RGPV (DIPLOMA WING) BHOPAL	OCBC CURRICULUM FOR THE COURSE	FORMAT-3	Sheet No. 1/3

Branch	Mechanical Engineering	Semester	VI

Course Code		Course Name	Refrigeration and Air Conditioning

Course Outcome 1	Calculate COP, Refrigeration Effect, Work input for a given Air-refrigeration cycles.	Teach Hrs	Marks
Learning Outcome 11	Describe refrigeration , refrigeration methods	7	10
Contents	Meaning of Refrigeration, Applications of refrigeration, Methods of refrigeration: Ice Refrigeration, Evaporative Refrigeration, Refrigeration by Dry-ice, Refrigeration by Throttling of Gas (Vapour), Steam-Jet, Liquid Gas Refrigeration (Nitrogen, Air), Thermo- electric Refrigeration, Magnetic Refrigeration, Solar Refrigeration. Unit of refrigeration, Coefficient of performance, Rating of Refrigeration Machines, Comparison Of Heat Engine , Refrigerator And Heat Pump		
Method of assessment	Paper-Pen Test/Quiz (Part of Progressive Test-1--Internal)		
Learning Outcome 12	Calculate COP, Refrigeration effect, work input for a given air- refrigeration cycle for a given condition.	7	10
Contents	Cycles used for air-refrigeration systems- Reversed Carnot Cycle, Bell- Coleman Cycle: Processes, their representation on PV and TS diagram, Advantages and Limitations, Calculation of COP, Ref. Effect and work input of Refrigerator and Heat Pump.		
Method of assessment	Part of End Semester Theory Exam (External)		
Course Outcome 2	Explain vapour compression, vapour absorption refrigeration system.	Teach Hrs	Marks
Learning Outcome 21	Explain simple vapour compression Refrigeration system.	7	10
Contents	Simple Vapour Compression Refrigeration Cycle, Schematic arrangement of components and its representation on P-h & T-s diagram, Expression for refrigeration Effect, Work done and Co-efficient of Performance of Vapour Compression Refrigeration System (VCRS), Merit and Demerits of Vapour Compression Refrigeration System over Air Refrigeration System.		
Method of assessment	Paper pen / Observation Test (Part of lab work-Internal)		
Learning Outcome 22	Calculate performance parameters for a vapour compression refrigeration system in a given state.	7	10
Contents	Dry, Wet, Superheated Compression, Effect Of Sub Cooling and Super Heating on the VCRS, System Performance, Effect of suction and discharge Pressure on Performance of VCRS, Simple Problems for calculating COP, Ref Effect and Power required in VCRS with the Use Of Refrigeration Charts And Tables		
Method of assessment	Part of End Semester Theory Exam (External)		
Learning Outcome 23	Select a suitable method for improving the performance of a given vapour compression refrigeration system.	7	10
Contents	Improvement in Vapour Compression Refrigeration System - by Flash Chamber, Accumulator, Variation in Evaporator Temperature and Pressure, Variation in Condenser Temperature and Pressure. Actual Vapour Compression Refrigeration		

	Cycle and its variations from simple Vapour Compression Refrigeration Cycle.		
Method of assessment	Paper pen test/ quiz (Part of Theory- Internal as Term work)		
Learning Outcome 24	**Explain a Vapour Absorption Refrigeration System.**	**7**	**10**
Contents	Flow diagram and Operation of Ammonia-Water cycle, Components of Practical VARS (NH_3 – H_2O): Absorber, Generator, Analyzer, Rectifier, Condenser, Evaporator, Heat Exchangers, Pump. Flow diagram and operation of Domestic Electrolux Refrigerator. Comparison between Vapour Compression and Vapour Absorption Refrigeration system.		
Method of assessment	Part of End Semester Theory Exam (External)		
Course Outcome 3	**Explain construction and working of the basic components used in a refrigeration system.**		
Learning Outcome 31	**Explain construction and working of Compressor, Condenser, Evaporator.**	**7**	**10**
Contents	**Compressors**: Difference between Hermetically sealed compressor, semi-hermetically sealed compressor and open compressor. Working and constructional details of reciprocating compressor, screw compressor, centrifugal compressor. **Condensers**: Classification, constructional details and working of air cooled, water cooled and evaporative condenser. **Evaporators**: Classification, constructional details and working of natural and forced circulation type evaporators, Plate evaporators, flooded evaporators.		
Method of assessment	Part of End Semester Theory Exam (External)		
Learning Outcome 32	**Explain construction and working of a given controlling component of a refrigeration system.**	**7**	**10**
Contents	Working and constructional details of Capillary tube, Automatic Expansion Valve, Thermo static Expansion Valve, Float Valve, Solenoid Control Valve and Evaporator pressure regulator valve.		
Method of assessment	Part of End Semester Theory Exam (External)		
Course Outcome 4	**Maintain a given refrigeration system**		
Learning Outcome 41	**select a suitable refrigerant for a given application**	**7**	**10**
Contents	Functions, Classification of Refrigerants, Nomenclature of Refrigerants, Desirable Properties of Ideal Refrigerant, Selection of Refrigerant, Properties and Applications of Commonly Used Refrigerants in Vapor Compression Refrigeration system. Refrigerants and Environmental issues, Ozone Depletion Potential (ODP) and Global Warming (GW), Montreal and Kyoto protocols, Total Equivalent Warming Index (TEWI), future refrigerants: Alternative refrigerants to R11, R12, R22.		
Method of assessment	Paper pen / Observation Test (Part of lab work-Internal)		
Learning Outcome 42	**Select a suitable refrigeration system for a given application.**	**7**	**10**

Contents	Food Spoilage and Control, Preservation by refrigeration, Slow and quick freezing, Cold Storage and frozen Storage, Dairy refrigeration, Ice Manufacturing, Ice-cream manufacturing, Transport Refrigeration and Cold chain		
Method of assessment	Paper pen / Observation Test (Part of End Semester Practical Exam--External)		
Learning Outcome 43	**Practice maintenance, servicing and repairing procedures for a given refrigeration system.**	**7**	**10**
Contents	Tools used in Refrigeration, Tube Cutting, Tube Bending, Tube Flaring , Tube Swaging, Tube Brazing, Refrigeration System Installation Procedure, Common faults in Refrigeration System, Periodic Servicing of Refrigeration system. Refrigerant charging and Leakage Testing Methods.		
Method of assessment	Paper pen / Observation Test (Part of End Semester Practical Exam--External)		
Course Outcome 5	**Maintain a given air conditioning system.**		
Learning Outcome 51	**Calculate psychometric properties for a given state of air.**	**7**	**10**
Content	Define psychrometry, Dry air, Moist air, Saturated air, Dry Bulb Temperature, Wet Bulb Temperature, Dew Point Temperature, Wet Bulb Depression, Dew Point Depression, Partial Pressure of Water Vapour, Specific Humidity, Absolute humidity, Relative humidity, Degree of saturation, Enthalpy of moist Air. Calculation of Psychrometric Properties..		
Method of assessment	Paper-Pen Test/Quiz (Part of Progressive Test-2--internal)		
Learning Outcome 52	**Calculate capacities, efficiency of a given air conditioning system component.**	**7**	**10**
Contents	Basic Psychometric Processes, Sensible Cooling, Sensible Heating, Humidification, Dehumidification, Cooling and humidification, Cooling and de-humidification, Heating and humidification, Heating and de-humidification. Adiabatic Saturation, Sensible Heat Factor, By-pass Factor, Capacities and Efficiencies of the coils and equipments, Representation on Psychometric chart. (Simple Numerical Problems Using Psychrometric-chart)		
Method of assessment	Theory exam (External)		
Learning Outcome 53	**Explain construction and working of summer, winter and year round air conditioning systems.**	7	10
Contents	Schematic arrangement & working of Summer, Winter and Year round Air-conditioning system, Window and Split type Air-conditioner, Air-distribution and duct systems.		
Method of assessment	Theory exam (External)		
Learning Outcome 54	**Practice maintenance, servicing and repairing procedures for a given air conditioning system.**	**7**	**10**
Contents	Air-conditioning Installation Procedure, Faults in Air-conditioning System, Servicing of Air-conditioning, Brief idea about Cooling load estimation and factors affecting cooling load estimation. Various Applications of Air-conditioning i.e. Residential, offices, Hospitals, commercial buildings Malls etc.		
Method of assessment	Paper pen / Observation Test (Part of End Semester Practical Exam--External)		

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

COURSE NAME	**Refrigeration and Air Conditioning**
CO Description	**CO-1 Calculate COP, Refrigeration Effect, Work input for a given Air-refrigeration cycles.**
LO Description	LO-11 Describe refrigeration , refrigeration methods

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Meaning of Refrigeration, Applications of refrigeration, Methods of refrigeration: Ice Refrigeration, Evaporative Refrigeration, Refrigeration by Dry-ice, Refrigeration by Throttling of Gas (Vapour), Steam-Jet, Liquid Gas Refrigeration (Nitrogen, Air), Thermo- electric Refrigeration, Magnetic Refrigeration, Solar Refrigeration. Unit of refrigeration, Coefficient of performance, Rating of Refrigeration Machines, Comparison Of Heat Engine , Refrigerator And Heat Pump	Interactive lecture method and visuals through handouts, PPTs, Charts and Videos.	Teacher will explain the contents and provide handout to students. Teacher will conduct quiz/ tutorials /assignment to make students practice their learning.	7	-	Handouts, Charts, Videos	NIL

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Paper-Pen Test/Quiz (Part of Progressive Test-1)	Student will be asked to explain given terms associated with Refrigeration and its methods .	10	Test Paper	Internal

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Part of Progressive Test 1

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

COURSE NAME	**Refrigeration and Air Conditioning**
CO Description	CO-1 Calculate COP, Refrigeration Effect and Work input for Air-refrigeration cycle.
LO Description	LO-12 Calculate COP, Refrigeration effect, work input for a given air- refrigeration cycle for a given condition.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Cycles used for air-refrigeration systems- Reversed Carnot Cycle, Bell- Coleman Cycle: Processes, their representation on PV and TS diagram, Advantages and Limitations, Calculation of COP, Ref. Effect and work input of Refrigerator and Heat Pump.	Interactive lecture method and visuals through handouts, PPTs, Charts and Videos.	Teacher will explain the contents and provide handout to students. Teacher will conduct quiz/ tutorials /assignment to make students practice their learning.	7	-	Handouts, Charts, Videos,	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Theory Exam	Student will be asked to calculate COP, Refrigeration effect, work input for a given air- refrigeration cycle for a given condition.	10	Test paper + Rating Scale	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Part of end Semester theory Exam

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

COURSE NAME	**Refrigeration and Air Conditioning**
CO Description	CO-2: Explain vapour compression, vapour absorption refrigeration system.
LO Description	LO-21: Explain simple vapour compression Refrigeration 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	Simple Vapour Compression Refrigeration Cycle, Schematic arrangement of components and its representation on P-h & T-s diagram, Expression for refrigeration Effect, Work done and Co-efficient of Performance of Vapour Compression Refrigeration System (VCRS), Merit and Demerits of Vapour Compression Refrigeration System over Air Refrigeration System	Interactive lecture method and visuals through handouts, PPTs, Charts and Videos.	Teacher will explain the contents and provide handout to students. Teacher will conduct quiz/ tutorials /assignment to make students practice their learning.	1	**6**	Handouts, Charts, Videos,	NIL

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Paper pen / Observation Test (Practical Component)	Student will be asked to (a) explain working of a given vapour compression refrigeration system by drawing P-h,T-s diagrams. (b) draw schematic arrangement of a given vapour compression refrigeration system	10	Test paper/ Observation Schedule/ Check list/ Rating Scale	Internal

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

(Part of Lab work)

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

COURSE NAME	**Refrigeration and Air Conditioning**
CO Description	CO-2: Explain vapour compression, vapour absorption refrigeration system.
LO Description	LO-22:Calculate performance parameters for a vapour compression refrigeration system in a given state.

SCHEME OF STUDY

S.No	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
1	Dry, Wet, Superheated Compression, Effect Of Sub Cooling and Super Heating on the VCRS, System Performance, Effect of suction and discharge Pressure on Performance of VCRS, Simple Problems for calculating COP, Ref Effect and Power required in VCRS with the Use Of Refrigeration Charts And Tables	Interactive lecture method and visuals through handouts, PPTs, Charts and Videos.	Teacher will explain the contents and provide handout to students. Teacher will conduct quiz/ tutorials /assignment to make students practice their learning.	7	-	Handouts, Charts, Videos	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	**Theory Exam**	Student will be asked to calculate given performance parameters for a vapour compression refrigeration system in a given state.	10	Test paper + Rating Scale	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Part of end semester theory exam

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		M	*0*	*2*				*2*	*3*	

COURSE NAME	**Refrigeration and Air Conditioning**
CO Description	CO-2: Explain vapour compression, vapour absorption refrigeration system.
LO Description	LO-23 Select a suitable method for improving the performance of a given vapour compression refrigeration system.

SCHEME OF STUDY

S. No	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
	Improvement in Vapour Compression Refrigeration System - by Flash Chamber, Accumulator, Variation in Evaporator Temperature and Pressure, Variation in Condenser Temperature and Pressure. Actual Vapour Compression Refrigeration Cycle and its variations from simple Vapour Compression Refrigeration Cycle.	Interactive lecture method and visuals through handouts, PPTs, Charts and Videos.	Teacher will explain the contents and provide handout to students. Teacher will conduct quiz/ tutorials /assignment to make students practice their learning.	7	-	Handouts, Charts, Videos	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Paper pen test/ quiz	Student will be asked to select a suitable method for improving the performance of a given vapour compression refrigeration system.	10	Test Paper	Internal

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Part of Term work

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

COURSE NAME	**Refrigeration and Air Conditioning**
CO Description	CO-2: Explain vapour compression, vapour absorption refrigeration system.
LO Description	LO-24 Explain a Vapour Absorption Refrigeration System.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
1	Flow diagram and Operation of Ammonia-Water cycle, Components of Practical VARS (NH_3 – H_2O): Absorber, Generator, Analyzer, Rectifier, Condenser, Evaporator, Heat Exchangers, Pump. Flow diagram and operation of Domestic Electrolux Refrigerator. Comparison between Vapour Compression and Vapour Absorption Refrigeration system.	Interactive lecture method and visuals through handouts, PPTs, Charts and Videos.	Teacher will explain the contents and provide handout to students. Teacher will conduct quiz/ tutorials /assignment to make students practice their learning.	7	-	Handouts, Charts, Videos	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	**Theory Exam**	Student will be asked to explain working of a given vapour absorption refrigeration system.	10	Test paper + Rating Scale	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Part of end semester theory exam

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		M	*0*	*2*				*3*	*1*	

COURSE NAME	**Refrigeration and Air Conditioning**
CO Description	CO-3 Explain construction and working of the basic components used in a refrigeration system.
LO Description	LO-31 Explain construction and working of Compressor, Condenser, Evaporator.

SCHEME OF STUDY

S. No	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
	Compressors: Difference between Hermetically sealed compressor, semi- hermetically sealed compressor and open compressor. Working and constructional details of reciprocating compressor, screw compressor, centrifugal compressor. **Condensers**: Classification, constructional details and working of air cooled, water cooled and evaporative condenser. **Evaporators**: Classification, constructional details and working of natural and forced circulation type evaporators, Plate evaporators, flooded evaporators.	Interactive lecture method and visuals through handouts, PPTs, Charts and Videos.	Teacher will explain the contents and provide handout to students. Teacher will conduct quiz/ tutorials /assignment to make students practice their learning.	7	-	Handouts, Charts, Videos	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Theory Exam	Student will be asked to Explain the construction/working of given Compressor/Condenser/Evaporator.	10	Test paper + Rating Scale	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Part of End Semester Theory exam

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		M	*0*	*2*				*3*	*2*	

COURSE NAME	**Refrigeration and Air Conditioning**
CO Description	CO-3 Explain construction and working of the basic components used in a refrigeration system.
LO Description	LO-32 Explain construction and working of a given controlling component of a refrigeration system.

SCHEME OF STUDY

S. No.	Learning Content	T-L Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
	Working and constructional details of Capillary tube, Automatic Expansion Valve, Thermo static Expansion Valve, Float Valve, Solenoid Control Valve and Evaporator pressure regulator valve.	Interactive lecture method and visuals through handouts, PPTs, Charts and Videos.	Teacher will explain the contents and provide handout to students. Teacher will conduct quiz/ tutorials /assignment to make students practice their learning.	7	-	Handouts, Charts, Videos, Experimental setup for refrigerator /heat engine/Heat pump	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Theory exam	Student will be asked to explain the construction/working of given controlling component of a refrigeration system.	10	Test paper + Rating Scale	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Part of end Semester theory Exam

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

COURSE NAME	**Refrigeration and Air Conditioning**
CO Description	**CO-4 Maintain a given refrigeration system**
LO Description	LO-41 **select a suitable refrigerant for a 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
	Functions, Classification of Refrigerants, Nomenclature of Refrigerants, Desirable Properties of Ideal Refrigerant, Selection of Refrigerant, Properties and Applications of Commonly Used Refrigerants in Vapor Compression Refrigeration system. Refrigerants and Environmental issues, Ozone Depletion Potential (ODP) and Global Warming (GW), Montreal and Kyoto protocols, Total Equivalent Warming Index (TEWI), future refrigerants: Alternative refrigerants to R11, R12, R22.	Interactive lecture method and visuals through handouts, PPTs, Charts and Videos.	Teacher will explain the contents and provide handout to students. Teacher will conduct quiz/ tutorials /assignment to make students practice their learning.	3	4	Handouts, Charts, Videos, Experimental setup for dryness fraction	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Paper pen / Observation Test (Practical Component)	Student will be asked to select a suitable refrigerant for a given application.	10	Test paper/ Observation Schedule/ Check list/ Rating Scale	**Internal**

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

(Part of Lab work)

RGPV(Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		M	*0*	*2*				*4*	*2*	
COURSE NAME										
CO Description	**CO-4 Maintain a given refrigeration system**									
LO Description	**LO-42 Select a suitable refrigeration system for a 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
	Food Spoilage and Control, Preservation by refrigeration, Slow and quick freezing, Cold Storage and frozen Storage, Dairy refrigeration, Ice Manufacturing, Ice-cream manufacturing, Transport Refrigeration and Cold chain.	Interactive Classroom method, Handout PPTs, Charts and Videos, Models	Teacher will explain the contents and provide handout to students. Experimental determination of dryness fraction.	1	6	Handouts, Charts, Videos, Experimental setup for dryness fraction	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Paper pen / Observation Test (Practical Component)	Student will be asked to select a suitable refrigeration system for a given application.	10	Test paper/ Observation Schedule/ Check list/ Rating Scale	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

(Part of End Semester Practical Exam)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		M	*0*	*2*				*4*	*3*	

COURSE NAME	**Refrigeration and Air Conditioning**
CO Description	**CO-4 Maintain a given refrigeration system**
LO Description	LO-43 **Practice maintenance, servicing and repairing procedures for a given refrigeration system.**

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
	Tools used in Refrigeration, Tube Cutting, Tube Bending, Tube Flaring , Tube Swaging, Tube Brazing, Refrigeration System Installation Procedure, Common faults in Refrigeration System, Periodic Servicing of Refrigeration system. Refrigerant charging and Leakage Testing Methods.	Interactive Classroom method, Handout, PPTs, Charts and Videos. Models of boilers, mountings and accessories	Teacher will explain the contents and provide handout to students. Teacher will conduct Quiz/visit to make students practice their knowledge	1	6	Handouts, Charts, Videos,	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Paper pen / Observation Test (Practical Component)	Student will be asked to supervise maintenance/servicing /repairing of a given refrigeration system/component.	10	Test paper/ Observation Schedule/ Check list/ Rating Scale	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

(Part of End Semester Practical Exam)

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

COURSE NAME	**Refrigeration and Air Conditioning**
CO Description	**CO-5 Maintain a given air conditioning system.**
LO Description	LO-51 Calculate psychometric properties for a given state of air.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
1	Define psychrometry, Dry air, Moist air, Saturated air, Dry Bulb Temperature, Wet Bulb Temperature, Dew Point Temperature, Wet Bulb Depression, Dew Point Depression, Partial Pressure of Water Vapour, Specific Humidity, Absolute humidity, Relative humidity, Degree of saturation, Enthalpy of moist Air. Calculation of Psychrometric Properties.	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	7	-	Handouts, Charts, Videos, models	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Paper-Pen Test/Quiz (Part of Progressive Test-2)	Student will be asked to (a) define given psychometric properties (b) calculate given psychometric properties for a given state of air.	10	Test Paper	Internal

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Part of Progressive Test 2

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

COURSE NAME	**Refrigeration and Air Conditioning**
CO Description	**CO-5 Maintain a given air conditioning system**
LO Description	**LO-52 Calculate capacities, efficiency of a given air conditioning system component.**

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
1	Basic Psychometric Processes, Sensible Cooling, Sensible Heating, Humidification, Dehumidification, Cooling and humidification, Cooling and de-humidification, Heating and humidification, Heating and de-humidification. Adiabatic Saturation, Sensible Heat Factor, By-pass Factor, Capacities and Efficiencies of the coils and equipments, Representation on Psychometric chart. (Simple Numerical Problems using a Psychrometric-chart)	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	7	-	Handouts, Charts, Videos, models	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Theory exam	Student will be asked to (a) describe a given psychometric process (b) calculate capacity/efficiency of a given air conditioning system component using psychometric chart.	10	Test paper + Rating Scale	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Part of end semester theory exam

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		M	*0*	*2*				*5*	*3*	

COURSE NAME	**Refrigeration and Air Conditioning**
CO Description	**CO-5 Maintain a given air conditioning system**
LO Description	**LO-53 Explain construction and working of summer, winter and year round air conditioning systems.**

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
	Schematic arrangement & working of Summer, Winter and Year round Air-conditioning system, Window and Split type Air-conditioner, Air-distribution and duct systems.	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	5	2	Handouts, Charts, Videos, models	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Theory Exam	Student will be asked to explain construction and working of summer/winter/year round air conditioning systems.	10	Test Paper	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Part of end semester theory exam

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

COURSE NAME	**Refrigeration and Air Conditioning**
CO Description	**CO-5 Maintain a given air conditioning system**.
LO Description	LO-54 Practice maintenance, servicing and repairing procedures for a given air conditioning system.

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
	Air-conditioning Installation Procedure, Faults in Air-conditioning System, Servicing of Air-conditioning, Brief idea about Cooling load estimation and factors affecting cooling load estimation. Applications of Air-conditioning i.e. Residential, offices, Hospitals, commercial buildings Malls etc.	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	1	6	Handouts, Charts, Videos, models	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Paper pen / Observation Test (Practical Component)	Student will be asked to supervise maintenance/servicing /repairing of a given air conditioning system/component.	10	Test paper/ Observation Schedule/ Check list/ Rating Scale	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

(Part of End Semester Practical Exam)

CO	LO	Hours	Marks	Component	
				Th/ Pr	Int / Ext
CO 1	LO- 11	7 + 0	10	Th	Int (PT-1)
	LO- 12	7 + 0	10	Th	Ext
CO 2	LO - 21	1 + 6	10	Pr	Int
	LO - 22	7 + 0	10	Th	Ext
	LO - 23	7 + 0	10	Th	Int (TW)
	LO - 24	7 + 0	10	Th	Ext
CO 3	LO - 31	7 + 0	10	Th	Ext
	LO - 32	7 + 0	10	Th	Ext
CO 4	LO - 41	3 + 4	10	Pr	Int
	LO - 42	1 + 6	10	Pr	Ext
	LO - 43	1 + 6	10	Pr	Ext
CO 5	LO- 51	7 + 0	10	Th	Int (PT-2)
	LO - 52	7 + 0	10	Th	Ext
	LO - 53	5 + 2	10	Th	Ext
	LO - 54	1 + 6	10	Pr	Ext
TOTAL		75 + 31	150		

Suggested List of Experiments:

1. Study on at least one Vapour compression refrigeration system available in Laboratory, market or virtual system. Then drawing P-h , T-s diagrams and schematic arrangement.
2. Study on Vapour compression refrigeration system using, Ammonia, Freon, etc using as refrigerants and compare their performance regarding global warming and ozone layer depletion.
3. Study on refrigeration system used in Ice manufacturing plant, Ice-cream manufacturing plant, Cold storage plant, Dairy (milk chilling) plant regarding refrigeration process and equipments used.
4. Cutting, Bending, Flaring and swaging operation on copper tube used in Refrigeration and Air- Conditioning systems.
5. Brazing operation in tube used in Refrigeration and Air- Conditioning systems.
6. Study/Perform Evacuation, charging and leakage testing of refrigerant in Refrigeration and Air- Conditioning systems.
7. Study of installation, fault tracing and servicing procedure of Refrigeration and Air- Conditioning systems.
8. Study on Cooling load estimation of Residential buildings, Commercial buildings, Offices, Hospitals, Malls. etc. and list the factors affecting it.

Suggested books for studies:

1. Refrigeration and Air-Conditioning by Ramesh Chandra Arora. PHI Learning Private Limited New Delhi- 110001.
2. Refrigeration and Air-Conditioning by S. N. Sapali, PHI Learning Private Limited New Delhi- 110001.
3. Refrigeration and Air-Conditioning by C P Arora. Tata Mcgraw-Hill Publishing Company Limited, New Delhi.
4. A course in Refrigeration and Air-Conditioning by Domkundwar Arora. Dhanpat Rai & Co.
5. Refrigeration and Air-Conditioning by R.S. Khurmi , J.K. Gupta. Eurasia Publishing House (P) Ltd, New Delhi- 110055.