GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Refrigeration and Air Conditioning (Elective-I)**
Subject Code: 2361907

Sr. No.	Subject Content	Hrs.
1	**INTRODUCTION.** 1.1 Know the objectives of learning this subject. 1.2 Need, Scope & importance of Refrigeration and Air-conditioning (RAC). 1.3 Need of attitude, knowledge & skill required for application Of RAC. 1.4 Refrigeration and Air conditioning: Importance, concept, basic principle, cycle of operation, need, classification and definition, Unit used.	2
2	**REFRIGERATION SYSTEMS.** 2.1 Bell- Coleman cycle, representation on P-V and S-T diagram. 2.2 C.O.P. 2.3 Types of refrigeration systems and their applications. 2.4 Simple vapour absorption system, working principle (NH3- H2O)and applications.	2
3	**VAPOUR COMPRESSION REFRIGERATION SYSTEM (VCRS).** 3.1 Simple, standard vapour compression cycle and its analysis on P-h chart. 3.2 Calculations of refrigerating effect, work done and C.O.P., wet and dry compression, simple examples. 3.3 Effect of different parameters on vapour compression cycle. 3.4 Practical vapour compression system. 3.5 VCRS components, types, their construction, material of construction, specifications, working, common troubles -their causes and remedies , applications, (components include compressor (Reciprocating, Rotary, Screw and scroll),condensers(Air cooled and water cooled),evaporators(Dx type, flooded, shell and tube type) ,expansion devices (Automatic, thermostatic and capillary tube, High side float valve) and others. 3.6 Application of refrigeration and air conditioning in domestic and industrial context. 3.7 Ice Plant, cold storage, water cooler, domestic refrigerator, deep freezer, dessert cooler, window and split air conditioners- cycle and block diagram, components, working, common troubles-their causes and remedies.	12

	Note : Question/s to calculate COP/RE/WD, remedies for specific trouble/s, etc(applications type) of 10-12 marks out of 70.	
4	**REFRIGERANTS.** 4.1 Primary and secondary refrigerant. 4.2 Classification. 4.3 Designation 4.4 Need of new refrigerants. 4.5 Desirable properties of refrigerants. 4.6 Properties of R 22, R 134a and R717.	2
5	**THERMAL INSULATION.** 5.1 Types of Insulation and their applications. 5.2 Salient features of thermocol & fiber glass.	2
6	**APPLIED PSYCHOROMETRY.** 6.1 Psychrometric properties of air such as Dry Bulb Temperature (DBT),Wet Bulb Temperature(WBT), Dew Point Temperature (DPT), absolute humidity, relative humidity, specific humidity, humidity ratio, degree of saturation, specific volume, enthalpy, familiarization with tables of psychometric properties of air, simple calculations. 6.2 Psychometric charts and their use. 6.3 Psychometric processes-sensible heating, sensible cooling, addition and removal of latent heat, adiabatic mixing of air streams, cooling and dehumidification, heating and humidification, adiabatic saturation, solution of problems using psychometric chart. 6.4 Psychrometry- sensible heat factor(SHF) and its determination with the help of psychometric chart, condition line room apparatus and coil apparatus dew point and their determination with the help of chart, estimation of dehumidified air quantity, bypass and contact factor. 6.5 Human Comfort-body temperature regulation, environmental influence on comfort, effective temperature and factors affecting it. 6.6. Comfort chart and its limitations. 6.7 Instruments for measuring psychometric properties-sling psychrometer dew point psychrometer,organic hygrometer, aspiration psychrometer-working and applications. **Note** : Question/s to plot any simple process, calculating/plotting SHF, BF,CF, etc. applications type) of 8-10 marks out of 70.	10

7	**INTRODUCTION TO COOLING LOADS.** 7.1 Types, classification and normal values of cooling loads. 7.2 Design conditions. 7.3 Over all heat transfer co-efficient and its calculation. 7.4 Flywheel effect of building material. 7.5 Effect of wall construction on cooling load. 7.6 Concept of IHG and ICL. 7.7 Heat gain through glass. 7.8 Air infiltration and load due to it. **Note** : Question/s to calculate OHTC (applications type) of 4-5 marks out of 70.	3
8	**AIR CONDITIONING AND AIR HANDLING SYSTEMS.** 8.1 Working principles and working of central plant and packaged plant. 8.2 Air filtration -various types, principles of working of different air filters. 8.3 Fans -classification, types, working, selection method, terminology used in fans, applications. 8.4 Velometer and pitot tube : their construction and working. 8.5 Duct design, installation and commissioning- estimation of duct size by equal friction method with the help of charts and tables, estimation of losses in ducts, different material & layouts ,installation and commissioning steps and precautions . 8.6 Air Distribution-importance, terms used, different types of outlets, grill register, diffusers, location of outlets. **Note** : Question/s on selection based on given set of conditions(applications type) of 4-5 marks out of 70.	7
9	**REFRIGERATION AND AIR CONDITIONING SERVICING.** 9.1 Tube operations-service tools and special tools-applications and specifications. 9.2 System operation such as-vacuumization, leak detection, charging the system, pumping down, etc.-process, equipments used and their specifications.	2
	Total	42

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.

B. FOR PAPER SETTER/MODERATOR.

a. Refer GTU syllabus and do not take reference of previous TEB question papers.
b. Ask the questions from each topic having marks weightage proportionate to hours allotted to that topic.
c. Optional questions must be asked from the same topic. That is weightage of compulsory attendance part of questions will be equal to proportionate to hours allotted to each topic.
d. Marks ratio of knowledge: comprehension: application types questions must be 30:30:40 respectively.
e. Submit solution / answer keys along with distribution of marks in each question for the paper being submitted.

Reference Books:

1	Principle of Refrigeration	Dossat R.J. Prentice Hall, USA
2	Basic Refrigeration and air conditioning(2nd Edition)	P.N. Anantha narayan Tata Mc Graw Hill
3	Refrigeration and Air conditioning	Domkundwar Dhanpat Rai & Sons
4	Refrigeration and Air conditioning	Khurmi & Gupta S. Chand, New Delhi
5	Refrigeration and Air conditioning	C.P. Arora Tata Mc Graw Hill
6	Refrigeration & Air conditioning	M. Prasad Wilely Easter, Delhi
7	Refrigeration & Air Conditioning	P.S. Desai L.F.Rajput Atul PRakashan
8	Refrigeration & Air Conditioning -	L.R.D.C., A'bad

Additional Reference Books:

1.	Refrigeration and Air conditioning	P.L. Balleney Khanna Publishers
2	Ind. Refrigeration Handbook	Stoecker Mc Graw Hill, USA
3	Modern Refrigeration & Air Conditioning	Althouse etc Galgotia Book source New Delhi
4	Fundamental of refrigeration	Longely Delmar Pub. USA
5	Refrigeration & Air conditioning	ARI P.H.I., USA
6	Handbook of Air conditioning	Wang Mc Graw Hill
7	Air Conditioning Lang	CBS Pub. Co. Delhi
8	Heating, Ventilation and air	

	conditioning	Clifford Reston Pub. USA
9	Air conditioning (4th Edition)	Jones Edward Arnold
10	Air conditioning Principles & Systems	Pita John Wilely USA
11	Refrigeration & air conditioning	Trott Mc Graw Hill Uk
12	HVAC Principles & applications	Mull Mc Graw Hill USA
13	Principles of Heating, Ventilation and air conditioning	Howell saucer coad Ashree 1998
14	HVAC Systems Duct Design -	SMACNA, USA
15	HVAC Systems	Monger Prentice Hall, USA
16	HVAC Systems Design Hand Book	Hains& Wilson Mc Graw Hill USA
17	Fan Application Manual -	AMCA, USA
18	Cooling Towers	Gurney & Cotter Maclaren & Sons , UK
19	ASHRAE Handbook Fundamentals	-ASHRAE
20	ASHRAE Handbook Refrigeration	-ASHRAE
21	ASHRAE Handbook Applications	- ASHRAE
22	ASHRAE Handbook System and Applications	-ASHRAE
23	Prashitan and vatanukulan	A.K. Mehta Uni. Text Book Board, AHN
24	Refrigeration & Air Conditioning	Whitman Johnson Tomczyk Delmar Pub. Co. USA