BRANCH CHEMICAL ENGG SUB/COURSE :CHEMICAL ENGINEERING THERMODYNAMICS V SEM OCBC SYLLABUS(FORMAT -3)

CO 1	Apply the fundamentals of thermodynamics to various thermodynamic systems and devices.	Hoursofstudy	Marks	
LO 1	Analyze fundamental concept of thermodynamics.	12		
Content	Introduction to Thermodynamic, Basic concept, Scope of thermodynamics, Thermodynamic system and its surrounding, types of systems, System properties, System states and process, Heat and work: Definition, Difference between heat and work. Extensive and intensive properties. State and path function: Definition, Difference between state and path function . Fundamental postulates and their relationship of three laws of classical thermodynamics.	03	5	A
LO 2	Apply first law of thermodynamics to a given thermodynamic system.	03	6	A
Content	First law of thermodynamics: Definition and scope, Application to simple situation.			
LO 3	Estimate change in internal energy for a given process and to calculate work done and heat transfer.	06	18	A
Content	Mathematical equation for first law of thermodynamics for open system and steady state flow processes. Internal energy: Definition &concept, Calculation.Enthalpy: Definition and concepts of enthalpy.			

CO 2	Identify the important thermodynamic properties of gaseous mixture and solutions.	10		
LO 1	Interrelate the properties of mixture.	4	5	В
Content	Volumetric properties of fluids and heat effects, Properties of pure substances, Changes in thermodynamics properties and their relationship, Ideal gases and PVT behavior of pure substance.			
LO 2	Select an appropriate equation of state for representing the PVT behavior of gas or liquid.	6	16	А

Content	Calculation on PVT relationship:			
	Heat effects,			
	Heat of mixing, heat of solutions, sensible heat, latent heat, heat			
	of formation, heat of combustion, heat of reaction and heat			
	capacity. Adiabatic flame temperature.			
	Calculation of heat of reaction at different temperature,			
	Calculation of heat of formation at different temperature,			
	Calculation of heat of combustion at different temperature,			
	Calculation of adiabatic flame temperature.			
CO 3	Apply second law of thermodynamics and analyze the feasibility	10		
	of system.			
LO 1	Apply second law of thermodynamics to a given thermodynamic	4	10	А
	system.			
Content	Second law of thermodynamics:			
	Definition and its application.			
	Statement of second law of thermodynamics:			
	Kelvin -Planck and Clausius statement			
	Heat engine and heat pump:			
	Calculation on heat engine and heat pump			
	Carnot Principle:			
	Carnot cycle,			
	Corollary of Carnot Principle.			
LO 2	Estimate the entropy change in each situation.	6	10	A
Content	Entropy:			
	Concepts of Entropy,			
	Relationship between lost work and maximum work.			
	Application to engg. problem relative to equilibrium and			
	minimum and maximum work.			
		1		

CO 4	Identify the fundamental chemical properties of binary systems.	12		
LO 1	List the molal properties of binary mixture.	6	6	В
Content	Free energy, Chemical Potential and work function : Concepts of Partial molal properties, Mathematical model for the chemical potential, Ideal and non ideal mixture, Gibbs and Helmhotz free energy, Maxwell Relation.			
LO 2	Calculate the fugacity and activity coefficient of elements.	6	6	В
Content	Elementary concepts of fugacity and fugacity coefficient, Elementary concepts of activity and activity coefficient, Temperature dependency of equilibrium constant.			
CO 5	Estimate the efficiency of process involving refrigeration and liquefaction.	16		
LO 1	Explain the Refrigeration, Refrigerant and Refrigeration Cycle.	5	4	А
Content	Refrigeration: Outline &Definition, Characteristics &Types of Refrigerant. Performance evaluation of refrigeration system, Capacity of refrigeration, Coefficient of performance, Circulation rate.			
LO 2	Select suitable refrigeration cycle with justification.	6	6	А
Content	Refrigeration Cycle: Introduction, Carnot cycle by TS diagram, Air refrigeration cycle, Vapor compression cycle.			
LO 3	Explain liquefaction process and its utility in process industry.	5	8	В
Content	Joule Thomson liquefaction process, Calculation on power required.			

Where

A --- Theory exam paper B--- Internal Assessment

RGPV	RGPV (Diploma Wing) Bhopal		SCHEME FOR L OUTCOME	EARNING	Branch	Code	Cou	rse Cod	le CO Code	LO Code	Format No. 4
					C 0	2			1	1	
COURS NAME	SE	CHEMICAL ENGINEEF	RING THERMODYNAMICS	/	I	I					
CO Des	scaription	Apply the fundame	ntals of thermodynamics to	various thermodynamic sy	/stems ar	nd devices.					
LO Des	cription	Analyze fundamental	concept of thermodynamic	cs.							
SCHEM	AE OFSTU	JDY									
S. No.	Learning	g Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs	s.	LRs Rec	quired	Ren	narks
	Introducti Thermody Basic cond Scope of t Thermody surroundin thermodyr System pr System sta and work: Definition Difference work. Extensive properties State and Definition Difference path funct Fundament their relati of classica	ion to /namic cept, hermodynamics, mamic system and its ng, types of namic systems operties: ates and process, Heat , e between heat and and intensive 5. path function: , e between state and tion. atal postulates and ionship of three laws at thermodynamics.	Interactive classroom teaching, demonstration, quiz, assignments, tutorial.	Teacher will explain the contents and provide handouts to students. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge.	02	01	F	Handout PT, tex	s, chalk board tbook.		
SCHEN S No	Mothad	SESSMENT of Aggoggment	Description of Assess	mont Ma		Docours		anirad			Extomal /
3. INU.		or Assessment	Description of Assess	Marks	IUIII	Resourc	es re	quirea			Internal

1	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	Nil									

RGPV	RGPV (Diploma Wing) Bhopal		SCHEME FOR OUTCOME	SCHEME FOR LEARNING OUTCOME		Bran	ich Code		Course Code		CO I Code		e Format No. 4
						С	0	2			1	2	
COUR NAME	SE	CHEMICAL ENGINE	ERING THERMODYNAMICS										
CO De	scription	Apply the fundam	entals of thermodynamics to	various thermody	/namic sy	stems a	nd dev	ices.					
LO De	scription	Apply first law of th	nermodynamics to a given the	ermodynamic syste	em.								
SCHE	ME OF ST	UDY											
S. No.	Learning	Content	Teaching –Learning Method	Description of 7 Process	T-L	Teach Hrs.	Pra /Tu	ct. t Hrs.	LRs	Req	uired	R	lemarks
2 First law of thermodynamics: Definition and scope. Application to simple situation.		thermodynamics: and scope. ion to simple	Interactive classroom teaching, demonstration, quiz, assignments, tutorial.	n, contents and provide handouts to students. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge.		02	01		Handouts, chalk board, PPT, textbook.		d,		
SCHEI S. No.	ME OF AS Method o	SESSMENT f Assessment	Description of Assess	ment	Maxim Marks	um	Res	ources	Requi	red			External / Internal
1	Theory Exam Theory Quantum Control of the organization of the orga		Theory questions relate content will be asked in question paper	ry questions related to the learned ent will be asked in the university ion paper			Question paper			External			
ADDIT	TIONAL I	NSTRUCTIONS F	FOR THE HOD/ FACUL'	TY (IF ANY)									
Nil													

RGPV	(Diploma	Wing) Bhopal	SCHEME FOR I OUTCOME	LEARNING	Branch	Code	C	Course (Code	CO Code	LO Code	Format No. 4
					С	0	2			1	3	
COURS NAME	SE	CHEMICAL ENGINEE	RING THERMODYNAM	ICS				I	I	I	I	
CO Des	cription	Apply the fundame	entals of thermodynam	ics to various thermodyn	namic syst	ems and	d devices.					
LO Des	cription	Estimate change in	internal energy for a gi	ven process and to calcul	ate work	done an	nd heat tra	ansfer.				
SCHEN	AE OF ST	rudy										
S. No.	Learnin	g Content		Teaching –Learning Method	Descrip T-L Pro	tion of ocess	•		Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
	Mathema thermod flow prod Internal e Definition Calculat Enthalpy Definition	atical equation for fir ynamics for open sys cesses, energy: on& concept, ion. : n and concepts of en	st law of tem and steady state thalpy	Interactive classroom teaching, demonstration, quiz, assignments, tutorial	Teacher contents to stude: conduct quiz/tuto practice	will ex s and pronts. Tea assignr orial to their kn	splain the rovide ha acher wil ments/ make stu nowledg	e indouts ll udents ie.	04	02	Handouts, chalk board, charts.	
S. No.	Method	of Assessment	Description of As	sessment M	Maximur Marks	n	Resourc	ces Requ	uired		Ext Inte	ernal / ernal

		-	Marks		Internal				
1	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									

			SCHEME FOR LE	ARNING	Bra	anch Co	ode (Cou	rse C	ode	СО	LO	
RGPV	(Diploma)	Wing) Bhopal	OUTCOME								Code	Code	e Format No. 4
					C	0	2				2	1	
COURS NAME	SE	CHEMICAL ENGINEE	RING THERMODYNAMIC		I	I					I		/
CO Des	scription	Identify the importa	nt thermodynamic properties	s of gaseous m	nixture and	solution	s.						
LO Des	cription	Interrelate the prope	erties of mixture.										
SCHEN	AE OF ST	UDY											
S. No.	Learning	g Content	Teaching –Learning Method	Description Process	of T-L	Teach Hrs.	Pract. /Tut H	rs.	LRs	Req	uired	I	Remarks
1	Volumetri and heat e Properties Changes i properties relationsh Ideal gase of pure su	c properties of fluids ffects: of pure substances, n thermodynamics and their ip, s and PVT behavior bstance.	Interactive classroom teaching, demonstration, quiz, assignments, tutorial.	Teacher will the contents provide hand students. Tea conduct assi quiz/tutorial students prac knowledge.	l explain and douts to acher will ignments/ l to make ctice their	03	01		Hand	douts book.	, chalk bo	ard,	
SCHEN	/ //E OF AS	SESSMENT											
S. No.	Method	of Assessment	Description of Assessme	nt	Maximu Marks	n l	Resource	s Ro	equir	ed			External / Internal
Pen Paper Test T		Theory questions related to content will be asked	elated to the learned 10 ed		-	Гest Pape	r +]	Ratin	g Sca	le		Internal	
ADDIT	IONAL IN	NSTRUCTIONS FO	OR THE HOD/ FACULTY	Y (IF ANY)									
Nil													

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME	Branch Code C				Course Code		LO Code	Format No. 4
			С	0	2			2	2	
COURSE NAME	CHEMICAL ENGINEERING	G THERMODYNAMIC					I	1		
CO Descriptio	${f n}$ ldentify the important t	hermodynamic properties of gaseous n	nixture	and solu	utions.					
LO Description	${f n}$ Select an appropriate ec	uation of state for representing the PV	- behav	ior of ga	s or liqui	id.				

SCHEME OF STUDY

S. No.	Learning Content	Teaching –	Description of T-L	Teach	Pract.	LRs Required	Remarks
		Learning	Process	Hrs.	/Tut Hrs.		
1	Coloulation on DV/T valationship	Method		05	1	TT 1 / 1 11	
1	Calculation on PVT relationship Heat effects, Heat of mixing, heat of solutions, sensible heat, latent heat, heat of formation, heat of combustion, heat of reaction and heat capacity. Adiabatic flame temperature: Calculation of heat of reaction at different temperature, Calculation of heat of formation at different temperature, Calculation of heat of combustion at different temperature, Calculation of heat of combustion at different temperature, Calculation of adiabatic flame	Interactive classroom teaching, demonstration, quiz, assignments, tutorial.	Teacher will explain the contents and provide handouts to students. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge.	05	1	Handouts, chalk board, charts.	
	temperature.						

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Theory Exam	Theory questions related to the learned content will be asked in the university question paper	10	Question paper	External
ADDI 'I Nil	FIONAL INSTRUCTION	S FOR THE HOD/ FACULTY (IF	ANY)		· · · · · · · · · · · · · · · · · · ·

RGPV	RGPV (Diploma Wing) Bhopal		SCHEME F OUTCOME	SCHEME FOR LEARNING OUTCOME			ch Co	ode	Course C	Course Code		LO Code	e Format No. 4
	× 1	8/ I			C	C 0		2			3	1	
COURS	SE	CHEMICAL ENGINEER	ING THERMODYNAMICS		I								I
CO Des	scription	Apply second law of t	hermodynamics and ana	lyze the feasibility of	f system.								
LO Des	cription	Apply second law of t	hermodynamics to a give	en thermodynamic sy	ystem.								
SCHEN	ME OF ST	UDY											
S. No.	Learnin	g Content	Teaching –Learning Method	Description of T- Process	L		T H	'each Irs.	Pract. /Tut Hrs.	LRs	Requir	ed	Remarks
1	Second law of thermodynamics Definition and its application. Statement of second law of thermodynamics: Kelvin -Planck and Clausius statement. Heat engine and heat pump. Calculation on heat engine and heat pump. Carnot Principle, Carnot cycle, Corollary of Carnot Principle		Interactive classroom teaching, demonstration, quiz, assignments, tutorial.	Teacher will explain the contents and provide handouts to students. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge.			03	3	01 Handou board, P textbool			nalk	
SCHEN S No	Method	SESSMENT of Assessment	Description of Assa	ssmont	Məyimum	M	orke	Roc	SOURCES Rea	uirod		F	ztarnal / Intarnal
5. 110.	Methou	of Assessment	Description of Asse	851110111		IVIč	11 KS	Nes	sources Req	uneu		123	
1	Theory E	Exam	Theory questions rel content will be asked question paper	ated to the learned l in the university	10			Que	estion paper			Ex	ternal
ADDIT	IONAL IN	NSTRUCTIONS FO	R THE HOD/ FACU	LTY (IFANY)									
Nil													

RGPV	GPV (Diploma Wing) Bhopal		SCHEME FOR LE OUTCOME	EARNING	Brar	ich Coo	de	Co	ourse Code		CO Code	LO Code	Format No. 4
					С	0	2				3	2	
COUR	SE NAME	CHEMICAL ENGINE	ERING THERMODYNAMICS										
CO Des	scription	Apply second law o	f thermodynamics and analyze	e the feasibility of	system.								
LO Des	scription	Estimate the entrop	oy change in each situation.										
SCHEN	ME OFSTU	JDY											
5. No.	Learning	Content	Teaching – Learning Method	Description of	T-L Pr	ocess	Tea Hr:	ach s.	Prac /Tut	t. Hrs.	LRs Re	equired	Remarks
	Entropy: Concepts of Entropy, Relationship between lost work and maximum work. Application to engg. problem relative t equilibrium and minimum and maximum work.		Interactive classroom teaching demonstration, qui assignments, elative to tutorial.	Teacher will explain the contents g, and provide handouts to students iz, Teacher will conduct assignments/ quiz/tutorial to mak students practice their knowledge			nts 05 nts. nake dge.		01		Handou board, F textbool	ts, chalk PT, k.	
SCHEN S. No.	Method o	of Assessment	Description of Assessn	nent	Maxim	ım	Reso	irces	Requi	ired			External /
					Marks	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Reso	ui eeb	nequ	ii cu			Internal
1	Theory E	xam	Theory questions related content will be asked in question paper	d to the learned the university	10		Ques	tion p	aper				External
ADDIT	IONAL IN	STRUCTIONS F	OR THE HOD/ FACULT	Y (IFANY)	1		I						
Nil													

RGPV	Diploma	Wing) Bhopal	SCHEME FOR I OUTCOME	LEARNING	Branc	Branch Code		Course C	Course Code		LO Code	Format No.
					С	0	2			4	1	
COURS	SE	CHEMICAL ENGINEE	RING THERMODYNAMICS									
CO Des	cription	Identify the fundam	nental chemical properties of b	pinary systems.								
LO Des	cription	List the molal prope	rties of binary mixture.									
SCHEN	1E OF ST	UDY										
5. No.	Learnin	g Content	Teaching –Learning Method	Description Process	of T-L	Teac Hrs.	ch	Pract. /Tut Hrs.	LRs	s Required		Remarks
	Free energy, Chemical Potential, and work function: Concepts of Partial molal properties, Mathematical model for the chemical potential. Ideal and non-idealmixture. Gibbs and Helmhotz free energy, Maxwell Relation.		Interactive classroom teaching, demonstration, quiz, assignments, tutorial.	Teacher will explain the contents and provide l. handouts to students. Teacher will conduct assignments/ quiz/tutori to make students practic their knowledge.		04		02	Handouts, chalk board, PPT, textbook.		k board,	
SCHEN	IE OF AS	SESSMENT	Degenintion of Assessme		Maria		Daga	Dogus	u a d			External /
5. NO.	Niethod	of Assessment	Description of Assessme	ent	Maximum		Keso	ources Requi	rea			External / Internal
l	Pen Pape	er Test	Theory questions related content will be asked	to the learned	10		Test	Paper + Ratin	ng Sca	ale		Internal
ADDIT	IONAL I	NSTRUCTIONS F	OR THE HOD/ FACULTY	(IF ANY)								

RGPV	(Diploma	Wing) Bhopal		SCHEME FOR I OUTCOME	LEARNING	В	sranc	ch Co	ode	Cour	se Cod	e CO Code	LO Code	e Format No. 4
	URSE CHEMICAL ENGINEERIN					C	r ,	0	2			4	2	
COURS NAME	SE	CHEMICAL ENGINEE	RING THER	MODYNAMICS		I					II		I	
CO Des	scription	Identify the fundam	ental chen	nical properties of b	pinary systems.	•								
LO Des	cription	Calculate the fugacit	ty and activ	ity coefficient of ele	ements.									
SCHEN	AE OF ST	CUDY												
S. No.	Learnin	g Content	Teaching Method	g –Learning	Description Process	of T-L	Tea Hr	ach s.	Prac /Tut	t. Hrs.	LRs	Required	1	Remarks
	Elementa fugacity a Elementa andactivi Temperat equilibriu	ary concepts of and fugacitycoefficient ary concepts of activity ty coefficient. ture dependency of am constant.	Interactive classroom Te t. teaching, demonstration, co y quiz, assignments, tutorial. ha Te as qu str kr		Teacher will contents and handouts to s Teacher will assignments/ quiz/tutorial students prac knowledge.	explain the provide tudents. conduct to make tice their	e 04		02		Handouts, chalk board, textbook.		,	
SCHEN	AE OF AS	SSESSMENT							I					
S. No.	Method	of Assessment	Descrij	otion of Assessme	ent	Maximur Marks	n	Re	source	s Requ	iired		E	xternal / Internal
1	Pen Pape	er Test	Theory content	questions related will be asked	to the learned	10		Te	st Paper	r + Rat	ing Sc	ale	Ir	nternal
ADDIT	IONAL I	NSTRUCTIONS FO	OR THE	HOD/ FACULTY	(IF ANY)									
Nil														

RGPV	(Diploma V	Wing) Bhopa	l	SCHEME FO OUTCOME	R LEARNING	Bran	ch C	ode 2	Cours	se Code	CO Code	LO Code	Format No. 4
COURS	SE NAME	CHEMICAL ENG	GINEERING TH	IERMODYNAMICS	5	C	U	4			5	_	
CO Des	scription	Estimate the e	fficiency of pr	ocess involving re	efrigeration and lique	faction.							
LO Des	cription	Explain the Ret	frigeration, Re	efrigerant and Ref	rigeration Cycle.								
SCHEN	AE OFSTU	U DY											
S. No.	Learning	g Content	Teaching – Method	Learning	Description of T-	L Process		Teach Hrs.	Pract. /Tut Hrs	LR:	s Requir	ed	Remarks
1	Refrigerat Outline & Character Refrigerar Performar of refriger Capacity o Coefficien performar Circulation	tion: Definition, istics &Types of nt. nce evaluation ration system, of refrigeration, t of nce, n rate.	Interactive teaching, de quiz, assign	classroom monstration, ments, tutorial.	Teacher will expla and provide hando Teacher will cond quiz/tutorial to ma practice their know	ain the conte outs to studen uct assignme ike students wledge.	nts nts. ents/	04	01	Har PPT	idouts, ch	nalk board ok.	
SCHEN	AE OFASS	SESSMENT											
S. No.	Method	of Assessment	Des	cription of Asse	ssment	Maximum Marks		Resour	ces Requi	ired			External / Internal
1	Theory E	xam	The cont ques	bry questions rel ent will be asked tion paper	ated to the learned 1 in the university	10		Questic	on paper				External
ADDIT	IONAL IN	STRUCTION	NS FOR TH	E HOD/ FACU	LTY (IF ANY)			<u> </u>					<u> </u>
Nil													

RGPV (RGPV (Diploma Wing) Bhopal		SCHEME FOR LEAD OUTCOME	HEME FOR LEARNING Branch C TCOME		Code		Code Course Co			LO Code	Format No. 4
					\boldsymbol{C}	0	2				2	
COURS	SE NAME	CHEMICAL ENGINE	ERING THERMODYNAMICS					I				·
CO Des	cription	Explain the types a	nd cycling processof refrigeration a	and their pro	perties involvin	g in it.						
LO Des	cription	Select suitable refr	igeration cycle with justification.									
SCHEM	1E OFSTU	J DY										
S. No.	Learning	g Content	Teaching –Learning Method	l Descriptio Process	n of T-L	Teac Hrs.	ch	Pract. /Tut Hrs.	LRs	Requir	ed	Remarks
1	Refrigeration Cycle: Introduction, Carnot cycle by TS diagram, Air refrigeration cycle, Vapor compression cycle.		Interactive classroom teaching, demonstration, quiz, assignments, tutorial.	Teacher will explain the iz, contents and provide handouts to students. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge.				02	Handouts, chalk board PPT, textbook.			
SCHEN	IE OFASS	SESSMENT	I									
S. No.	Method (of Assessment	Description of Assessment		Maximum Marks	Reso	our	ces Required	d			External / Internal
1	Theory E	xam	Theory questions related to content will be asked in the question paper	the learned university	10	Question paper					External	
ADDIT	IONAL IN	STRUCTIONS I	FOR THE HOD/ FACULTY (I	F ANY)								
Nil												

RGPV	RGPV (Diploma Wing) Bhopal		SCHEME F OUTCOME	SCHEME FOR LEARNING OUTCOME			Branch Code				CO Code	LO Code	Format No. 4
	(I	···			C	ŗ	0	2			5	3	
COURS NAME	SE	CHEMICAL ENGINEER		5	I				1		I	I	
CO Des	cription	Estimate the efficien	cy of process involving re	efrigeration and lique	efaction.								
LO Des	cription	Explain liquefaction	process and its utility in p	process industry.									
SCHEN	/IE OF ST	UDY											
S. No.	Learning	g Content	Teaching –Learning Method	Description of T-	L Process	Teac Hrs.	h]	Pract. Tut Hrs.	LRs R	equired		Remarks
1	Joule Thomson liquefaction process, Calculation on power required.		Interactive classroom teaching, demonstration, quiz, assignments, tutorial.	 n Teacher will explain the contents and provide handouts to students. l. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge. 		03		02		Handouts, chalk board, charts, textbook.		board,	
SCHEN	IE OF AS	SESSMENT		1									
S. No.	Method	of Assessment	Description of Asse	essment	Maximu Marks	m	R	Reso	ources Ree	quired			External / Internal
1	Pen Pape	er Test	Theory questions rel content will be asked	ated to the learned	10		Т	Test	Paper + R	ating Sc	ale		Internal
ADDIT	IONAL I	NSTRUCTIONS FO	OR THE HOD/ FACU	ULTY (IF ANY)									
Nil													