SHORT TERM VOCATIONAL
CERTIFICATE COURSE

REFRIGERATION and AIR CONDITIONING TECHNICIAN
(06 MONTHS)

PREPARED BY

Dr. E. Madhusudhan Raju
Associate Professor of Mech. Engg.,
Osmania University, Hyderabad
&

Dr. D. Raji Reddy
Junior Lecturer in Mech. Engg.,
GOVT. JUNIOR COLLEGE, GAJWEL

Course Coordinator:

Dr. R. JYOSTNA RANI
Principal & Lecturer SIVE
O/o Director of Intermediate Education Hyderabad

STATE INSTITUTE OF VOCATIONAL EDUCATION
Director of Intermediate Education Hyderabad
HYDERABAD, TELANGANA

COURSE NAME:

REFRIGERATION and AIR CONDITIONING TECHNICIAN

SECTOR: ENGINEERING

COURSE CODE: RACT

ENTRY QUALIFICATION: 10th passed

PRE-REQUISITES: The student should have the basic knowledge of Refrigeration and Air Conditioning and various types of refrigerators and Air conditioners available in the market.

Terminal Competence: After completion of this course the students will be able to understand the various problems and able to resolve by inspection, testing and repairing.

Duration: 6 Months- (40 Hours: English + Course Content: 200 Hours)

Introduction:

The Refrigeration & Air Conditioning Technician, short term certificate course provides comprehensive training in the installation, maintenance, and repair of HVAC systems. The course covers essential technical skills, safety protocols, and industry standards, preparing students for immediate employment in the refrigeration and air conditioning industry. Through hands-on practice and theoretical learning, students gain the expertise needed to excel in this field.

Objectives:

- To equip students with the essential knowledge to install, maintain, and repair refrigeration and air conditioning systems
- To prepare students for immediate employment in the HVAC (Heating, Ventilation, and Air Conditioning) industry
- To educate students on safety protocols and environmentally responsible practices, including the handling of refrigerants
- To ensure compliance with regulations and promote sustainable practices in refrigeration and air conditioning

Skills:

- Proficiency in installing, servicing, and repairing refrigeration and air conditioning systems, including residential and commercial units.
- Skills in performing routine maintenance, such as cleaning coils, replacing filters, and checking refrigerant levels.
- Ability to diagnose and troubleshoot common issues in refrigeration and air conditioning systems, such as leaks, electrical problems, and performance inefficiencies.
- Understanding of HVAC codes, standards, and best practices to ensure safe and efficient system operation.

ON THE JOB TRAINING AND PRACTICAL:

- Work with local refrigeration repairing centres
- Work with local Air Conditioning repairing centres
- Visit the Refrigerator manufacturing units
- Visit the Air Conditioning manufacturing units.

COURSE SYLLABUS

THEORY

Unit No.	Unit Name
1	Basics of Refrigeration
2	Testing of Refrigerator Components
3	Servicing and Maintenance of Refrigerator
4	Basics of Air Conditioning
5	Testing of Air Conditioning Components
6	Servicing and Maintenance of Air Conditioner

PRACTICAL/OJT

Unit No.	Unit Name
1	Study Experiments
2	Dismantling and reassembling
3	Testing of equipment
4	Leakage detection
5	Problem detection and rectification
6	Servicing and Maintenance

SCHEME OF INSTRUCTIONS /MODULE:

1. Communicative English: 40 Hours
2. Course Content : 200 Hours

Duration of course	Theory		Practical/OJT		Total	
	Hours	weightage	Hours	weightage	Hours	Weightage
Module-1 (06 Months)	60	30%	140	70%	200	100%

COURSE CONTENTS

S.No.	Units (Theory)	Periods (60Hours)	Practical Lab/ OJT	Periods (140 Hours)
1	**Unit-1** **Basics of Refrigeration** 1.1Introduction 1.2Definition of Refrigeration 1.3Definition of Refrigerator 1.4Definition of Refrigerant 1.5Different Components of Refrigerator with Diagram 1.5.1 Compressor 1.5.2 Condenser 1.5.3 Evaporator 1.5.4 Expansion Valve. 1.6 Refrigerants 1.6.1 Types of Refrigerants	10	**Unit-1** **Basics of Refrigeration** 1.Study of a refrigerator and its parts 2. Study of different types of compressors and its parts 3. Study of different condensers and its parts 4. Study of different types of Evaporators and its parts 5. Study of different Expansion valves and its parts	20
	Unit-2 **Testing of Components** 2.1 Refrigeration tools 2.2 Testing of components 2.2.1 Compressor 2.2.2 Condenser 2.2.3 Evaporator 2.2.4 Expansion valve		**Unit-2** **Testing of Components** 6.Dismantiling and re-assembling of Refrigerator 7.Dismantling and Testing of	

2	2.3 Charging of Refrigerants 2.4 Leak Detection methods and prevention 2.4.1 Visual Inspection 2.4.2 Bubble water or Soap water Detection 2.4.3 Nitrogen water detection 2.4.4 Fluorescent leak detection 2.4.5. Gas pressure leak detection 2.4.6 Halogen lamp detection 2.4.6 Electronic leak detector.	10	Compressor and reassemble it 8. Dismantling and testing of condenser and reassemble it 9.Dismantling and testing of Evaporator and reassemble it 10. Dismantling and testing of Expansion valve and reassemble it 11. leakage testing 12. Brazing of a leakage refrigerant tube	20
3	**Unit-3** **<u>Servicing and Maintenance</u>** 3.1 General Problems and their Remedies 3.2 Dismantling and Re-assembling of parts. 3.3 Maintenance of Refrigerator 3.3.1 Daily Maintenance 3.3.2 Weekly Maintenance 3.3.3 Quarterly Maintenance 3.3.4.Yealry Maintenance 3.4 Applications of Refrigeration 3.4.1 Food processing and preservation 3.4.2 Chemical processing industries like textile, printing, photographic materials 3.4.3 Cooling of concrete for heavy structures 3.4.4 Blast furnace air treatment	10	13. Servicing of refrigerator 14. Identify and rectify the problem of low refrigerating effect in a refrigerator. 15. Identify and rectify the problem of Refrigerator does not run 16. Identify and rectify the problem of a Refrigerator makes noise. 17. Identify and rectify the problem of refrigerating unit gives humming and stops. 18. Identify and rectify the problem of a refrigerator runs	30

			very fast. 19. Identify and rectify the problem in a refrigerator ice formation is slow. 20.Identify and rectify the problem in refrigerator moisture formation on exterior. 21.Identify and rectify the problem in a refrigerator moisture collection inside 22. Identify and rectify the problem that refrigerator gives mild shocks.	
4	**Unit-4** **<u>Basics of Air Conditioning</u>** 4.1Introduction 4.2 Definition of Air conditioning 4.3 Components of Air Conditioning with Diagram 4.3.1 Compressor- its types 4.3.2 Condenser-its types 4.3.3 Evaporator-its types 4.3.4 Expansion Valve-its types. 4.4 Types of Air Conditioning 4.4.1 Portable type 4.4.2 Split type 4.4.3 Window type 4.4.4 Central Air Conditioner 4.4.5 Flour mounted type 4.4.6 Smart type 4.4.7 Geothermal type 4.4.7 Hybrid/Dual fuel type. 4.5 Applications if Air	10	23. Study of an Air Conditioner and its parts 24. Study of different types of compressors and its parts 25. Study of different condensers and its parts 26. Study of different types of Evaporators and its parts 27. Study of different Expansion valves and its parts 28. Dismantling and reassembling of a portable air conditioner 29. Dismantling and reassembling of split air conditioner	30

	Conditioning 4.5.1 Comfort cooling in residential, Commercial, Industrial buildings. 4.5.2 Process cooling in Industries 4.5.3 Server room cooling in computers 4.5.4Refrigeration in food storage, transportation, and preservation of perishable items. 4.5.5 In Automobiles like cars, buses, airplanes. 4.5.6Climate control in health care facilities...etc		30. Dismantling and reassembling of a window air conditioner 31. Dismantling and reassembling of a flour mounted air conditioner 32. Dismantling and reassembling of Smart type air conditioner 33. Dismantling and reassembling of Hybrid/Dual fuel type air conditioner	
5	**Unit-5** **<u>Testing of Components</u>** 5.1 Air Conditioning testing tools 5.2 Testing of Components 5.2.1 Compressor 5.2.2 Condenser 5.2.3 Evaporator 5.2.4 Expansion valve 5.3 Charging of Refrigerants 5.4 Leak detection and prevention methods 5.4.1 Soap bubbles method 5.4.2 Ultraviolet (UV)dye 5.4.3 Electronic leak detectors.	08	34.Dismantiling and re-assembling of Air Conditioner 35.Dismantling and Testing of Compressor and reassemble it 36. Dismantling and testing of condenser and reassemble it 37.Dismantling and testing of Evaporator and reassemble it 38. Dismantling and testing of Expansion valve and reassemble it 39.Practice of Bending a Refrigerant flow tube.	20
	Unit-6 **<u>Servicing and Maintenance</u>** 6.1General Problems and their		40. Identify and rectify the problem of compressor and	

6	remedies 6.2 Dismantling and Re-assembling of parts 6.3Maintenance 6.3.1Daily Maintenance 6.3.2Weekly Maintenance 6.3.3Quarterly Maintenance 6.3.4Yearly Maintenance	12	condenser fan motor will not run. 41.Identify and rectify the problem of No air flow, compressor runs 42.Identify and rectify the problem of compressor will not start, but condenser fan runs. 43. Identify and rectify the problem of system short of capacity. 44. Identify and rectify the problem of compressor is noisy. 45. Identify and rectify the problem of compressor losses oil.	20

List of Tools and Equipment:

1. Screw driver
2. 2. Line tester
3. 3. File
4. 4. Hammer
5. 5. Drilling machine
6. 6. Pliers
7. Crimping/Printing tool
8. 8.Solder Iron
9. 9.Ampere meter
10. 10.Voltmeter 0-600 Volts
11. Megger
12. Multi meter
13. Dry bulb & wet bulb thermometer

14.14.Tube cutter
15.Hack Saw
16.Pipe wrench
17.Torque wrench
18.Screw wrench
19.Vice-Bench
20.Snip
21.DE Spanner Set
22.22.Swaging tool
23.Oxygen cylinder
24.24.Acetyline cylinder
25.Brazing Set
26.Blow torch
27.Compressor
28.E& C Unit
29.Recovery machine
30.Gas mini fold

QUALIFICATION OF TEACHING FACULTY:

1. Graduate from any recognized university with an aggregate of 55% marks in Mechanical Engineering
2. Diploma/Polytechnic (DME) In Mechanical Engineering with 2 years of experience
3. 4+ year of experience in ITI RAC course

REFERENCE BOOKS/INTERNET:

1. Internet
2. ITI RAC Text book
3. Intermediate Vocational Mechanical Engineering 2nd year text Book.

DIVISION OF MARKS:

Theory: 100 Max Marks

1. Communicative English: 20 Marks
2. Short Questions: 6 X 5M = 30 Marks
3. Long Questions: 4 X 10 = 40 Marks

4. Multiple Choice Questions: 10 Marks

Practical: 100 Max Marks

1. **External: 40 Marks**
2. **Record/Mini Project & Viva: 10 Marks**
3. **Internship/ OJT: 50 Marks**

STATE INSTITUTE OF VOCATIONAL EDUCATION
O/o DIRECTOR OF INTERMEDIATE EDUCATION
TELANGANA, HYDERABAD
SHORT TERM VOCATIONAL CERTIFICATE COURSE

REGD.NO:

TIME: 3 HOURS **MAX.MARKS: 100**

REFRIGERATION AND AIR CONDITIONING
MODEL QUESTION PAPER (THEORY)
SECTION-A

COMMUNICATIVE ENGLICH **20 MARKS**

SECTION-B

Note: a) Answer ALL questions
b) Each question carries 5 Marks **6 X 5M = 30 MARKS**

1. Explain about the expansion valve.
2. Write about electric leak detection test.
3. Write the various applications of refrigeration.
4. What is Compressor? Write types of compressors.
5. Write about the types of refrigerants.
6. Name the types of servicing and maintenance methods.

SECTION-C

Note: a) Answer any Four questions
b) Each question carries 10 Marks **4 X 10M = 40 MARKS**

1. Explain the components of refrigerator with a neat sketch.
2. Explain briefly about any five important refrigeration tools.
3. Write about the weekly maintenance of refrigerator.
4. Explain about the Server room cooling of Computer with Air Conditioning.
5. Explain the working of rotary Compressor used in refrigeration with a neat sketch.
6. Explain briefly the need of Servicing and Maintenance of Air Conditioner.

SECTION-D **10 X1 M = 10MARKS**

1. What is Refrigeration?
   a) Process of removing heat b) Process of adding heat c) Used to increase level of humidity d) None of the above.
2. The function of the condenser is
   a) To expand refrigerant b) To compress refrigerant c) To cool refrigerant d) To boil refrigerant.
3. The refrigerant takes direct part in refrigeration system called as
   a) Primary refrigerant b) Secondary refrigerant c) Tertiary refrigerant d) Mixed refrigerant.
4. Which of the following material is used for shell and tube condenser in Ammonia refrigeration system.
   a) Copper b) Steel c) brass d) Aluminium.
5. Ammeter is used for measuring
   a) Current b) Voltage c) resistance d) None of these.
6. The colour of Acetylene cylinder is
   a) Black b) maroon c) white d) red
7. The snip is a
   a) Cutting tool b) marking tool c) measuring tool d) bending tool
8. Air conditioning means
   a) To warm the air b) cool the air c) compress the air d) None of the these
9. At a domestic refrigerator's back, the back of tubes is known as
   a) Evaporator tubes b) Condenser tubes c) Capillary tubes d) Refrigerant cooling tubes.
10. The expansion device, in any refrigeration system, is connected between
    a) Receiver and Condenser b) Compressor and Condenser c) Compressor and Evaporator d) Evaporator and Receiver.

STATE INSTITUTE OF VOCATIONAL EDUCATION
O/o DIRECTOR OF INTERMEDIATE EDUCATION
TELANGANA, HYDERABAD
SHORT TERM VOCATIONAL CERTIFICATE COURSE

TIME: 3 HOURS **MAX.MARKS: 100**

REFRIGERATION AND AIR CONDITIONING
MODEL QUESTION PAPER (PRACTICAL)

Note: a) Answer any ONE question
b) Each question carries 40 Marks **1 X 40M = 40 MARKS**

1. Study the given refrigerator and identify the parts.
2. Dismantle and reassemble the given refrigerator.
3. Attend the servicing of a given Air Conditioner.
4. Detect the leakage of a given refrigerator and prevent the leakage.

Record/Mini Project and Viva	10 MARKS
Internship/ OJT	50 MARKS