

RGPV (DIPLOMA WING) BHOPAL		OBE CURRICULUM FOR THE COURSE		FORMAT-3		Sheet No. 1/4	
Branch		REFRIGERATION AND AIR CONDITIONING ENGINEERING				Semester VI	
Course Code		611	Course Name		DESIGN OF HVAC SYSTEM EQUIPMENTS		
Course Outcome 1		Designing of Air Conditioning Ducts				Tea ch Hrs	Marks
Learning Outcome 1		Explain the requirement of air conditioning ducts				10	10
Contents		Objectives of duct design, Duct Design Criteria, , duct Classifications, Duct Components , Steps in Duct Design, Pressure in ducts- static pressure, velocity pressure, Total Pressure (Pt), Duct Velocity Ranges, Duct Material Roughness, Equivalent Duct Diameter for rectangular duct, Aspect ratio.					
Method of Assessment		Theory exam				External	
Learning Outcome 2		Use of Equal friction method for duct design.				10	10
Contents		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.					
Method of Assessment		Theory exam				External	
Learning Outcome 3		Design considerations for acoustics, system balancing and optimization in ducts				05	10
Contents		Need of system balancing, optimization of ducts, Optimization methods(T-method), Optimal duct sizes and fan size, system life-cycle optimization. Acoustic Construction Materials, Noise Penetrations, HVAC Equipment Location, Variable Speed Options, Duct Silencers, Duct-Borne Noise, Return Air Path, Velocity Noise, Ducts Shape, Terminal Units, Vibration Isolation, Volume Dampers					
Method of Assessment		Progressive Test I				Internal	

RGPV (DIPLOMA WING) BHOPAL		OBE CURRICULUM FOR THE COURSE		FORMAT-3		Sheet No. 2/4	
Branch		REFRIGERATION AND AIR CONDITIONING ENGINEERING				Semester VI	
Course Code		611		Course Name		DESIGN OF HVAC SYSTEM EQUIPMENTS	
Course Outcome 2		Design flow systems for RAC applications				Teach Hrs	Marks
Learning Outcome 4		Select suitable Pipes for Water of given conditions				10	10
Contents		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, 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	
Learning Outcome 5		Select a suitable Pumping system for given application				04	10
Contents		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					
Method of Assessment		Term Work				Internal	
Learning Outcome 6		Select suitable Pipes for Refrigerants of given RAC Systems				06	10
Contents		Refrigerant Pipe sizing : Criteria for sizing suction, liquid, hot gas line, pressure drop, oil return, schematic piping layout of systems, and best practices, pressure testing parameters, Accessories, Hands on exercises					
Method of Assessment		Laboratory Work				Internal	
Learning Outcome 7		Select fans for given application				06	10
Contents		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, Capacities, Range and Applications, Operating Range					
Method of Assessment		Laboratory Work				Internal	

RGPV (DIPLOMA WING) BHOPAL		OBE CURRICULUM FOR THE COURSE		FORMAT-3	Sheet No. 3/4
Branch	REFRIGERATION AND AIR CONDITIONING ENGINEERING			Semester	VI
Course Code	611	Course Name	DESIGN OF HVAC SYSTEM EQUIPMENTS		
Course Outcome 3	Design of Air terminals and Distribution of air			Teach Hrs	Marks
Learning Outcome 8	Design of free stream jets			05	10
Contents	Estimate throw, drop, spread and entrainment ratio of circular and rectangular, isothermal free stream jets				
Method of assessment	Progressive Test II			Internal	
Learning Outcome 9	Describe distribution units of air			10	10
Content	Air terminal unit types, design guidelines, selection guidelines. Dampers, filters. Pressure drop estimation. Variable Air Volume(VAV) systems, VAV boxes, VAV with parallel and series, fan powered terminal units, Induction VAVs. methods of Room air Distribution Systems- Mixing Air, Displacement, Unidirectional and Under-Floor.				
Method of Assessment	Theory exam			External	
Learning Outcome 10	Select of Air Handling, Fan Coil Unit for given application			10	10
Contents	Air Handling Unit (AHU), Components of AHU, Single, multi zone systems, terminal reheat systems, Dual duct Systems. Location of AHUs, AHU Tonnage Output equation. selection of AHU, Design guidelines for AHU. Types of Fan Coil Units (FCU), Components in FCU , selection of FCU, Design guidelines for FCU.				
Method of Assessment	Theory exam			External	
Course Outcome 4	Select HVAC systems for given Application				
Learning Outcome 11	Select suitable HVAC system for given comfort application			08	10
Contents	Selection criteria–Owner, Initial cost, Operating cost, Maintenance cost, Occupant density, Frequency of use, Aesthetics, Environmental impact, Cooling/heating capacity, Humidity, Overall Plant Efficiency (kW/TR), Sustainability, Performance, constructability, Particulates controls etc. Ductless split ACs, Package and Ductable units, VRFs/VRV, large DX systems with AHUs, Air cooled and water cooled condensing units. 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.				
Method of Assessment	Laboratory Work			External	

RGPV (DIPLOMA WING) BHOPAL		OBE CURRICULUM FOR THE COURSE		FORMAT-3		Sheet No. 4/4		
Branch		REFRIGERATION AND AIR CONDITIONING ENGINEERING			Semester		VI	
Course Code		611		Course Name		DESIGN OF HVAC SYSTEM EQUIPMENTS		
Learning Outcome 12		Select appropriate Indoor and Outdoor Unit of VRF/SPLIT system			08		10	
Contents		Commercial – Hotels, Mall, Hospitals, Industrial etc. Window, Ductless split ACs, Package and Ductable units, VRFs/VRV, large DX systems with AHUs, Air cooled and water cooled condensing units available range comparison with VRF/Water Chiller/DX System						
Method of Assessment		Laboratory Work			External			
Learning Outcome 13		Select suitable Chilled water system for given application			10		10	
Contents		Water Cooled Chillers – Compressors, Types And Capacities Range And Applications. Operating Range, Cooling Capacity, Controls, Components, Condensing Units, Installation Flexibility, Air and water cooled chillers – compressors, types and capacities range and applications, Selection criteria on the basis of – Technology, Merits & Demerits, Life Cycle Cost, Architecture, Reliability, Sustainability.						
Method of Assessment		Theory exam			External			
Course Outcome 5		Describe Economics of HVAC systems			Teach Hrs		Marks	
Learning Outcome 14		Select suitable size of HVAC system for given applications			10		10	
Contents		Peak cooling load, diversity assumptions. Over Sizing and Load Dependencies, outdoor indoor condition dependencies, building component dependencies, duct work conditions dependencies. Minimum requirements for ventilation rates in breathing zone. Designer's/Practice engineer's judgments and thumb rules for sizing of HVAC systems						
Method of Assessment		Theory exam			External			
Learning Outcome 15		Estimate Life Cycle Cost of HVAC			08		10	
Contents		Capital Cost : Installation Cost- Equipment cost, Air distribution network cost, control systems cost, Cable/wiring Cost, safety system cost, Operating Cost, Maintenance Cost, System life cycle. payback period						
Method of Assessment		Laboratory Work			External			

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code		Course Code		CO Code	LO Code	Format No. 4
					<i>R</i>	<i>0</i>	<i>1</i>	<i>6</i>	<i>1</i>	<i>1</i>	
COURSE NAME	DESIGN OF HVAC SYSTEM EQUIPMENTS										
CO Description	CO-1 Design of Air Conditioning Ducts										
LO Description	LO-1 Explain the requirement of air conditioning 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 Duct Design, Pressure in ducts- static pressure, velocity pressure, Total Pressure (Pt), Duct Velocity Ranges, Duct Material Roughness, Equivalent Duct Diameter for rectangular duct, Aspect ratio.	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	00	ASHRAE handbook, Carrier Handbook Handouts, Charts, Videos	NIL				
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) 1. Enlist objectives/ Important general rules/ Criteria to be considered/ procedure / Aspect ratio in duct designing. 2. Explain the term pressure in ducts/ duct velocity ranges/ Duct material roughness.			10	Test Paper	External				
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)											

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code		Course Code		CO Code	LO Code	Format No. 4
					<i>R</i>	<i>0</i>	<i>1</i>	<i>6</i>	<i>1</i>	<i>1</i>	
COURSE NAME	DESIGN OF HVAC SYSTEM EQUIPMENTS										
CO Description	CO-1 Design of Air Conditioning Ducts										
LO Description	LO-2 Use of Equal friction method for duct design.										
SCHEME OF STUDY											
S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark 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. No.	Method of Assessment	Description of Assessment			Maximum Marks	Resources Required	External / Internal				
1	Theory Exam	Students will be asked –(and/or) 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			10	Test Paper	External				
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)											

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code		Course Code		CO Code	LO Code	Format No. 4
					<i>R</i>	<i>0</i>	<i>1</i>	<i>6</i>	<i>1</i>	<i>1</i>	
COURSE NAME	DESIGN OF HVAC SYSTEM EQUIPMENTS										
CO Description	CO-1 Design of Air Conditioning Ducts										
LO Description	LO 3 Design considerations for acoustics, system balancing and optimization in 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	Need of system balancing, optimization of ducts, Optimization methods(T-method), Optimal duct sizes and fan size, system life-cycle optimization. Acoustic Construction Materials, Noise Penetrations, HVAC Equipment Location, Variable Speed Options, Duct Silencers, Duct-Borne Noise, Return Air Path, Velocity Noise, Ducts Shape, Terminal Units, Vibration Isolation, Volume Dampers	Interactive Classroom method, Handout, PPTs, Charts and Videos, Working Models of power utilization	Teacher will explain the contents and provide handouts to students. Teacher will conduct Quiz/visit to make students practice their knowledge	5	0	ASHRAE handbook, Carrier Handbook Handouts, Charts, Videos	NIL				
SCHEME OF ASSESSMENT											
S. No.	Method of Assessment	Description of Assessment			Maximum Marks	Resources Required	External / Internal				
1	Progressive test I	Students will be asked (and/or) 1. Describe need of system balancing/ Optimization of ducts/ Optimization methods(T-method)/ Optimal duct sizes and fan sizes/ Duct system life-cycle optimization 2. 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			10	Paper pen	Internal				
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)											

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code			Course Code			CO Code	LO Code	Format No. 4
					R	0	1	6	1	1	2	4	
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, Piping routing, pipe sizing – flow, velocity, pressure drop, 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	Interactive Classroom method, Handout, 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	10	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	Theory Exam	Students will be asked (and/or) 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	10	Test Paper	External								
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)													

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code			Course Code			CO Code	LO Code	Format No. 4
					R	0	1	6	1	1	2	5	
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	Interactive Classroom method, Handout, 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	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 2. Explain pump components and types of pumps 3. Explain the special requirements for Chilled brine and cooling water circulations 4. Describe head requirement, motor sizing, operation and Performance of water pumps	10	Paper pen	Internal								
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)													

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code			Course Code			CO Code	LO Code	Format No. 4
					R	0	1	6	1	1	2	6	
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 Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark						
1	Refrigerant Pipe sizing : Criteria for sizing suction, liquid, hot gas line, pressure drop, oil return, schematic piping layout of systems, and best practices, pressure testing parameters, Accessories, Hands on exercises	Interactive Classroom method, Handout 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	4	2	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	Laboratory Work	Students will be asked (and/or) 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					10	Pen Paper	Internal				
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)													

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code			Course Code			CO Code	LO Code	Format No. 4
					R	0	1	6	1	1	2	7	
COURSE NAME		DESIGN OF HVAC SYSTEM EQUIPMENTS											
CO Description		CO- 2 Design flow systems for RAC applications											
LO Description		LO-7 Select fans for given application											
SCHEME OF STUDY													
S. No.	Learning Content	T-L Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark						
1	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, Capacities, Range and Applications, Operating Range	Interactive Classroom method, Handout, PPTs, Charts and Videos. Internet search, market survey, manufacturer catalogue	Teacher will explain the contents and provide handout to students. Teacher will conduct Quiz/visit to make students practice their knowledge	2	4	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	Laboratory Work	Students will be ask to prepare market survey report on : (and/or) 1. Different Centrifugal Fan Pressure Classes 2. Types of fans used in various air conditioning practices, using manufacture's catalogue, Media publication data (Print/web etc) charts and tables 3. fan selection criteria, Comparison by - Types, Capacities, Range and Applications, Operating Range, electricity consumption etc.	10	Pen Paper Survey report	Internal								
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)													

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME				Branch Code			Course Code			CO Code	LO Code	Format No. 4
						R	0	1	6	1	1	3	8	
COURSE NAME		DESIGN OF HVAC SYSTEM EQUIPMENTS												
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				Teach Hrs.	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. No.	Method of Assessment	Description of Assessment							Maximum Marks	Resources Required	External / 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			
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)														

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code			Course Code			CO Code	LO Code	Format No. 4
					R	0	1	6	1	1	3	9	
COURSE NAME		DESIGN OF HVAC SYSTEM EQUIPMENTS											
CO Description		CO- 3 Design of Air terminals and Distribution of air											
LO Description		LO - 9 Describe distribution units of air											
SCHEME OF STUDY													
S. No.	Learning Content	T-L Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark						
1	Air terminal unit types, design guidelines, selection guidelines. Dampers, filters. Pressure drop estimation. Variable Air Volume(VAV) systems, VAV boxes, VAV with parallel and series, fan powered terminal units, Induction VAVs. methods of Room air Distribution Systems- Mixing Air, Displacement, Unidirectional and Under-Floor.	Interactive Classroom method, Handout PPTs, Charts and Videos, Models	Teacher will explain the contents and provide handout to students. Experimental determination of dryness fraction	10	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	Theory Exam	Students will be asked (and/or) <ol style="list-style-type: none"> 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) 					10	Test Paper	External				
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)													

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code			Course Code			CO Code	LO Code	Format No. 4
					R	0	1	6	1	1	3	10	
COURSE NAME		DESIGN OF HVAC SYSTEM EQUIPMENTS											
CO Description		CO- 3 Design of Air terminals and Distribution of air											
LO Description		LO-10 Select of Air Handling, Fan Coil Unit 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	Air Handling Unit (AHU), Components of AHU, Single, multi zone systems, terminal reheat systems, Dual duct Systems. Location of AHUs, AHU Tonnage Output equation. selection of AHU, Design guidelines for AHU. Types of Fan Coil Units (FCU), Components in FCU , Selection of FCU, Design guidelines for FCU.				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. No.	Method of Assessment	Description of Assessment							Maximum Marks	Resources Required	External / Internal		
1	Theory Exam	Students will be asked (and/or) <ol style="list-style-type: none"> 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 							10	Test Paper	External		
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)													

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code		Course Code		CO Code	LO Code	Format No. 4
					<i>R</i>	<i>0</i>	<i>1</i>	<i>6</i>	<i>1</i>	<i>1</i>	
COURSE NAME	DESIGN OF HVAC SYSTEM EQUIPMENTS										
CO Description	CO- 4 Select HVAC systems for given Application										
LO Description	LO- 11 Select suitable HVAC system for given comfort 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	Selection criteria–Owner, Initial cost, Operating cost, Maintenance cost, Occupant density, Frequency of use, Aesthetics, Environmental impact, Cooling/heating capacity, Humidity, Overall Plant Efficiency (kW/TR), Sustainability, Performance, constructability, Particulates controls etc. Ductless split ACs, Package and Ductable units, VRFs/VRV, large DX systems with AHUs, Air cooled and water cooled condensing units. 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.	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	4	4	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	Laboratory Work	Students will be asked to prepare a comparative report on (and/or) 1. Selection criteria – Owner, Initial cost, Operating cost, Maintenance cost, Occupant density, Frequency of use, Aesthetics, Environmental impact, Cooling/heating capacity, Humidity, Overall Plant Efficiency (kW/TR), Sustainability, Performance, constructability, Particulates controls etc. 2. Ductless split ACs, Package and Ductable units, VRFs/VRV, large DX systems with AHUs, Air cooled and water cooled condensing units. 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.				10	Test Paper/Viva	External			
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)											

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code			Course Code			CO Code	LO Code	Format No. 4
					<i>R</i>	<i>0</i>	<i>1</i>	<i>6</i>	<i>1</i>	<i>1</i>	<i>4</i>	<i>12</i>	
COURSE NAME	DESIGN OF HVAC SYSTEM EQUIPMENTS												
CO Description	CO- 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 – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remar k						
1	Commercial – Hotels, Mall, Hospitals, Industrial etc. Window, Ductless split ACs, Package and Ductable units, VRFs/VRV, large DX systems with AHUs, Air cooled and water cooled condensing units available range comparison with VRF/Water Chiller/DX System	Interactive Classroom method, Handout, PPTs, Charts and Videos, Models	Teacher will explain the contents and provide handout to students. Teacher will conduct Quiz/visit to make students practice their knowledge	4	4	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	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			
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)													

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code		Course Code		CO Code	LO Code	Format No. 4
					<i>R</i>	<i>0</i>	<i>1</i>	<i>6</i>	<i>1</i>	<i>1</i>	
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 Capacities Range And Applications. Operating Range, Cooling Capacity, Controls, Components, Condensing Units, Installation Flexibility, Air and water cooled chillers – compressors, types and capacities range and applications, Selection criteria on the basis of – Technology, Merits & Demerits, Life Cycle Cost, Architecture, Reliability, Sustainability.	Interactive Classroom method, Handout, PPTs, Charts and Videos, Models	Teacher will explain the contents and provide handout 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. No.	Method of Assessment	Description of Assessment			Maximum Marks	Resources Required	External / Internal				
1	Theory Exam	Students will be asked (and/or) 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.			10	Test Paper	External				
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)											

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code			Course Code			CO Code	LO Code	Format No. 4
					R	0	1	6	1	1	5	14	
COURSE NAME	DESIGN OF HVAC SYSTEM EQUIPMENTS												
CO Description	CO-5 Describe Economics of HVAC systems												
LO Description	LO-14 Select suitable size of HVAC system for given applications												
SCHEME OF STUDY													
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark						
1	Peak cooling load, diversity assumptions. Over Sizing and Load Dependencies, outdoor indoor condition dependencies, building component dependencies, duct work conditions dependencies. Minimum requirements for ventilation rates in breathing zone. Designer’s/Practice engineer’s judgments and thumb rules for sizing of HVAC systems	Interactive Classroom method, Handout, PPTs, Charts and Videos, Models	Teacher will explain the contents and provide handout 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. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal								
1	Theory Exam	Students will be asked (and/or) <ol style="list-style-type: none"> 1. Explain Peak cooling load and diversity assumptions 2. 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. 	10	Test Paper	External								
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)													

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code			Course Code			CO Code	LO Code	Format No. 4
					<i>R</i>	<i>0</i>	<i>1</i>	<i>6</i>	<i>1</i>	<i>1</i>	<i>5</i>	<i>15</i>	
COURSE NAME		DESIGN OF HVAC SYSTEM EQUIPMENTS											
CO Description		CO-- 5 Describe Economics of HVAC systems											
LO Description		LO- 15 Estimate Life Cycle Cost of HVAC											
SCHEME OF STUDY													
S. No.	Learning Content			Teaching –Learning Method		Description of T-L Process		Teach Hrs.	Pract. /Tut Hrs.	LRs Required		Remar k	
1	Capital Cost : Installation Cost- Equipment cost, Air distribution network cost, control systems cost, Cable/wiring Cost, safety system cost, Operating Cost, Maintenance Cost, System life cycle. payback period			Interactive Classroom method, Handout, PPTs, Charts and Videos, Models		Teacher will explain the contents and provide handout to students. Teacher will conduct Quiz/visit to make students practice their knowledge		2	6	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	Laboratory Work	Students will be ask to 1. Explain Capital Cost of RAC plants 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						10	Test Paper/Viva	External			
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)													