RGPV (DIP WING) BH			RRICULUM FOR HE COURSE	FORMA	Sheet No. 1				
Branch	REFR	IGERATION A	ND AIR CONDITIONING ENGINEE	ERING	Semes	ster	VI		
Course Code	611	Course Name	DESIGN OF HVAC SYSTEM EQU	JIPMENTS	}				
Course Outo	come 1	Designing of A	Air Conditioning Ducts	Tea ch Marks Hrs					
Learning Outo	come 1	Explain the rec	quirement of air conditioning duc	ets	10		10		
Contents		Duct Compor	nents, Steps in Duct Design, city pressure, Total Pressure (Pt	duct design, Duct Design Criteria, , duct Classification ents , Steps in Duct Design, Pressure in ducts- statity pressure, Total Pressure (Pt), Duct Velocity Range Roughness, Equivalent Duct Diameter for rectangular duc					
Method of Ass	essment	Theory exam	Theory exam External						
Learning Outo	come 2	Use of Equal f	riction method for duct design.		10		10		
Contents		Wesbaick equ Chart and tabl Velocity reduc Calculation for Rectangular du	gh ducts, Conservation of mass a ation, Estimation of pressure less, Procedure of Commonly uction method, Equal friction methor duct size/dimension using acts, Circular ducts. Dynamic Lonrough various fittings.	oss in duct used duct thod, Stat Equal	cts usin design ic rega Friction	ng F met in m n M	riction hods - nethod. lethod.		
Method of Ass	essment	Theory exam			Ext	ernal	l		
Learning Outo	come 3	Design considerand optimization	lerations for acoustics, system on in ducts	balancing	05		10		
Contents		T-method), Op Acoustic Cons Location, Var Return Air Par	of system balancing, optimization of ducts, Optimization method), Optimal duct sizes and fan size, system life-cycle optimization construction Materials, Noise Penetrations, HVAC Equiption, Variable Speed Options, Duct Silencers, Duct-Borne Non Air Path, Velocity Noise, Ducts Shape, Terminal Units, Vibration, Volume Dampers						

Progressive Test I

Internal

Method of Assessment

OBE CURRICULUM FOR RGPV (DIPLOMA Sheet FORMAT-3 No. 2/4WING) BHOPAL THE COURSE **Branch** REFRIGERATION AND AIR CONDITIONING ENGINEERING Semester VI **Course Code** 611 Course Name **DESIGN OF HVAC SYSTEM EQUIPMENTS** Tea Course Outcome 2 **Design flow systems for RAC applications** ch Marks Hrs **Learning Outcome 4** Select suitable Pipes for Water of given conditions 10 10 Water Pipe sizing: The materials most commonly used in piping systems, Recommended pipe and fitting materials, Pipe length, Open and closed piping systems, Piping routing, pipe sizing – flow, velocity, pressure drop, **Contents** Accessories - expansion /make up water tank, Valves and fittings, Calculation of total pressure drop across the piping circuit, Chemical dosing, NPSH calculations, pressure testing parameters **Method of Assessment** Theory exam External 04 **Learning Outcome 5** Select a suitable Pumping system for given application 10 Pumping system, objective of pumping system, characteristics of pumping system, Pump components, types of pumps, special requirements for Chilled brine and cooling water circulations. Head Requirement, Motor **Contents** sizing, Operation and Performance **Method of Assessment** Term Work Internal Select suitable Pipes for Refrigerants of given RAC **Learning Outcome 6** 06 10 Systems Refrigerant Pipe sizing: Criteria for sizing suction, liquid, hot gas line, pressure drop, oil return, schematic piping layout of systems, and best **Contents** practices, pressure testing parameters, Accessories, Hands on exercises **Method of Assessment** Laboratory Work Internal **Learning Outcome 7** Select fans for given application 06 10 Centrifugal Fan Pressure Classes - Selection, comparison, electrical energy cost of the fan, fan selection criteria, types of fan used in various air conditioning practices, manufactures catalogue, charts and tables, Types, **Contents** Capacities, Range and Applications, Operating Range

Internal

Method of Assessment

Laboratory Work

RGPV (I WING)				URRICULUM FOR THE COURSE	FORMA	т-3	Sheet No. 3/4		
Branch	REFR	RIGERA	ATION AND	AIR CONDITIONING ENGIN	EERING	Semes	ter VI		
Course Code	611	Cou	rse Name	DESIGN OF HVAC SYSTEM EQUI	PMENTS	·			
Course C	Outcon	ne 3	Design of A	ir terminals and Distribution of air	•	Teacl Hrs	¹ Marks		
Learning (Outcom	ne 8	Design of fr	ee stream jets		05	10		
Contents				nrow, drop, spread and entrain isothermal free stream jets	ment ratio	of cir	cular and		
Method of	assessr	nent	Progressive	Test II			Internal		
Learning (Outcom	ne 9	Describe dis	stribution units of air		10	10		
Content			filters. Pre VAV boxes Induction V	I unit types, design guidelines, se essure drop estimation. Variable s, VAV with parallel and series, AVs. methods of Room air District, Unidirectional and Under-Floor	Air Volum fan powere ibution Syst	e(VAV ed term) systems, inal units,		
Method of	Assess	ment	Theory exar	n		Exte	nal		
Learning (Outcom	ne 10	Select of application	Air Handling, Fan Coil Unit for given 10					
Contents			systems, ter AHU Tonna AHU. Type	ng Unit (AHU), Components or minal reheat systems, Dual duct age Output equation. selection of s of Fan Coil Units (FCU), Component guidelines for FCU.	Systems. Le AHU, Des	ocation ign guid	of AHUs, delines for		
Method of	Assess	ment	Theory exar	n		Exte	nal		
Course C	Outcon	ne 4	Select HVA	C systems for given Application					
Learning (Outcom	ne 11	Select suit application	able HVAC system for give	n comfort	08	10		
Contents			Occupant d Cooling/hea Sustainabilit Ductless sp systems with of suitable d Websites/	ensity, Frequency of use, Aesthe ting capacity, Humidity, Overall ty, Performance, constructability lit ACs, Package and Ductable th AHUs, Air cooled and water cooled and water cooled and water of equipments and es/ISHRAE Guidelines etc.	etics, Envir l Plant Eff y, Particula units, VRF oled conden l from differ	conment iciency ites con s/VRV, sing uni rent Ma	al impact, (kW/TR), ntrols etc. large DX its. Survey nufacturer		
Method of	f Assess	sment	Laboratory '	oratory Work Externa					

RGPV (DIPI WING) BHO			RRICULUM FOR IE COURSE	FORMA	т-3	She No.	eet . 4/4			
Branch REF	RIGER	ATION AND AI	R CONDITIONING ENGINI	EERING	Seme	ster	VI			
Course Code	611	Course Name	DESIGN OF HVAC SYSTEM EC	UIPMENTS						
Learning Outco	ome 12	Select approp	oppropriate Indoor and Outdoor Unit of O8							
Contents		split ACs, Pack AHUs, Air co	Hotels, Mall, Hospitals, Industry age and Ductable units, VRFs/oled and water cooled conder h VRF/Water Chiller/DX Systems	VRV, large ensing units	DX sy	stems	with			
Method of Asso	essment	Laboratory Wo	Laboratory Work Extern							
Learning Outco	ome 13	Select suitable (Chilled water system for given a	application	10	1	10			
Contents		Applications. C Condensing Un compressors, ty on the basis of	er Cooled Chillers – Compressors, Types And Capacities Range lications. Operating Range, Cooling Capacity, Controls, Compordensing Units, Installation Flexibility, Air and water cooled chill pressors, types and capacities range and applications, Selection or the basis of – Technology, Merits & Demerits, Life Cycle nitecture, Reliability, Sustainability.							
		Theory exam			Exte	xternal				
Course Outco	ome 5	Describe Econo	omics of HVAC systems		Tea ch Hrs	Mar	ks			
Learning Outco	ome 14	Select suitable applications	size of HVAC system	for given	10	1	10			
Contents		Dependencies, dependencies, of for ventilation judgments and	load, diversity assumptions outdoor indoor condition dependent work conditions dependent rates in breathing zone. Dethumb rules for sizing of HVAC	dencies, bu cies. Minin esigner's/Pr	ilding on the section in the section	comp quirer engir	onent ments			
Method of Asse	ssment	Theory exam Externa								
Learning Outco	ome 15	Estimate Life C	cycle Cost of HVAC		08	1	10			
Contents		cost, control	Capital Cost: Installation Cost- Equipment cost, Air distribution networks, control systems cost, Cable/wiring Cost, safety system cooperating Cost, Maintenance Cost, System life cycle. payback period							
Method of Asse	essment	Laboratory Wo	boratory Work External							

SCHEME FOR LEARNING OUTCOME

	LO Code	CO Code	de	urse Co	Co	e	ranch Cod	Ві
Format No. 4	1	1	1	1	6	1	0	R

COURSE NAME	DESIGN OF HVAC SYSTEM	EQUIPMENTS						
CO Description	CO-1 Design of Air Condit	tioning Ducts						
LO Description	LO-1 Explain the requireme	ent of air conditioning	ng ducts					

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Objectives of duct design, Duct Design Criteria, , duct Classifications, Duct Components , Steps in		Teacher will explain the contents and provide	10	00	ASHRAE handbook,	NIL
	Duct Design, Pressure in ducts- static pressure,		handouts to students. Teacher will conduct			Carrier Handbook	
	Velocity Ranges, Duct Material Roughness, Equivalent Duct Diameter for rectangular duct,	v ideos.	Quiz/visit to make students practice their knowledge			Handouts, Charts,	
	Aspect ratio.		r			Videos	

SCHEME OF ASSESSMENT

S.	Method of	`Description of Assessment	Maximum	Resources	External /
No.	Assessment		Marks	Required	Internal
1	Theory exam	 Students will be asked (and/or) Enlist objectives/ Important general rules/ Criteria to be considered/ procedure / Aspect ratio in duct designing. Explain the term pressure in ducts/ duct velocity ranges/ Duct material roughness. 	10	Test Paper	External

SCHEME FOR LEARNING OUTCOME

4	LO Code	CO Code	de	urse Co	Co	le	ranch Cod	Ві
Format No. 4	2	1	1	1	6	1	0	R

COURSE NAME	DESIGN OF HVAC SYSTEM	EQUIPMENTS					
CO Description	CO-1 Design of Air Condit	ioning Ducts					
LO Description	LO-2 Use of Equal friction	method for duct design.					

SCHEME OF STUDY

S.	Learning Content	Teaching -	Description of T-L	Teach	Pract.	LRs	Remark
No.	Learning Content	Learning Method	Process	Hrs.	/Tut Hrs.	Required	S
1	Air flow through ducts, Conservation of mass and energy equations, Darcy Wesbaick equation, Estimation of pressure loss in ducts using Friction Chart and tables, Procedure of Commonly used duct design methods - Velocity reduction method, Equal friction method, Static regain method. Calculation for duct size/dimension using Equal Friction Method. Rectangular ducts, Circular ducts. Dynamic Losses, Evaluation of dynamic pressure loss through various fittings.	Interactive Classroom method, Handout, PPTs, Charts and Videos.	Teacher will explain the contents and provide handouts to students. Teacher will conduct Quiz/visit to make students practice their knowledge	10	0	ASHRAE handbook, Carrier Handbook Handouts, Charts, Videos	

SCHEME OF ASSESSMENT

S.	Method of	Description of Assessment	Maximum	Resources	External
No.	Assessment	Description of Assessment	Marks	Required	/ Internal
1	Theory Exam	Students will be asked –(and/or)	10	Test Paper	External
		1. Explain conservation of mass and energy equations/ Darcy Wesbaick equation for duct designing.			
		2. Calculate frictional pressure drop of given circular/rectangular ducts using friction charts and equations			
		3. Describe Velocity reduction method/ Equal friction method/ Static regain method for duct designing.			
		4. Calculate duct size/dimension using Equal Friction Method for given - Rectangular/ Circular ducts			
		5. Explain the dynamic pressure Losses through given fittings in ducts			

SCHEME FOR LEARNING OUTCOME

	LO Code	CO Code	de	urse Co	Co	e	anch Cod	Ві
Format No. 4	3	1	1	1	6	1	0	R

COURSE NAME	DESIGN OF HVAC SYSTEM EQUIPMENTS							
CO Description	CO-1 Design of Air Conditioning Ducts							
IO Description	LO3 Design considerations for acoustics, system balancing and ontimize	ation	in duct	· c				

SCHEME OF STUDY

		301121112 31 31 3	- .				
S.	Learning Content	Teaching –Learning	Description of T-L	Teach	Pract.	LRs	Remarks
No.	Learning Content	Method	Process	Hrs.	/Tut Hrs.	Required	Remarks
1	Need of system balancing, optimization of ducts,	Interactive Classroom	Teacher will explain	5	0	ASHRAE	NIL
	Optimization methods(T-method), Optimal duct sizes	method, Handout,	the contents and			handbook,	
	and fan size, system life-cycle optimization.	PPTs, Charts and	provide handouts to			Carrier	
		Videos, Working	students. Teacher will			Handbook	
	Acoustic Construction Materials, Noise Penetrations,	Models of power	conduct Quiz/visit to			Handouts,	
	HVAC Equipment Location, Variable Speed Options,	utilization	make students			Charts,	
	Duct Silencers, Duct-Borne Noise, Return Air Path,		practice their			Videos	
	Velocity Noise, Ducts Shape, Terminal Units,		knowledge				
	Vibration Isolation, Volume Dampers						

SCHEME OF ASSESSMENT

S.	Method of	Description of Assessment	Maximum	Resources	External /
No.	Assessment		Marks	Required	Internal
1	Progressive test I	 Students will be asked (and/or) Describe need of system balancing/ Optimization of ducts/ Optimization methods(T-method)/ Optimal duct sizes and fan sizes/ Duct system life-cycle optimization Describe Acoustic Construction Materials/ Noise Penetrations/ HVAC Equipment Location and Variable Speed Options for noise control/ Duct Silencers, Duct Borne Noise/ Noise in Return Air Path/ Velocity Noise/ Noise due to Duct's Shape/ Noise in Terminal Units/ Vibration Isolation and Volume Dampers 		Paper pen	Internal

SCHEME FOR LEARNING OUTCOME

	LO Code	CO Code	de	urse Co	Co	e	Branch Code			
Format No. 4	4	2	1	1	6	1	0	R		

COURSE NAME	DESIGN OF HVAC SYSTEM EQUIPMENTS
CO Description	CO-2 Design flow systems for RAC applications
LO Description	LO 4 - Select suitable Pipes for Water of given conditions

SCHEME OF STUDY

S. No	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
1	Water Pipe sizing: The materials most commonly used in piping systems, Recommended pipe and fitting materials, Pipe length, Open and closed piping systems,		Teacher will explain the contents and provide handout to	10	0	ASHRAE handbook, Carrier	
	Piping routing, pipe sizing – flow, velocity, pressure drop, Accessories - expansion /make up water tank, Valves and fittings, Calculation of total pressure drop	Charts and Videos.	students. Teacher will conduct Quiz/visit to make students practice			Handbook Handouts, Charts,	
	across the piping circuit, Chemical dosing, NPSH calculations, pressure testing parameters		their knowledge			Videos	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Theory	Students will be asked (and/or)	10	Test Paper	External
	Exam	1. Describe the materials used in water piping systems			
		2. Explain open/ closed piping systems/ Pipe routing.			
		3. Explain the pipe sizing considering flow/ velocity/ pressure drop			
		4. Enlist the accessories (Valves and fittings) for water piping			
		5. Explain expansion /make up water tank			
		6. Describe pressure testing parameters for water piping			

SCHEME FOR LEARNING OUTCOME

В	ranch Cod	le	Co	urse Co	de	CO Code	LO Code
R	0	1	6	1	1	2	5

Format No. **4**

COURSE NAME	DESIGN OF HVAC SYSTEM EQUIPMENTS
CO Description	CO2- Design flow systems for RAC applications
LO Description	LO 5 Select a suitable Pumping system for given application

SCHEME OF STUDY

S. No	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
1	Pumping system, objective of pumping system, characteristics of pumping system, Pump components, types of pumps, special requirements for Chilled brine and cooling water circulations. Head Requirement, Motor sizing, Operation and Performance	Classroom method, Handout, PPTs,	Teacher will explain the contents and provide handout to students. Teacher will conduct Quiz/visit to make students practice their knowledge	4	0	ASHRAE handbook, Carrier Handbook Handouts, Charts, Videos	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Term Work	Students will be asked (and/or) 1. Describe objectives and characteristics of pumping system	10	Paper pen	Internal
		 Explain pump components and types of pumps Explain the special requirements for Chilled brine and cooling water circulations Describe head requirement, motor sizing, operation and Performance of water pumps 			

SCHEME FOR LEARNING OUTCOME

В	ranch Cod	е	Course Code			CO Code	LO Code
R	0	1	6	1	1	2	6

Format No. **4**

COURSE NAME	DESIGN OF HVAC SYSTEM EQUIPMENTS
CO Description	CO2 Design flow systems for RAC applications
LO Description	LO-6 Select suitable Pipes for Refrigerants of given RAC Systems

SCHEME OF STUDY

S. No.	Learning Content	T-L Method	Description of T-L	Teach	Pract.	LRs	Rema
3. NO.	Learning Content	1-L Wethou	Process	Hrs.	/Tut Hrs.	Required	rk
1	Refrigerant Pipe sizing: Criteria for sizing	Interactive Classroom	Teacher will explain the	4	2	ASHRAE	
	suction, liquid, hot gas line, pressure drop, oil	method, Handout PPTs,	contents and provide			handbook,	
	return, schematic piping layout of systems, and	Charts and Videos.	handout to students.			Carrier	
	best practices, pressure testing parameters,		Teacher will conduct			Handbook	
	Accessories, Hands on exercises		Quiz/visit to make			Handouts,	
			students practice their			Charts,	
			knowledge			Videos.	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Laboratory	Students will be asked (and/or)	10	Pen Paper	Internal
	Work	1. Explain the refrigerant piping criteria for sizing suction/ liquid/ hot gas line.			
		2. Enlist the accessories (valves and fittings) for refrigerant piping			
		3. Explain pressure drop/oil return/ Pressure testing parameters for refrigerant piping			
		4. Draw a schematic piping layout of a given system			

Branch Code Course Code CO LO Code **RGPV (Diploma Wing)** SCHEME FOR LEARNING Code Format No. 4 **Bhopal OUTCOME** R 1 6 1 2 7 0 **DESIGN OF HVAC SYSTEM EQUIPMENTS COURSE NAME CO- 2 Design flow systems for RAC applications CO** Description **LO** Description LO-7 Select fans for given application **SCHEME OF STUDY** S. **Learning Content** T-L Method **Description of T-L** Teach Pract. LRs Remark /Tut Hrs. Required No. **Process** Hrs. Centrifugal Fan Pressure Classes - Selection, Interactive Classroom Teacher will explain **ASHRAE** 1 4 comparison, electrical energy cost of the fan, fan method. Handout. the contents and handbook. selection criteria, types of fan used in various air PPTs. Charts provide handout to Carrier and conditioning practices, manufactures catalogue, Videos. Internet search, students. Teacher Handbook charts and tables, Types, Capacities, Range and market will conduct Handouts. survey. Quiz/visit Applications, Operating Range manufacturer catalogue Charts, to make students practice Videos their knowledge SCHEME OF ASSESSMENT Method of **Description of Assessment** Resources External / S. Maximum Internal No. Assessment Marks Required Students will be ask to prepare market survey report on: (and/or) Pen Paper Laboratory 10 Internal 1 Work Survey 1. Different Centrifugal Fan Pressure Classes report 2. Types of fans used in various air conditioning practices, using manufacture's catalogue, Media publication data (Print/web etc) charts and tables

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

3. fan selection criteria, Comparison by - Types, Capacities, Range and Applications,

Operating Range, electricity consumption etc.

RGPV (Diploma Wing) SCHEME FOR LEARNING Bhopal OUTCOME

В	ranch Co	de	Co	ourse Co	ode	CO Code	LO Code
R	0	1	6	1	1	3	8

Format No. **4**

COURSE NAME	DESIGN OF HVAC SYSTEM EQUIPMENTS
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CO Description | CO- 3 Design of Air terminals and Distribution of air

LO Description LO- 8 Design of free stream jets

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method Description of T-L Process			Pract. /Tut Hrs.	LRs Required	Remark
1	Estimate throw, drop, spread and entrainment ratio of circular and rectangular, isothermal free stream jets	Interactive Classroom method, Handouts, PPTs, Charts and Videos.	Teacher will explain the contents and provide handout to students. Teacher will conduct Quiz/visit to make students practice their knowledge	5	0	ASHRAE handbook, Carrier Handbook Handouts, Charts, Videos	

SCHEME OF ASSESSMENT

S.	Method of	Description of Assessment	Maximum	Resources	External /
No.	Assessment		Marks	Required	Internal
1	Progressive Test II	Students will be asked: (and/or) 1. Estimate throw/ Drop/ Spread/Entrainment ratio of circular jets/ Entrainment ratio of rectangular jets 2. Explain Isothermal free stream jets	10	Paper pen	Internal

Branch Code Course Code co LO **RGPV (Diploma Wing) SCHEME FOR LEARNING** Code Code Format No. 4 9 **Bhopal OUTCOME** R 0 1 6 1 1 3 **COURSE NAME DESIGN OF HVAC SYSTEM EQUIPMENTS** CO- 3 Design of Air terminals and Distribution of air **CO** Description LO - 9 Describe distribution units of air **LO** Description **SCHEME OF STUDY Description of T-L** S. **Learning Content** T-L Method Teach Pract. LRs Remark No. **Process** Hrs. /Tut Hrs. Required Air terminal unit types, design guidelines, selection Interactive Teacher will explain **ASHRAE** 1 10 0 guidelines. Dampers, filters. Pressure drop estimation. Classroom contents and handbook, Variable Air Volume(VAV) systems, VAV boxes, VAV method. provide handout to Carrier

SCHEME OF ASSESSMENT

and

students. Experimental

of

determination

dryness fraction

Handbook

Handouts,

Charts.

Videos

Handout PPTs,

Charts

Videos.

Models

with parallel and series, fan powered terminal units,

Induction VAVs. methods of Room air Distribution

Systems- Mixing Air, Displacement, Unidirectional and

Under-Floor.

S.	Method of	Description of Assessment	Maximum	Resources	External
No.	Assessment		Marks	Required	/ Internal
1	Theory	Students will be asked (and/or)	10	Test Paper	External
	Exam	1. Enlist types of air terminal units/ design guidelines/ selection guidelines			
		2. Explain the criteria for Selecting dampers and filters			
		3. Calculate pressure drop for given air terminal			
		4. Describe Variable air Volume(VAV) systems/ VAV boxes/ VAV with parallel and series/ fan powered terminal units/ Induction VAVs.			
		5. Explain given method of Room air Distribution Systems (Mixing Air/ Displacement/ Unidirectional/ Under-Floor)			

RGPV (Diploma	SCHEME FOR	- 1	Branch Co	de	(Course Code	9	CO Code	LO Code	A	
Wing) Bhopal	LEARNING OUTCOME	R	0	1	6	1	1	3	10	Format No. 4	
COURSE NAME	COURSE NAME DESIGN OF HVAC SYSTEM EQUIPMENTS										
CO Description	CO- 3 Design of Air terminals and I	Distrib	ution o	f air							
LO Description	LO-10 Select of Air Handling, Fan	Coil U	nit for	given a	pplication	on					

SCHEME OF STUDY

S.	Learning Content	Teaching –	Description of T-L	Teach	Pract.	LRs	Rema
No.	Learning Content	Learning Method	Process	Hrs.	/Tut Hrs.	Required	rk
1	Air Handling Unit (AHU), Components of AHU, Single,	Interactive	Teacher will explain	10	0	ASHRAE	
	multi zone systems, terminal reheat systems, Dual duct	Classroom method,	the contents and			handbook,	
	Systems. Location of AHUs, AHU Tonnage Output equation.		provide handouts to			Carrier	
	selection of AHU, Design guidelines for AHU. Types of Fan	Charts and Videos.	students. Teacher			Handbook	
	Coil Units (FCU), Components in FCU, Selection of FCU,		will conduct			Handouts,	
	Design guidelines for FCU.		Quiz/visit to make			Charts,	
			students practice			Videos	
			their knowledge				

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Theory Exam	Students will be asked (and/or)	10	Test Paper	External
		1. Explain Air Handling Unit (AHU)/ components of AHU.			
		2. Describe Single / Multi zone/ Terminal reheat/ Dual duct Systems Air Handling			
		Unit.			
		3. Explain criteria to optimize the location of AHUs.			
		4. Write the AHU Tonnage Output equation.			
		5. Explain selection criteria/ Design guidelines for AHU.			
		6. Enlist the types of Fan Coil Units (FCU) and its Components.			
		7. Explain selection criteria/ Design guidelines for FCU			

	DV /D::sla.	no Wing \ Dhonol	SCHEME FOR LEA	ARNING	Branc	ch Code	•	Cours	e Coo	de	CO Code	LO Code		4						
KG	וסוקוט) אי	ma Wing) Bhopal	OUTCOM	E	R	0	1 (5 2	1	1	4	11	Form	at No. 4						
COL	JRSE NAME	DESIGN OF HVAC SYSTEM E	QUIPMENTS		ı	ı	I	<u>l</u>	1				l .							
CO E	Description	CO- 4 Select HVAC system	ns for given Application																	
LO D	escription	LO- 11 Select suitable HVA	C system for given comfort	application																
	•		SCHEM	IE OF STUDY																
S. No.		Learning Conte	Learning Content Teaching – Learning Method T-L Process					Teach Hrs.	Pra /Tut		LRs Require	Remark								
1	cost, Occupar impact, Cooli (kW/TR), Su- controls etc. VRFs/VRV, cooled conde obtaining data	eria-Owner, Initial cost, Open tent density, Frequency of use, ng/heating capacity, Humidit stainability, Performance, con Ductless split ACs, Packlarge DX systems with AH ensing units. Survey of sura from different Manufacturand parts, with the help of the control of the con	Aesthetics, Environmental y, Overall Plant Efficiency onstructability, Particulates tage and Ductable units, Us, Air cooled and water itable HVAC system by the Websites/ Broacher of Charts/Tables/ISHRAE	Interactive Classroom method, Handout PPTs, Charts and Videos.	exp and han stud wil Qui stud	d ndout dents ll iz/vis dents	the c I s . T c sit to	Ceach condu mal oractic	ts le to er ct	4	2		ASHRA nandboo Carrier Handboo Handout Charts, Videos	k, ok						
			SCHEME C	F ASSESSMENT																
S. No.	Method of Assessment		Description of Assessment								kimum arks		ources uired	External / Internal						
1	Laboratory Work	1. Selection criteria – Ow	ria - Owner, Initial cost, Operating cost, Maintenance cost, Occupant density,								Students will be asked to prepare a comparative report on (and/or) 1. Selection criteria – Owner, Initial cost, Operating cost, Maintenance cost, Occupant der Frequency of use, Aesthetics, Environmental impact, Cooling/heating capacity, Humi				•		10	Test Paper	r/Viva	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Overall Plant Efficiency (kW/TR), Sustainability, Performance, constructability,

2. Ductless split ACs, Package and Ductable units, VRFs/VRV, large DX systems with AHUs,

3. Survey of suitable HVAC system by obtaining data from different Manufacturer Websites/Broacher of equipments and parts, with the help of Charts/Tables/ISHRAE Guidelines etc.

Particulates controls etc.

Air cooled and water cooled condensing units.

RGPV (Diploma	Wing) Bhopal
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SCHEME FOR LEARNING OUTCOME

В	ranch Cod	e	Co	urse Co	de	CO Code	LO Code	_
R	0	1	6	1	1	4	12	Format No. 4

COURSE NAME	DESIGN OF HVAC SYSTEM EQUIPMENTS						
CO Description	D- 4 Select HVAC systems for given Application						
LO Description	LO- 12 Select appropriate Indoor and Outdoor Unit of VRF/SPLIT system						

SCHEME OF STUDY

S. No.	Learning Content	Teaching –	Description of T-L	Teach	Pract.	LRs	Remar
3. IVO.	Learning Content	Learning Method	Process	Hrs.	/Tut Hrs.	Required	k
1	Commercial – Hotels, Mall, Hospitals, Industrial	Interactive	Teacher will explain the	4	4	ASHRAE	
	etc. Window, Ductless split ACs, Package and	Classroom method,	contents and provide			handbook,	
	Ductable units, VRFs/VRV, large DX systems	Handout, PPTs,	handout to students.			Carrier	
	with AHUs, Air cooled and water cooled	Charts and Videos,	Teacher will conduct			Handbook	
	condensing units available range comparison	Models	Quiz/visit to make students			Handouts,	
	with VRF/Water Chiller/DX System		practice their knowledge			Charts,	
						Videos	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Laboratory Work	Students will be asked to prepare a comparative report on (and/or) 1. Commercial – Hotels, Mall, Hospitals, Industrial etc. 2. Window, Ductless split ACs, Package and Ductable units 3. VRFs/VRV, large DX systems with AHUs, Air cooled and water cooled condensing units available range comparison with VRF/Water Chiller/DX System	10	Test Paper/Viva	External

SCHEME FOR LEARNING OUTCOME

А	LO Code	CO Code	de	urse Co	Co	e	ranch Cod	В
Format No. 4	13	4	1	1	6	1	0	R

COURSE NAME	DESIGN OF HVAC SYSTEM EQUIPMENTS									
CO Description CO- 4 Select HVAC systems for given Application										
LO Description	LO-13 Select suitable Chilled water system for given application									

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
1	Water Cooled Chillers - Compressors, Types And	Interactive Classroom	Teacher will explain	10	0	ASHRAE	
	Capacities Range And Applications. Operating Range,	method, Handout,	the contents and			handbook,	
	Cooling Capacity, Controls, Components, Condensing	PPTs, Charts and	provide handout to			Carrier	
	Units, Installation Flexibility, Air and water cooled	Videos, Models	students. Teacher			Handbook	
	chillers – compressors, types and capacities range and		will conduct			Handouts,	
	applications, Selection criteria on the basis of -		Quiz/visit to make			Charts,	
	Technology, Merits & Demerits, Life Cycle Cost,		students practice			Videos	
	Architecture, Reliability, Sustainability.		their knowledge				

SCHEME OF ASSESSMENT

S.	Method of	Description of Assessment	Maximum	Resources	External
No.	Assessment	Description of Assessment	Marks	Required	/ Internal
1	Theory Exam	Students will be asked (and/or)	10	Test Paper	External
		1. Explain Types/ Capacities Range / Applications / Operating Range/ Cooling Capacity/			
		Controls/ Condensing Units of Water Cooled Chillers			
		2. Describe Installation Flexibility/ Air and water cooled chillers			
		3. Explain selection criteria on the basis of Technology/ Merits & Demerits/, Life Cycle Cost,			
		Architecture/ Reliability/ Sustainability.			

SCHEME FOR LEARNING OUTCOME

Ві	ranch Cod	e	Co	urse Co	de	CO Code	LO Code	A
R	0	1	6	1	1	5	14	Format No. 4

COURSE NAME	DESIGN OF HVAC SYSTEM EQUIPMENTS					
CO Description	O-5 Describe Economics of HVAC systems					
LO Description	LO-14 Select suitable size of HVAC system for given applications					

SCHEME OF STUDY

S.	Learning Content	Teaching –Learning	Description of T-L	Teach	Pract.	LRs	Remar
No.	Learning Content	Method	Process	Hrs.	/Tut Hrs.	Required	k
1	Peak cooling load, diversity assumptions. Over Sizing	Interactive Classroom	Teacher will explain	10	0	ASHRAE	
	and Load Dependencies, outdoor indoor condition	method, Handout,	the contents and			handbook,	
	dependencies, building component dependencies, duct	PPTs, Charts and	provide handout to			Carrier	
	work conditions dependencies. Minimum requirements	Videos, Models	students. Teacher will			Handbook	
	for ventilation rates in breathing zone.		conduct Quiz/visit to			Handouts,	
	Designer's/Practice engineer's judgments and thumb		make students practice			Charts,	
	rules for sizing of HVAC systems		their knowledge			Videos	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Theory Exam	Students will be asked (and/or)	10	Test Paper	External
		1. Explain Peak cooling load and diversity assumptions			
		 Explain Over Sizing / Load Dependencies/ Outdoor Indoor condition dependencies/ Building component dependencies/ Duct work conditions dependencies. 			
		3. Describe Minimum requirements for ventilation rates in breathing zone.			
		4. Explain Designer's/Practice engineer's judgments and thumb rules for sizing of HVAC systems and applications.			
		5. Describe selection criteria on the basis of – Technology/ Merits & Demerits/ Life Cycle Cost/ Architecture/ Reliability/ Sustainability.			

SCHEME FOR LEARNING OUTCOME

A	LO Code	CO Code	de	urse Co	Co	le	ranch Cod	В
Format No. 4	15	5	1	1	6	1	0	R

COURSE NA	ME DESIGN OF HVAC SYSTEM	EQUIPMENTS					
CO Descrip	cion CO 5 Describe Economic	es of HVAC systems					
LO Descript	ion LO- 15 Estimate Life Cycle	Cost of HVAC					

SCHEME OF STUDY

S.	Learning Content Teaching –Learning		Description of T-L	Teach	Pract.	LRs	Remar
No.	Learning Content	Method	Process	Hrs.	/Tut Hrs.	Required	k
1	Capital Cost: Installation Cost- Equipment cost,	Interactive Classroom	Teacher will explain the	2	6	ASHRAE	
	Air distribution network cost, control systems cost,	method, Handout,	contents and provide			handbook,	
	Cable/wiring Cost, safety system cost, Operating	PPTs, Charts and	handout to students.			Carrier	
	Cost, Maintenance Cost, System life cycle. payback	Videos, Models	Teacher will conduct			Handbook	
	period		Quiz/visit to make			Handouts,	
			students practice their			Charts,	
			knowledge			Videos	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Laboratory	Students will be ask to	10	Test	External
	Work	1. Explain Capital Cost of RAC plants		Paper/Viva	
		2. Describe Air distribution network cost/ Control systems cost/ Cable-wiring Cost/ Safety system cost			
		3. Explain Operating Cost of RAC plants			
		4. Explain Maintenance Cost of RAC plants			
		5. Describe system life cycle of RAC plants.			
		6. Describe payable period of RAC plants			