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

Branch	Refrigeration and Air-conditioning	Semester	V

Course Code	501	Course Name	Advanced refrigeration

Course Outcome 1	Describe Advanced Vapour Compression Refrigeration Cycle.	Teaching Hrs	Marks
Learning Outcome 1	State function of components of advance vapour compression refrigeration system..	10	10
Contents	Function of compressor, condenser, expansion valve, flash chamber, evaporators chambers, balancing valve, inter cooler dual compressor and their symbolic representation.		
Method of Assessment	Paper-Pen Test (Part of Pg.1)		
Learning Outcome 2	Explain fundamental concepts of actual vapour compression refrigeration cycle.	10	15
Contents	Introduction of actual vapour compression refrigeration cycle, deviation from simple vapour refrigeration cycle, use of suction heat exchanger, vapour compression refrigeration system with multiple evaporator.		
Method of Assessment	Laboratory work		
Learning Outcome 3	Analyze different types of compounding and multiple evaporator and compression system.	8	10
Contents	Types of compound vapour compression with intercooler, Types of multiple evaporator and compression system, flash gas removal, flash inter cooling, choice of intermediate pressure, complete multi stage compression system.		
Method of Assessment	Assignment/ Paper-Pen Test		
Course Outcome 2	Describe the working of condensers and evaporators.	Teaching Hrs	Marks
Learning Outcome 4	Select the relevant condenser for given refrigeration system with justification. .	9	10
Contents	Purpose of condensers, classifications, working of air cooled and water cooled condensers, evaporative condenser, comparison and applications. Cooling towers and their types and applications, natural and forced draft cooling towers.		
Method of Assessment	Theory Exam		
Learning Outcome 5	Select the relevant evaporators for given refrigeration system with justification.	9	10
Contents	Purpose of evaporator, classification and working of finned type, bared tube, plate type, flooded, shell and tube type evaporators and their applications. Chillers- direct expansion and flooded type chillers, working and applications		

Method of Assessment	Theory Exam		
Learning outcomes 6	Explain the various Frosting and De-Frosting methods Refrigeration systems.	7	10
Contents	Definition of Frosting, importance of defrosting evaporators, methods of defrosting, Frosting, non-frosting and Defrosting evaporators. Temperature Defrost methods, time shut down and supplementary heat defrost methods.		
Method of Assessment	Laboratory test by observation		
Course Outcome 3	Describe the working of various types of expansion valve.	Teaching Hrs	Marks
Learning Outcome 7	Select the relevant Expansion device for given refrigeration system with justification.	9	10
Contents	Purpose of expansion devices, classifications, capillary tube, automatic expansion valve, thermostatic expansion valve, selection ,working and application.		
Method of Assessment	Theory Exam		
Learning Outcome 8	Explain the working of specified auxiliary devices used in refrigeration system.	8	10
Contents	Drier, Solenoid valve, Thermostatic switch, Low side float valve, high side float valve Defrosting devices, working and applications.		
Method of Assessment	Laboratory test by observation		
Course Outcome 4	Describe the working of various types of refrigerant compressor and non mechanical refrigeration system.	Teaching hrs	Marks
Learning Outcome 9	Select the relevant Compressors for given refrigeration system with justification.	8	10
Contents	Purpose of compressor, classification, construction and working of hermetically sealed compressor, open type compressor, reciprocating, rotary and centrifugal compressor, screw and scroll compressor and their applications.		
Method of Assessment	Theory exam		
Learning Outcome 10	Explain wet compression and its impact on Performance of System.	8	10
Contents	Wet compression, compressor speed, mechanical efficiency and other efficiencies, effect of suction, super heat on compressor performance. Advantages and disadvantages of centrifugal compressor over reciprocating compressor. Selection of compressor.		
Method of	Paper pen test (part of Pg.2)		

Assessment			
Learning Outcome 11	Explain the working non mechanical refrigeration system.	8	10
Contents	Steam jet refrigeration, thermoelectric refrigeration, vortex tube refrigeration.		
Method of Assessment	Theory Exam		
Course Outcome 5	Describe food spoilage and their preservation by refrigeration.	Teaching Hrs	Marks
Learning Outcome 12	Explain food spoilage and their preservation.	9	10
Contents	Food preservation, deterioration and spoilage- Enzymes, Micro-organism. Bacteria-yeast and moulds control of spoilage agent. Preservation by refrigeration, refrigeration system, RH and air velocity in chill room. Combined chilling and storage, freezing and frozen storage. Slow or sharp freezing, Quick freezing, packaging of frozen materials for storage. Slow or sharp freezing, Quick freezing, packaging of frozen materials for storage.		
Method of Assessment	Theory exam		
Learning Outcome 13	Explain components of domestic and commercial refrigerators for food preservation and their working	2+7	15
Contents	Domestic and commercial refrigerators-reach in refrigerator, walk-in-coolers, display cases, refrigerator vending machines and Bar refrigerators.		
Method of Assessment	Laboratory test by observation		
Learning Outcome 14	Explain the working of ice plant, cold storage and cold chain	8	10
Contents	Working of ice plant, preservation of fruits and vegetables, storage condition and properties and perishable products, medicine, other products. Their storage conditions. Application of transportation of refrigerated product by refrigerated Railways, Cars, Trucks, Trailers. (Cold Chain)		
Method of Assessment	Theory Exam		

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

COURSE NAME	**ADVANCED REFRIGERATION**
CO Description	CO-1 Describe Advanced Vapour Compression Refrigeration Cycle.
LO Description	LO-1 State function of components of advance 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	Function of compressor, condenser, expansion valve, flash chamber, evaporators chambers, balancing valve, inter cooler dual compressor and their symbolic representation.	Interactive Classroom method, Handout, PPTs, Charts and Videos.	Teacher will explain the contents should be taught and with the aim to develop different types of skills so that students are able to acquire competency.	10		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 (Part of Pg.1)	Student will be asked to define various terms associated with Vapour compression refrigeration system.	10	Test Paper	Internal

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Part of Progressive 1

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

COURSE NAME	**ADVANCED REFRIGERATION**
CO Description	CO-1 Describe Advanced Vapour Compression Refrigeration Cycle.
LO Description	LO-2 Explain fundamental concepts of actual vapour compression refrigeration cycle.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Introduction of actual vapour compression refrigeration cycle, deviation from simple vapour refrigeration cycle, use of suction heat exchanger, vapour compression refrigeration system with multiple evaporator.	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		Handouts, Charts, Videos,	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Laboratory work	Student will be asked to explain the concepts of actual vapour compression refrigeration cycle.	15	Paper Pen	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	5	0	1	1	3	

COURSE NAME	**ADVANCED REFRIGERATION**
CO Description	CO-1 Describe Advanced Vapour Compression Refrigeration Cycle.
LO Description	LO-3: Analyze different types of compounding and multiple evaporator and compression 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	Types of compound vapour compression with intercooler, Types of multiple evaporator and compression system, flash gas removal, flash inter cooling, choice of intermediate pressure, complete multi stage compression system.	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.	8		Handouts, Charts, Videos,	NIL

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Assignment/ Paper-Pen Test	Student will be asked to different types of compounding and multiple evaporator and compression system	10	Test 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	5	0	1	2	4	

COURSE NAME	**ADVANCED REFRIGERATION**
CO Description	CO-2 Describe the working of condensers and evaporators.
LO Description	LO-4 Select the relevant condenser for given refrigeration system with justification.

SCHEME OF STUDY

S.No	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
1	Purpose of condensers, classifications, working of air cooled and water cooled condensers, evaporative condenser, comparison and applications. Cooling towers and their types and applications, natural and forced draft cooling towers.	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.	9		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 concept of condenser, woking and application of condenser.	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	5	0	1	2	5	

COURSE NAME	**ADVANCED REFRIGERATION**
CO Description	**CO2**- Describe the working of condensers and evaporators.
LO Description	LO-5 Select the relevant evaporators for given refrigeration system with justification.

SCHEME OF STUDY

S. No	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
	Purpose of evaporator, classification and working of finned type, bared tube, plate type, flooded, shell and tube type evaporators and their applications. Chillers- direct expansion and flooded type chillers, working and applications.	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	9		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 explain classification and working of evaporator.	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	5	0	1	2	6	

COURSE NAME	**ADVANCED REFRIGERATION**
CO Description	**CO2**- Describe the working of condensers and evaporators.
LO Description	LO-6 Explain the various Frosting and De-Frosting methods Refrigeration systems

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
1	Definition of Frosting, importance of defrosting evaporators, methods of defrosting, Frosting, non-frosting and Defrosting evaporators. Temperature Defrost methods, time shut down and supplementary heat defrost methods.	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	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Laboratory test by observation	Student will be asked to Frosting and De-frosting method for various Refrigeration systems	10	Test 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	5	0	1	3	7	

COURSE NAME	**ADVANCED REFRIGERATION**
CO Description	CO-3 Describe the working of various types of expansion valve.
LO Description	LO-7 Select the relevant Expansion device for given refrigeration system with justification.

SCHEME OF STUDY

S. No	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
	Purpose of expansion devices, classifications, capillary tube, automatic expansion valve, thermostatic expansion valve, selection ,working and application.	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	9		Handouts, Charts, Videos	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Theory Exam	Student will be asked to explain different types of expansion device.	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	5	0	1	3	8	

COURSE NAME	**Advanced refrigeration**
CO Description	CO-3 Describe the working of various types of expansion valve.
LO Description	LO-8 Explain the working of specified auxiliary devices used in 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
	Drier, Solenoid valve, Thermostatic switch, Low side float valve, high side float valve Defrosting devices, working and applications.	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	8		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
	Laboratory test by observation	Student will be asked to uses and working of defrosting devices, defrosting method	10	Test 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	5	0	1	4	9	

COURSE NAME	**ADVANCED REFRIGERATION**
CO Description	**CO-4** Describe the working of various types of refrigerant compressor and non mechanical refrigeration system.
LO Description	LO-9 Select the relevant Compressors for given refrigeration system with justification.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
	Purpose of compressor, classification, construction and working of hermetically sealed compressor, open type compressor, reciprocating, rotary and centrifugal compressor, screw and scroll compressor and their applications.	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.	8		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
	Theory exam	Student will be asked to construction and working of compressor.	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.
		R	0	1	5	0	1	4	10	4

COURSE NAME	**ADVANCED REFRIGERATION**
CO Description	**CO-4** Describe the working of various types of refrigerant compressors and non mechanical refrigeration system.
LO Description	LO-10 Explain wet compression and its impact on Performance of System

SCHEME OF STUDY

S. No.	Learning Content	T-L Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
	Wet compression, compressor speed, mechanical efficiency and other efficiencies, effect of suction, super heat on compressor performance. Advantages and disadvantages of centrifugal compressor over reciprocating compressor. Selection of compressor.	Interactive Classroom method, Handout PPTs, Charts and Videos, Models	Teacher will explain the contents and provide handout to students. Experimental determination of dryness fraction.	8		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
	Paper pen test (part of Pg.2)	Student will be asked about wet compression, advantages and disadvantages of centrifugal compressor over reciprocating compressor.	10	Test 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	5	0	1	4	11	

COURSE NAME	**ADVANCED REFRIGERATION**
CO Description	**CO-4** Describe the working of various types of refrigerant compressor and non mechanical refrigeration system.
LO Description	LO-11 Explain the working non mechanical 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
	Steam jet refrigeration, thermoelectric refrigeration, vortex tube refrigeration.	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	8		Handouts, Charts, Videos,	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Theory exam	Student will be asked to working of Steam jet refrigeration, thermoelectric refrigeration, vortex tube refrigeration	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	5	0	1	5	12	

COURSE NAME	**ADVANCED REFRIGERATION**
CO Description	**CO-5** Describe food spoilage and their preservation by refrigeration.
LO Description	LO-12 Explain food spoilage and their preservation.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
1	Food preservation, deterioration and spoilage- Enzymes, Micro-organism. Bacteria-yeast and moulds control of spoilage agent. Preservation by refrigeration, refrigeration system, RH and air velocity in chill room. Combined chilling and storage, freezing and frozen storage. Slow or sharp freezing, Quick freezing, packaging of frozen materials for storage. Slow or sharp freezing, Quick freezing, packaging of frozen materials for storage.	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	9		Handouts, Charts, Videos, models	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Theory Exam	Student will be asked to explain food spoilage and its preservation by refrigeration. Various types of Food preservation methods	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	5	0	1	5	13	

COURSE NAME	**FUNDAMENTALS OF THERMODYNAMICS**
CO Description	**CO-5** Describe food spoilage and their preservation by refrigeration.
LO Description	LO-13 Explain components of domestic and commercial refrigerators for food preservation and their working

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
1	Domestic and commercial refrigerators-reach in refrigerator, walk-in-coolers, display cases, refrigerator vending machines and Bar refrigerators.	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	2	7	Handouts, Charts, Videos, models	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Laboratory test by observation	Student will be asked to Domestic and commercial refrigerators-reach in refrigerator, walk-in-coolers, display cases, refrigerator vending machines and Bar refrigerators.	15	Paper pen	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

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RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		R	0	1	5	0	1	5	14	

COURSE NAME	**ADVANCED REFRIGERATION**
CO Description	**CO-5** Describe food spoilage and their preservation by refrigeration.
LO Description	LO-14 Explain the working of ice plant, cold storage and cold chain

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
	Working of ice plant, preservation of fruits and vegetables, storage condition and properties and perishable products, medicine, other products. Their storage conditions. Application of transportation of refrigerated product by refrigerated Railways, Cars, Trucks, Trailers. (Cold Chain)	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	8		Handouts, Charts, Videos, models	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Theory Exam	Student will be asked working of ice plant, cold storage and cold chain	10	Test Paper	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)