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	B
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	A

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 of system.	10		
LO 1	Apply second law of thermodynamics to a given thermodynamic system.	4	10	A
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.			

CO 4	**Identify** the fundamental chemical properties of binary systems.	12		
LO 1	List the molal properties of binary mixture.	6	6	B
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	B
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	A
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	A
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	B
Content	Joule Thomson liquefaction process, Calculation on power required.			

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

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

COURSE NAME	CHEMICAL ENGINEERING THERMODYNAMICS
CO Descaription	Apply the fundamentals of thermodynamics to various thermodynamic systems and devices.
LO Description	Analyze fundamental concept of thermodynamics.

SCHEME OFSTUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	**Introduction to Thermodynamic** Basic concept, Scope of thermodynamics, Thermodynamic system and its surrounding, types of thermodynamic 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.	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	Handouts, chalk board, PPT, textbook.	

SCHEME OFASSESSMENT

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
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*	

COURSE NAME	CHEMICAL ENGINEERING THERMODYNAMICS
CO Description	Apply the fundamentals of thermodynamics to various thermodynamic systems and devices.
LO Description	Apply first law of thermodynamics to a given thermodynamic system.

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
2	First law of thermodynamics: Definition and scope. Application to simple situation.	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	Handouts, chalk board, PPT, textbook.	

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

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*	*3*	

COURSE NAME	CHEMICAL ENGINEERING THERMODYNAMICS
CO Description	Apply the fundamentals of thermodynamics to various thermodynamic systems and devices.
LO Description	Estimate change in internal energy for a given process and to calculate work done and heat transfer.

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
	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	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.	04	02	Handouts, chalk board, charts.	

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

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*	

COURSE NAME	CHEMICAL ENGINEERING THERMODYNAMIC
CO Description	**Identify the important thermodynamic properties of gaseous mixture and solutions.**
LO Description	Interrelate the properties of 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	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.	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	01	Handouts, chalk board, textbook.	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Pen Paper Test	Theory questions related to the learned content will be asked	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*	*2*	

COURSE NAME	CHEMICAL ENGINEERING THERMODYNAMIC
CO Description	**Identify the important thermodynamic properties of gaseous mixture and solutions.**
LO Description	Select an appropriate equation of state for representing the PVT behavior of gas or liquid.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
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 adiabatic flame temperature.	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.	

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

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*	*1*	

COURSE NAME	CHEMICAL ENGINEERING THERMODYNAMICS
CO Description	Apply second law of thermodynamics and analyze the feasibility of system.
LO Description	Apply second law of thermodynamics to a given thermodynamic system.

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	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	01	Handouts, chalk board, PPT, textbook	

SCHEME OFASSESSMENT

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

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IFANY)

Nil

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COURSE NAME	CHEMICAL ENGINEERING THERMODYNAMICS
CO Description	Apply second law of thermodynamics and analyze the feasibility of system.
LO Description	Estimate the entropy change in each situation.

SCHEME OFSTUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Entropy: Concepts of Entropy, Relationship between lost work and maximum work. Application to engg. problem relative to equilibrium and minimum and maximum work.	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	01	Handouts, chalk board, PPT, textbook.	

SCHEME OFASSESSMENT

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

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IFANY)

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*	

COURSE NAME	CHEMICAL ENGINEERING THERMODYNAMICS
CO Description	**Identify the fundamental chemical properties of binary systems.**
LO Description	List the molal properties of binary 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	**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 handouts to students. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge.	04	02	Handouts, chalk board, PPT, textbook.	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Pen Paper Test	Theory questions related to the learned content will be asked	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*				*4*	*2*	

COURSE NAME	CHEMICAL ENGINEERING THERMODYNAMICS
CO Description	**Identify the fundamental chemical properties of binary systems.**
LO Description	Calculate the fugacity and activity coefficient of elements.

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Elementary concepts of fugacity and fugacitycoefficient. Elementary concepts of activity andactivity coefficient. Temperature dependency of equilibrium constant.	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.	04	02	Handouts, chalk board, textbook.	

SCHEME OF ASSESSMENT

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

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

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

COURSE NAME	CHEMICAL ENGINEERING THERMODYNAMICS
CO Description	Estimate the efficiency of process involving refrigeration and liquefaction.
LO Description	Explain the Refrigeration, Refrigerant and Refrigeration Cycle.

SCHEME OFSTUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	**Refrigeration:** **Outline &**Definition, Characteristics &Types of Refrigerant. Performance evaluation of refrigeration system, Capacity of refrigeration, Coefficient of performance, Circulation rate.	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.	04	01	Handouts, chalk board PPT, textbook.	

SCHEME OFASSESSMENT

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

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***	

COURSE NAME	CHEMICAL ENGINEERING THERMODYNAMICS
CO Description	Explain the types and cycling processof refrigeration and their properties involving in it**.**
LO Description	Select suitable refrigeration cycle with justification.

SCHEME OFSTUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	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 contents and provide handouts to students. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge.	04	02	Handouts, chalk board PPT, textbook.	

SCHEME OFASSESSMENT

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

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***	

COURSE NAME	CHEMICAL ENGINEERING THERMODYNAMICS
CO Description	Estimate the efficiency of process involving refrigeration and liquefaction.
LO Description	Explain liquefaction process and its utility in process industry.

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Joule Thomson liquefaction process, Calculation on power required.	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	02	Handouts, chalk board, charts, textbook.	

SCHEME OF ASSESSMENT

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

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Nil