaching Equipments: Mixer settler, Dorr Agitator/classifier, Boll man extractor, Hildebrandt extractor Rotocel extractor		
Method of Assessment	Theory exam (external)		
Learning	Student will be able to Find the rate of leaching and operate	9	10
Outcome 3	leaching equipments.		~
Contents	Find the rate of leaching (Calcium carbonate, water, NaOH system ) . Operation of different leaching equipments with understanding of their working principles.		
Method of	Laboratory test by observations(internal)		
Assessment			
Course	Student will be able to Extract more useful components from		
Unicome 5	The students will be able Dictinguich between leaching and extraction	7	10
Outcome 1	and Select suitable solvent for different extraction process	/	10
Contents	<b>Extraction:</b> Definition, Difference between leaching & extraction, Comparison with distillation as a separation operation, Fields of application of extraction, Desirable characteristics of solvent for extraction, Selectivity and distribution coefficient with respect to extraction, Representation of ternary system on triangular diagram		
Method of	Theory exam(external)		
Assessment			
Learning	The students will be able Operate different types of extractors	9	20
Outcome 2	used in chemical industries		
Contents	Theory and Concept of extraction, Theoretical or ideal stage, Type of Extraction, Reactive Extraction, Extraction of bio molecules, Supercritical fluid extraction, Type of Extractor: Dispersion extractors, Pulse column, Centrifugal extractor, Podbielnik extractor, York Shiebel extractor,		
Method of Assessment	Pen Paper test (internal		

Learning	Student will be able to operate extraction equipments.	9	10
Outcome 3			
Contents	understanding of operation of different extraction equipments		
Method of	Laboratory test by observations(internal)		
Assessment			

RC	RGPV (Diploma Wing ) Bhopal		SCHEM	E FOR LEARNING OUTCOME	; Bra	Branch Cod		Cou	rse Cod	e C	CO Code	<b>LO</b> Le Code F	Format No. 4
					C	0	2				1	1	
COURS	E NAME	SEPARATION	N PROCESSES II										
CO De	scription	Student will be a	able to Monitor enviro	nment and working par	ameters of hu	midifyin	g and o	de humi	idifying a	pparat	tus		
LO Des	scription	Student will be a	able to Identify the me	thod of expressing rela	tive saturation	of air.							
	<b>i</b>			SCHEME (	OF STUDY								
S. No.	Learnii	ng Content		Teaching – Learning Method	Descriptio Proc	n of T-l ess	ב ד ב ב	each Hrs.	Prac /Tut l	et. Hrs.	LRs	Required	d Remarks
1	Humidification and Dehumidification: Definition and Terminology, Absolute Humidity, Molal Humidity, Relative and Percentage humidity, Definition and expression for them. Relation between Percentage and Relative humidity. Humid heat and Humid volume. Enthalpy for pure substances and Total enthalpy, VLE and Dew point, Adiabatic saturation temperature, Equation for adiabatic cooling lines, Wet bulb and Dry bulb temperature, Difference between adiabatic saturation temperature, Relation of wet bulb and dry bulb temperature with humidity and other thermal properties of air		Traditional Lecture Method	Faculty will learning con To identify s weakness assignment given and accordingly remedial and tutorials will taken.	aculty will explain arning content. b identify students eakness signment will be ven and cordingly medial and torials will be ken.			9 2		Suggested text book handouts power point		ext its	
				SCHEME OF A	ASSESSMEN	NT							
S. No.	Method	of Assessment	Description	of Assessment	Maximu Marks	n		Reso	ources R	equir	ed		External / Internal
1	Theory Exam		Theory question a learned content wi exam	related to the Il be asked in the	15		Question Paper				External		
			ADDITIONAL I	NSTRUCTIONS FO	R THE HO	D/ FAC	ULTY	(IF A	NY)				
				N	il								

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

COURSE	RSE NAME SEPARATION PROCESSES II										
CO Desc	cription	Student will be abl	e to Monito	r environment and worki	ng par	ameters of humidify	ing and	d de humidi	fying apparatu	s.	
LO Desc	cription	Student will be	able to c	operate humidifying	and	dehumidifying e	quipr	ments and	l use humid	ity chart	
				SCHE	ME O	F STUDY					
S. No.	S. No. Learning Content			Teaching – Learning Method		Description of T-I Process	L	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	<ol> <li>Psychometric chart and its application , Lewis relation, Measurement of Humidity, Psychometric and hygrometric method: Wet bulb Temperature and Dew point temperature psychometric method. Cooling Tower: Classification, Operations and working details, Applications, Industrial Humidifier: Operations and working details, Numerical problems based on humidity of air Davebarderic</li> </ol>			Traditional Lecture Method	Faculearn To i wea be g remo be ta	alty will explain ning content. dentify students kness assignment v iven and according edial and tutorials v aken.	vill Jy will	8	8 2 Suggested text bo handouts power poin		
				SCHEME	OF A	SSESSMENT		-		-	
S. No.	Method o	of Assessment	Desc	ription of Assessment	ţ	Maximum Marks		Reso	urces Requir	red	External / Internal
Theory ExamTheor1learnethe test			Theory learned the test	question related to the content will be asked paper	in	15		Question Paper			External
	·	· · · · · · · · · · · · · · · · · · ·	ADDITIO	NAL INSTRUCTIO	NS FC	OR THE HOD/ FA	CUL	TY (IF AN	NY)		
					Nil						

RGPV (Diploma Wing ) Bhopal	E FOR LEARNING Br OUTCOME	Branch Cod	Course Code		CO Code	LO Code	e Format No. 4	
	C	0	2			1	3	

COURS	E NAME	SEPARATION	PROCESSES II								
CO Des	scription	Student will be al	ble to Monitor environment and	working parame	ters of humidify	ying and	de humidi	fying apparat	us		
LO Des	scription	Student will b	e able to determine prop	erties of air a	nd operate hu	umidify	ying equ	ipment			
			S	SCHEME OF S	STUDY						
S. No.	Learnin	ng Content	Teaching –Learning Method	Descri	ption of T-L Process		Teach Hrs.	Pract. /Tut Hrs.	LRs R	Require	d Remarks
1	In Determinati properties of a temperature m method, opera and humidifier	ion of different ir by dry bulb nethod and de point tion of cooling tow	Lab - demonstration	Faculty will e in lab and der take reading	Faculty will explain the content9Experimin lab and demonstrate how toSetuptake readingLab Ma					riment Manual	
			SCH	EME OF ASS	ESSMENT						
S. No.	Method o	of Assessment	Description of Assess	sment	Maximum Marks		Reso	urces Requi	red		External / Internal
	Laboratory T observation	est by	Examiner will ask to studen take reading and then calcula front of him and will asses correctness of result	nts to ate in	10	Rati	ing scale				External
			ADDITIONAL INSTRU	CTIONS FOR	THE HOD/ F	ACUL	ГY (IF A	NY)			
				Nil							
RC	GPV (Diploma	Wing ) Bhopal	SCHEME FOR I OUTCO	LEARNING ME	Branch	Code	Cou	urse Code	CO Code	LO Code	Format No. 4

		С	0	2			2	1	
COURSE NAME	SEPARATION PROCESSES II								
CO Description	Student will be able to Operate various types of drying o	equipments and	l contro	l condi	tions requi	red for	optimum	drying	

LO Des	cription Student w	ill be able to Indentify different types	of moisture and	their role in drying				
			SCHEME OI	F STUDY				
S. No.	Learning Conten	t	Teaching – Learning Method	ching –Description of T-rningLethodProcess		Pract. /Tut Hrs.	LRs Required	Remarks
1	St <b>Drying: Definitions,</b> (wet and dry basis), Free a Unbound Moisture, Equili moisture content of solids Continuous Dryer, Mecha Cross circulation, through bed drying and pneumati Constant drying condition drying rate, Nature of ma mechanism of moisture m and falling rate period, cri total drying time for cross casehardening	Bone dry solid, Moisture content and Equilibrium moisture, Bound and brium between drying air and 5, Direct and Indirect Dryer, Batch and nism of air solid contacting in dryer: circulation, shower drying, fluidized c conveying. Rate of drying, s, Conditions of drying air affecting terial affecting drying rate: novement within a solid, Constant tical moisture content, Calculation of circulation drying. shrinkage and	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 3		Suggested text book handouts power point	
		SC	CHEME OF AS	SSESSMENT		·		
S. No.	Method of Assessment	Description of Assessment	t	Maximum Marks		<b>Resources</b>	Required	External / Internal
	Theory exam	Theory question (including sin problem) related to the learned be asked in the test paper	mple numerical d content will	15		question pap	per	External
		ADDITIONAL INSTR	RUCTIONS FO	OR THE HOD/ FACU	LTY (IF A	ANY)		
			Nil					

RG	PV (Diploma	Wing ) Bhopal	SCHEME FOR L OUTCOM	EARNING ME	Br	anch Co	ode	Cou	rse Code	CO Code	LO Code	Format No. 4
					C	0	2			2	2	
COURS	E NAME	SEPARATION PR	OCESSES II		I							
CO Des	scription	Student will be ab	le to Operate various type	s of drying eq	uipments a	nd contr	ol cond	itions	required for	optimu	m dryinş	5
LO Des	cription	The students will be a	ble to understand and descri	ibe drying mec	hanism in d	fferent d	ryers.					
			S	SCHEME OF	F STUDY							
S. No.	Learnin	g Content	Teaching –Learning Method	Desc	cription of Process	T-L	T	'each Hrs.	Pract. /Tut Hrs	LRs	Requir	ed Remarks
1	Application, Construction, and Disadva dryers: Tray Tunnel dryer, dryer, Double dryer, fluidiz spray dryer	Features, Working, Advantages ntages of following dryer, Truck dryer Rotary dryer, Drum drum dryer, cylinder red bed dryer, and	Traditional Lecture Method	Faculty will content. To identify assignment accordingly tutorials will	l explain le students w will be giv remedial a ll be taken.	arning eakness en and nd		6	2	Sug text hand pow	gested boo douts ver point	ok
	1		SCH	EME OF AS	SESSME	T	I			I		I
S. No.	Method o	of Assessment	Description of Assess	sment	Maximu Marks	n		Reso	ources Requ	iired		External / Internal
	Theory exan	1	Theory question (include simple numerical proble related to the learned con will be asked in the test	ing m) ntent paper	10			qı	uestion pape	er		External
	1	'	ADDITIONAL INSTRU	JCTIONS FO	OR THE H	OD/ FA	CULT	Y (IF	ANY)			
				Nil								

RO	GPV (Diploma	Wing ) Bhopal	SCHEME FOR L OUTCOM	LEARNING ME	Br	anch Co	ode	Cou	irse Code	CO Code	LO Code	Format No. <b>4</b>
					С	0	2			2	3	
COURS	E NAME	SEPARATION	PROCESSES II		i				<u> </u>			
CO De	scription	Student will be	able to Operate various type	s of drying eq	uipments a	nd contr	ol conc	litions	required for	optimu	m drying	
LO Des	scription	Students will be a	ble to operate drying equipmen	ıts								
			(	SCHEME OI	F STUDY							
S. No.	Learnin	ng Content	Teaching –Learning Method	Desc	cription of Process	T-L	]	Feach Hrs.	Pract. /Tut Hrs.	LRs	Require	ed Remarks
1	<ol> <li>Plot drying raises in a tray dryer dryer and rot calculate dry Determine the Content of a gi out its equation falling rate per</li> </ol>	ate curve for drying er and fluidized bed tary dryer and ing time, e Critical Moisture ven material & find n for constant and iod	sof Lab - demonstration	Faculty will in lab and d take reading		how to			6	Exp Setu Lab	eriment ip Manual	
			501	LENIE OF AS	DOEODIVIEI	N 1						
S. No.	Method o	of Assessment	Description of Assess	sment	Maximu	m		Reso	ources Requ	ired		External / Internal
	Laboratory T observation	est by	Examiner will ask to studen take reading and then calcula front of him and will asses correctness of result	nts to ate in	10		Ratin	g scale				External
			ADDITIONAL INSTRU	UCTIONS FO	OR THE H	OD/ FA	CULI	TY (IF	ANY)		I	
				Nil								

RG	PV (Diploma	wing ) Bhopal	SCH	IEME FOR LEARN OUTCOME	ING	Bra	anch Co	ode	Cou	rse Code	CO Code	LO Code	Format No. 4
						С	0	2			3	1	
COURS	E NAME	SEPARATION P	ROCESSES	-II			_			I			1
CO Des	cription	Student will be abl	e to classify an	d compare different me	echanism (	of crysta	llization	and the	equipm	ents used ir	ı crystalli	zation	
LO Des	cription	Students will b	e able to un	derstand mechanis	m of cry	stalliz	ation						
	1			SCHEM	IE OF ST	TUDY							
S. No.	Learnii	ng Content		Teaching – Learning Method	Dese	cription Proce	of T-L ss	נ <i>י</i>	'each Hrs.	Pract. /Tut Hrs	s. LRs	Requir	ed Remarks
1	Crystallization super satura vapour, liqui Curve, Impo crystallizatio crystallizatio saturation: C Evaporation, salting, prec arrangemen	n: Introduction, Satur ted solutions, Crysta d melt and solution, S rtance and objective n, Theory of solubilit n : Methods to achie Cooling a solution or r Adiabatic evaporative sipitation, Crystal geo t, some common crys	ated and Ilization from Solubility of industrial y and ve super melt, ve cooling, ometry, lattice stal shapes	Traditional Lecture Method	Faculty learning To iden weakne will be accordin and tuto taken.	will exp g conten tify stuc ss assig given an ngly ren orials wi	olain t. lents nment nd nedial 11 be		7	2	Sug text han pow	gested bo douts ver poin	ok t
	1			SCHEME (	OF ASSE	SSME	T	I					I
S. No.	Method	of Assessment	Descrip	otion of Assessment	M	laximuı Marks	n		Reso	ources Req	uired		External / Internal
	Theory exam	n	Theory qu simple nur related to will be asl	estion (including merical problem) the learned content ked in the test paper		10			qı	estion pape	er		External
			ADDITIO	NAL INSTRUCTION	NS FOR	THE H	OD/ FA	ACULI	Y (IF .	ANY)			
					Nil								

COURSE NAME       SEPARATION PROCESSES II         CO Description       Student will be able to classify and c         LO Description       Student will be able to Select method         S. No.       Learning Content         1       Crystallization Process: Nucleation and Crystal Growth, Methods of nucleation: Classification, Spurious and Primary nucleation, Secondary nucleation types of primary and secondary nucleation Mechanism of Crystal Growth : Miers theory and Del L (ΔL) law, Effect of heat on size and growth of crystal Particle Size Distribution of Crystals, Crystallizing Equipments: Agitated batch crystallizers, Swenson Walker crystallizers, Batch and Continuous vacuum crystallizers	ompare different med ds to achieve super sa SCHEMI Teaching – Learning Method Traditional Lecture Method	chanism of conturations of conturations of conturations of conturations of conturations of conturbation of con	C 0 crystallizati of solution JDY ription of ' Process will explain g content. tify studen ss assignm given and	9 2 ion and t T-L iin nts nent	2 the equipm Teach Hrs. 8	Pract. /Tut Hrs.	3 crystalliz LRs Sug text	2 zation Required	l Remarks
COURSE NAME       SEPARATION PROCESSES II         CO Description       Student will be able to classify and c         LO Description       Student will be able to Select method         S. No.       Learning Content         1       Crystallization Process: Nucleation and Crystal Growth, Methods of nucleation: Classification, Spurious and Primary nucleation, Secondary nucleation types of primary and secondary nucleation Mechanism of Crystal Growth : Miers theory and Del L (ΔL) law, Effect of heat on size and growth of crystal Particle Size Distribution of Crystals, Crystallizing Equipments: Agitated batch crystallizers, Swenson Walker crystallizers, Batch and Continuous vacuum crystallizers	ompare different med ds to achieve super sa SCHEMI Teaching – Learning Method Traditional Lecture Method	chanism of conturations of conturations of contract of the context	crystallizati of solution J <b>DY</b> ription of ' Process will explain g content. tify studen ss assignm given and	ion and t <b>T-L</b> iin nts nent	the equipm Teach Hrs. 8	Pract. /Tut Hrs.	LRs Sug text	zation Required	l Remarks
CO Description       Student will be able to classify and c         LO Description       Student will be able to Select method         S. No.       Learning Content         1       Crystallization Process: Nucleation and Crystal Growth, Methods of nucleation: Classification, Spurious and Primary nucleation, Secondary nucleation types of primary and secondary nucleation Mechanism of Crystal Growth : Miers theory and Del L (ΔL) law, Effect of heat on size and growth of crystal Particle Size Distribution of Crystals, Crystallizing Equipments: Agitated batch crystallizers, Swenson Walker crystallizers, Batch and Continuous vacuum crystallizers	ompare different med ds to achieve super sa SCHEMI Teaching – Learning Method Traditional Lecture Method	turations of c turations of E OF STU Descr Faculty v learning To ident weaknes will be g	crystallizati of solution J <b>DY</b> ription of ' Process will explai g content. tify studen ss assignm given and	ion and t <b>T-L</b> iin nts nent	the equipm Teach Hrs. 8	Pract. /Tut Hrs. 3	LRs Sug text	zation Required gested	l Remarks
LO Description       Student will be able to Select methom         S. No.       Learning Content         1       Crystallization Process: Nucleation and Crystal Growth, Methods of nucleation: Classification, Spurious and Primary nucleation, Secondary nucleation types of primary and secondary nucleation Mechanism of Crystal Growth : Miers theory and Del L (ΔL) law, Effect of heat on size and growth of crystal Particle Size Distribution of Crystals, Crystallizing Equipments: Agitated batch crystallizers, Swenson Walker crystallizers, Batch and Continuous vacuum crystallizers	ds to achieve super sa SCHEMI Teaching – Learning Method Traditional Lecture Method	E OF STU Description Faculty v learning To ident weaknes will be g	of solution J <b>DY</b> ription of ' Process will explain g content. tify studen ss assignm given and	<b>T-L</b> in nts nent	Teach Hrs. 8	Pract. /Tut Hrs. 3	LRs Sug text	Required	l Remarks
S. No.       Learning Content         1       Crystallization Process: Nucleation and Crystal Growth, Methods of nucleation: Classification, Spurious and Primary nucleation, Secondary nucleation types of primary and secondary nucleatio Mechanism of Crystal Growth : Miers theory and Del L (ΔL) law, Effect of heat on size and growth of crystal Particle Size Distribution of Crystals, Crystallizing Equipments: Agitated batch crystallizers, Swenson Walker crystallizers, Batch and Continuous vacuum crystallizers	SCHEMI Teaching – Learning Method Traditional Lecture Method	E OF STU Descr Faculty v learning To ident weaknes will be g	JDY ription of ' Process will explain content. tify studen ss assignm given and	<b>T-L</b> in nts nent	Teach Hrs.8	Pract. /Tut Hrs. 3	LRs Sug text	<b>Required</b>	l Remarks
S. No.Learning Content1Crystallization Process: Nucleation and Crystal Growth, Methods of nucleation: Classification, Spurious and Primary nucleation, Secondary nucleation types of primary and secondary nucleatio Mechanism of Crystal Growth : Miers theory and Del L (ΔL) law, Effect of heat on size and growth of crystal Particle Size Distribution of Crystals, Crystallizing Equipments: Agitated batch crystallizers, Swenson Walker crystallizers, Batch and Continuous vacuum crystallizers Caking of crystals and its prevention	Teaching – Learning Method Traditional Lecture Method	Faculty v learning To ident weaknes will be g	ription of ' Process will explain content. tify studen ss assignm given and	T-L in nts nent	Teach Hrs. 8	Pract. /Tut Hrs.	LRs Sug text	Required	d Remarks
<ol> <li>Crystallization Process: Nucleation and Crystal Growth, Methods of nucleation: Classification, Spurious and Primary nucleation, Secondary nucleation types of primary and secondary nucleatio Mechanism of Crystal Growth : Miers theory and Del L (ΔL) law, Effect of heat on size and growth of crystal Particle Size Distribution of Crystals, Crystallizing Equipments: Agitated batch crystallizers, Swenson Walker crystallizers, Batch and Continuous vacuum crystallizers</li> <li>Caking of crystals and its prevention. Numerical</li> </ol>	Traditional Lecture Method	Faculty v learning To ident weaknes will be g	will explai g content. tify studen ss assignm given and	in nts nent	8	3	Sug text	gested	
problems	"', 	accordin and tutor taken.	ngly remed prials will b	dial be			hand	book douts verpoint	ς
	SCHEME O	F ASSESS	SMENT		-				'
S. No. Method of Assessment Description	n of Assessment	Max Ma	ximum larks		Reso	ources Requi	ired		External / Internal
Theory ExamTheory quest learned conto the universit	ions related to the ent will be asked in question paper		20		Q	uestion paper	r		External
ADDITIONA	L INSTRUCTION	S FOR TH	HE HOD/	' FACU	LTY (IF	ANY)			
		Nil							

RG	RGPV (Diploma Wing ) Bhopal	SCHEME F	OR LEARNING ICOME	Bra	nch Co	ode	Cour	se Code	CO Code	LO Code	Format No. <b>4</b>	
					С	0	2			3	3	
COURS	E NAME	SEPARATION	PROCESSES - II		I				I			
CO Des	scription	Student will be a	ble to classify and compar	e different mechan	ism of crysta	llization	and the	e equipm	ents used in	crystalliz	ation	
LO Des	scription	Student will be a	able to Determine the cryst	al yield.								
				SCHEME O	F STUDY							
S. No.	Learnir	ng Content		Teaching – Learning Method	Descrip Pr	tion of ' ocess	T-L	Teach Hrs.	Pract. /Tut Hrs.	LRs	Require	d Remarks
1	Determinatio operation of a Walker Crystal	n of crystallizer yie gitated batch cryst lizer	eld, and construction and allizer and Swenson	Lab - demonstration	Faculty w the conter demonstra take readi	ill expla at in lab ate how ng	uin and to		9	Expo Setu Lab	eriment p Manual	
				SCHEME OF AS	SSESSMEN	T						
S. No.	Method	of Assessment	Description of A	Assessment	Maximur Marks	n		Reso	urces Requ	ired		External / Internal
	Laboratory T observation	est by	Examiner will ask to s take reading and then c front of him and will as correctness of result	students to alculate in sses	10		Ratin	g scale				External
			ADDITIONAL INS	STRUCTIONS F	OR THE H	OD/ FA	CUL	ГY (IF A	NY)			
				Nil								

RC	GPV (Diploma	Wing ) Bhopal	SCHEME FOR L OUTCOM	EARNING ME	Br	anch Co	ode	Cou	rse Code	CO Code	LO Code	Format No. 4
					С	0	2			4       1         LRs Requi         Suggested         text       ba         handouts         power poin	1	
COURS	E NAME	SEPARATION PI	ROCESSES II		I				I			1
CO Des	scription	Student will be able	to separate efficiently differe	ent componer	nts of a mixt	ure by us	sing lead	hing m	ethods			
LO Des	scription	Identify the primar	y variables and parameters tl	hat determine	the perform	nance of	leaching	operat	ions.			
			S	SCHEME O	F STUDY							
S. No.	Learnin	ng Content	Teaching –Learning Method	Des	cription of Process	T-L	<b>T</b>	'each Hrs.	Pract. /Tut Hrs	LRs	Requir	ed Remarks
1	application of and percolat Solid, Percol agitated vess leaching pro Effect of tem Equilibrium i	of leaching, Elutriation ion, Preparation of ation tanks and sels, Principle of cess, Rate of leaching, perature on leaching, n leaching	Method	To identify assignment accordingly tutorials wi	students w will be giv y remedial a ill be taken.	eakness en and nd		+	1	text hand pow	bo douts ver point	ok t
			SCH	EME OF A	SSESSME	NT						1
S. No.	Method	of Assessment	Description of Assess	sment	Maximu Marks	n		Reso	ources Requ	iired		External / Internal
	Paper Pen Te	st	Theory question related learned content will be a the test paper	to the sked in	10		r.	Гest Pa	per + Ratin	g Scale		Internal
	<u> </u>		ADDITIONAL INSTRU	JCTIONS F	OR THE H	OD/ FA	CULT	Y (IF .	ANY)			I
				Nil								

RC	GPV (Diplom	a Wing ) Bhopal	SC	CHEME FOR LEARNING OUTCOME	G B	ranch C	ode	Cou	rse Code	CO Code	LO Code	Format No. 4
					C	0	2			4	2	
COURS	E NAME	SEPARATION I	PROCESSE	S II	I	I		1	I I			
CO De	scription	Student will be ab	le to separate	e efficiently different compon	ents of a mix	ture by u	sing le	aching m	ethods			
LO De	scription	Students will be al	ble to select s	suitable process for leaching								
				SCHEME	OF STUDY							
S. No.	Learnin	ng Content		Teaching –Learning Method	Descrip Pr	tion of T ocess	<b>-L</b>	Teach Hrs.	Pract. /Tut Hrs	LRs	Requir	ed Remarks
	Type of leaching bed leaching A Desirable char variable and co and Operation settler, Dorr A extractor, Hilc extractor	ng process: stationary Advantage and disady acteristic of solvent, o onstant underflow, c s of Leaching Equipm gitator/classifier, Bol lebrandt extractor Ro	y and moving vantages, Concept of onstruction nents: Mixer II man otocel	Method	Faculty w learning c To identif weakness assignmen given and according and tutoria taken.	Ill explai ontent. y student at will be ly remed als will b	n is ial e	6	2	Sug text han pow	gested bo douts ver point	ok :
S. No.	Method	of Assessment	Desci	ription of Assessment	ASSESSMI Maximu Mark	um s		Reso	ources Requ	iired		External / Internal
	Theory Exan	1	Theory learned the univ	questions related to the content will be asked in versity question paper	10			Q	uestion pap	er		External
			ADDITI	ONAL INSTRUCTIONS	FOR THE	HOD/ FA	ACUL	TY (IF	ANY)			
				Ň	fil							

RO	GPV (Diploma	Wing ) Bhopal		SCHEME FOR L OUTCOM	EARNING /IE	Br	anch Co	ode	Cou	rse Code	CO Code	LO Code	Format No. 4
						C	0	2			4	3	
COURS	E NAME	SEPARATION	PR	OCESSES II		I		_		· · · · ·			I
CO De	scription	Student will be a	ble t	o separate efficiently differe	ent componer	nts of a mixt	ure by u	sing lea	ching m	ethods			
LO Des	scription	Student will be a	ble t	o Find the rate of leaching a	and operate lo	eaching equi	pments.						
	-	·		S	CHEME O	F STUDY							
S. No.	Learnir	ng Content		Teaching –Learning Method	Des	cription of Process	T-L	r -	Feach Hrs.	Pract. /Tut Hrs	LRs	Requir	ed Remarks
1	1 Find the rate carbonate, wa Operation of a equipments w their working	e of leaching (Calciu ater, NaOH system different leaching /ith understanding principles.	um ) . of	Lab - demonstration	Faculty wil in lab and o take readin	ll explain th lemonstrate g	e conter how to	nt		9	Exp Setu Lab	eriment ıp Manua	1
				SCH	EME OF A	SSESSME	NT						
S. No.	Method o	of Assessment		Description of Assess	ment	Maximu Marks	m		Reso	ources Requ	ired		External / Internal
	Laboratory T observation	est by	E tak fro coi	xaminer will ask to studen te reading and then calcula nt of him and will asses trectness of result	its to ite in	10		Ratin	g scale				internal
				ADDITIONAL INSTRU	CTIONS F	OR THE H	I <b>OD/ F</b> A	ACULT	ΓY (IF	ANY)			
					Nil								

RGPV (Diploma Wing ) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code	Course Code	CO Code	LO Code	Format No. 4
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					C	0	2			4	5 1	
COURS	E NAME	SEPARATION PR	OCESSES II									
CO Des	scription	Student will be able t	to Extract more useful comp	oonents from	undesirable c	ompone	nts in a	binary r	nixture			
LO Des	scription	The students will be a	ble Distinguish between lead	ching and extr	raction and Se	lect suita	able solv	vent for	different e	xtract	tion process	
			S	SCHEME O	F STUDY							
S. No.	Learni	ng Content	Teaching –Learning Method	Des	scription of T Process	Ր <b>-</b> Լ		each Hrs.	Pract. /Tut Hi	s. I	<b>CRs Required</b>	Remarks
1	<b>Extraction:</b> Definition, Difference between leaching & extraction, Comparison with distillation as a separation operatio Fields of application of extraction, Desirable characteristics of solvent for extraction, Selectivity and distribution coefficient with respect to extraction, Representation of ternary system on triangular diagra		Traditional Lecture Method	Faculty wi content. To identify assignmen accordingly tutorials w	ll explain lea / students we t will be give y remedial ar ill be taken.	rning akness n and id		5	2		Suggested text book handouts power point	
			SCH	EME OF A	SSESSMEN	Т						
S. No.	Method	of Assessment	Description of Assess	sment	Maximun Marks	1		Reso	urces Req	uired	d	External / Internal
	Theory Exar	n	Theory questions related learned content will be a the university question p	to the sked in aper	10			Qı	estion pap	ber		External
		· · · ·	ADDITIONAL INSTRU	<b>JCTIONS F</b>	OR THE H	DD/ FA	CULT	Y (IF	ANY)		· · · ·	
				Nil	l							

RG	PV (Diploma	wing ) Bho	opal	EME FOR LE OUTCOM	CARNING E	Bra	anch Co	ode	Cou	rse Code	CO Code	LO Code	Format No. 4
						С	0	2			5	2	
COURS NAME	E	SEPARAT	TON PROCESSES	I				1			1		1
CO Des	scription	Student will	l be able to Extract mo	re useful compo	onents from u	ndesirable o	compone	nts in a	binary	mixture			
LO Des	cription	The student	s will be able Operate	different types o	of extractors u	used in chen	nical ind	ustries					
				SC	CHEME OF	<b>STUDY</b>							
S. No.	Learnin	ng Content		Teaching – Learning Method	Des	cription of Process	T-L	]	ſeach Hrs.	Pract. /Tut Hrs	s. LRs	Requir	ed Remarks
1	Theory and Concept of extraction, Theoret deal stage, types of Extraction, Reactive Extraction, Extraction of bio molecules, Supercritic fluid extraction , Type of Extractor: Dispersion extractors, Pulse column, Centrifugal extractor, Podbielnik extrac York Shiebel extractor		action, Theoretical or ve Extraction, ules, Supercritical of Extractor: Pulse column, odbielnik extractor,	Traditional Lecture Method	Faculty wi content. To identify assignmen accordingl tutorials w	ill explain 1 y students v it will be gi ly remedial vill be taker	earning weaknes ven and and a.	S	7	2	Sug text han pow	gested bo douts /er point	ok t
				SCHE	EME OF AS	SESSMEN	T						
S. No.	Method o Assessme	of ent	Description o	f Assessment		Maximur Marks	n		Reso	ources Requ	uired		External / Internal
	Pen Paper te	st	Theory questions re content will be asked	elated to the lean l in the test pape	rned er	20		Test pa	aper+ ra	ting scale			internal
	1		ADDITIO	NAL INSTRU	CTIONS FC	OR THE H	OD/ FA	CULT	ΓY (IF	ANY)			1
					Nil								

RG	PV (Diplom	a Wing ) Bhopal		SCHEME FOR DOUTCO	LEARNING ME	Br	anch Co	ode	Cou	rse Code	CO Code	LO Code	Format No. 4
						C	0	2			5	3	
COURS AME	E	SEPARATION	PROCES	SSES II		I	1	-		I	1		
CO Des	scription	Student will be a	ble to cont	rol operation of abso	rption in packed	l and plate t	owers.						
LO Des	cription	Student will be a	ble to oper	ate extraction equipr	nents.								
					SCHEME OF	<b>STUDY</b>							
S. No.	Learni	ng Content		Teaching – Learning Method	Desc	ription of Process	T-L	r	Гeach Hrs.	Pract. /Tut Hrs	s. LRs	Require	ed Remarks
1	l understanding and operation of different extraction equipments			Lab - demonstration	Faculty will in lab and do take reading	explain th emonstrate	e conten how to	t		9	Exp Setu Lab	eriment ıp Manual	
	1			SCI	HEME OF AS	SESSME	NT				I		I
S. No.	Method	of Assessment	D	escription of Asses	ssment	Maximu Marks	n		Reso	ources Requ	uired		External / Internal
	Laboratory 7 observation	Гest by	Examin take read front of correctne	her will ask to stude ling and then calcu him and will asses ess of result	ents to late in	10		Ratin	g scale				Internal
			ADD	ITIONAL INSTR	UCTIONS FO	OR THE H	OD/ FA	CUL	ГY (IF	ANY)			
					Nil								
					Nil								

## SUBJECT – SEPARATION PROCESSES I

## V SEMESTER CHEMICAL ENGINEERING

#### LIST OF EXPERIMENTS

Following list is tentative and that practicals will be taken for which facilities will be available

S.No.	Name of experiments
1. 2. 3. 4. 5. 5. 6 7 8. 9. 10. 11 12 13 14. 15	Determination of properties of air by wet bulb temperature method. Determination of properties of air by dew point method. Operation of humidifier and observe changes in properties of air. Study of construction and working of cooling tower with demonstration of the process. To obtained rate of drying curve for given sample and to find critical and equilibrium moisture content. Demonstration of drying and to determine the drying efficiency of a tray dryer. demonstration of drying of granular solid in a tray dryer. To find yield for batch crystallization process. Study of construction and working of agitated batch crystallizer with demonstration of the process. Study of construction and working of Swenson Walker crystallizer with demonstration of the process. To demonstrate mass transfer in liquid –liquid extraction in a packed bed column. To demonstrate mass transfer in multistage countercurrent leaching system. To find distribution coefficient of acetic acid between water and toluene. To find distribution coefficient of acetic acid between water and toluene. To Find the rate of leaching (Calcium carbonate, water, NaOH system