

Name of Institute: Indus institute of technology

Name of Faculty: Dr.Bansi Raja

Course code: ME0727

Course name: Refrigeration & Air Conditioning

Pre-requisites: Knowledge of thermodynamics and heat and mass transfer.

Credit points: 05

Offered Semester: 6th

Course coordinator (weeks 13)

Full name : Dr. Bansi D. Raja

Department & location: Department of mechanical Engineering,
HMT LAB, Bhanwar Buiding

Telephone 9974170390

Email bansiraja.me@indusuni.ac.in

Consultation times : 9 AM to 5 PM

Course lecturer

Full name : Dr. Bansi D. Raja

Department & location: Department of mechanical Engineering,
HMT LAB, 1st floor, Bhanwar Building

Telephone 9974170390

Email :bansiraja.me@indusuni.ac.in

Consultation times : 9 AM to 5 PM

Students will be contacted throughout the session via mail with important informationrelating to this course.

Course Objectives

By participating in and understanding all facets of this course a student will:

- 1.To identify various methods of Refrigeration.
- 2.To understand various applications of Refrigeration & Air Conditioning.
- 3.To understand the importance of various equipments used in Refrigerator & Air Conditioning Systems.

Course Outcomes (CO)

After successful completion of the course, student will able:

- 1.To understand the fundamental concepts of Refrigeration & Air Conditioning Systems.
- 2.To analyze different Refrigeration cycles.
- 3.Compare the performance of different refrigerants.
- 4.Estimate Heating & Cooling Loads for various applications.

Course Outline

All type of heating and cooling systems like refrigerator, air condition, ice manufacturing, air cooling systems etc.

Method of delivery

Face to face lectures, self-study material, Active Learning Techniques

Study time

4 hour lecture and 2 hour laboratory session

CO-PO Mapping (PO: Program Outcomes)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO 1	3	1	1	-	-	-	-	-	-	-	-	1
CO 2	3	2	3	1	3	-	-	-	-	-	-	-
CO 3	3	2	2	2	3	-	-	-	-	-	-	-
CO 4	2	2	1	-	-	-	-	-	-	-	-	1

Blooms Taxonomy and Knowledge retention (For reference)

(Blooms taxonomy has been given for reference)

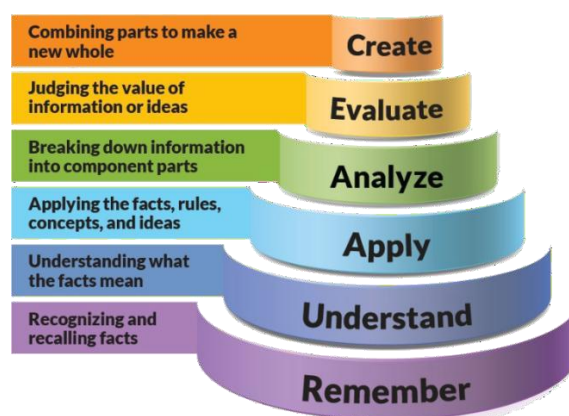


Figure 1: Blooms Taxonomy

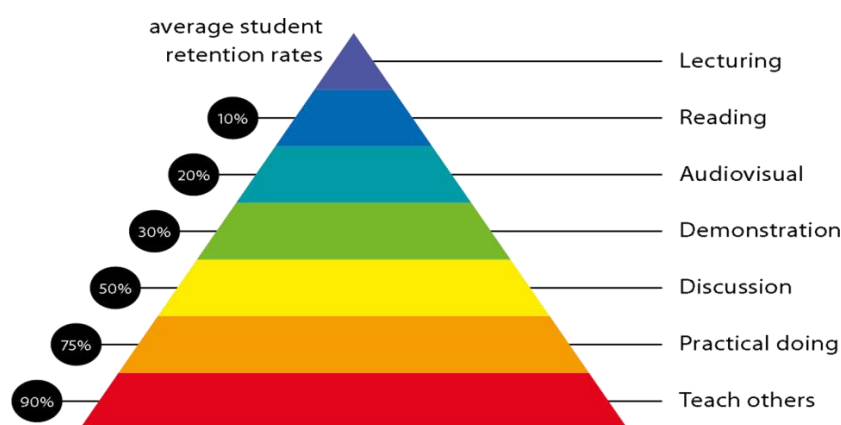


Figure 2: Knowledge retention

Graduate Qualities and Capabilities covered (Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of Mechanical Graduate Capabilities
Informed Have a sound knowledge of an area of study or profession and understand its current issues, locally and internationally. Know how to apply this knowledge. Understand how an area of study has developed and how it relates to other areas.	1 Professional knowledge, grounding & awareness
Independent learners Engage with new ideas and ways of thinking and critically analyze issues. Seek to extend knowledge through ongoing research, enquiry and reflection. Find and evaluate information, using a variety of sources and technologies. Acknowledge the work and ideas of	2 Information literacy, gathering & processing

others.	
Problem solvers Take on challenges and opportunities. Apply creative, logical and critical thinking skills to respond effectively. Make and implement decisions. Be flexible, thorough, innovative and aim for high standards.	4 Problem solving skills
Effective communicators Articulate ideas and convey them effectively using a range of media. Work collaboratively and engage with people in different settings. Recognize how culture can shape communication.	5 Written communication 6 Oral communication 7 Teamwork
Responsible Understand how decisions can affect others and make ethically informed choices. Appreciate and respect diversity. Act with integrity as part of local, national, global and professional communities.	10 Sustainability, societal & environmental impact

Practical work:

Sr. No.	PRACTICAL NAME
1	To study about air cooling systems
2	To determine COP of VCR system
3	To study about different type of refrigerants
4	To determine COP of Electrolux refrigerator
5	To determine COP of ice candy machine
6	To determine efficiency of cooling tower
7	To determine COP of Mechanical Heat Pump heating side
8	To determine COP of Mechanical Heat Pump cooling side
9	To determine COP of air condition system

Lecture/tutorial times

As per the time table

Attendance Requirements

The University norms states that it is the responsibility of students to attend all lectures, tutorials, seminars and practical work as stipulated in the course outline. Minimum attendance requirement as per university norms is compulsory for being eligible for semester examinations.

Details of referencing system to be used in written work

Text books

1. Rajput R.K "Refrigeration and air conditioning"; S. K. Kataria & Sons; Delhi, 2009
2. Manohar Prasad, "Refrigeration and Air Conditioning", Wiley Eastern Ltd., 1983
3. Arora. C.P., Refrigeration and Air Conditioning, Tata McGraw-Hill New Delhi, 1988
4. S C Arora & S Domkundwar, 'Refrigeration and Air-Conditioning' Dhanpat Rai Publication, 200

Additional Materials

1. Ahmadul Ameen "Refrigeration and Air Conditioning", Prentice Hall of India Pvt. Ltd. 2010
2. Ramesh Arora , " Refrigeration and Air-conditioning", Prentice Hall of India, 2010

ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

Tentative CIE Theory 60 Marks Bifurcation		Tentative Duration
10 Marks	Attendance	Academic Session
10 Marks	Assignment	Academic Session
40 Marks	Mid Sem exam	As per academic Calendar
Tentative CIE Practical 60Marks Bifurcation		Tentative Duration
10 Marks	Attendance	Academic Session
20 Marks	File work/ Journal write up – calculation etc. in lab. itself	After completion of experiment
30 Marks	Practical Performance /Lab Participation Skill Test	Week 4,6,8

SUPPLEMENTARY ASSESSMENT

Students who receive an overall mark less than 40% in internal component or less than 40% in the end semester will be considered for supplementary assessment in the respective components (i.e internal component or end semester) of semester concerned. Students must make themselves available during the supplementary examination period to take up the respective components (internal component or end semester) and need to obtain the required minimum 40% marks to clear the concerned components.

Practical Work Report/Laboratory Report:

A report on the practical work is due the subsequent week after completion of the class by each group.

Late Work

Late assignments will not be accepted without supporting documentation. Late submission of the reports will result in a deduction of -% of the maximum mark per calendar day

Format

All assignments must be presented in a neat, legible format with all information sources correctly referenced. **Assignment material handed in throughout the session that is not neat and legible will not be marked and will be returned to the student.**

Retention of Written Work

Written assessment work will be retained by the Course coordinator/lecturer for two weeks after marking to be collected by the students.

University and Faculty Policies

Students should make themselves aware of the University and/or Faculty Policies regarding plagiarism, special consideration, supplementary examinations and other educational issues and student matters.

Plagiarism - Plagiarism is not acceptable and may result in the imposition of severe penalties. Plagiarism is the use of another person's work, or idea, as if it is his or her own

- if you have any doubts at all on what constitutes plagiarism, please consult your Course coordinator or lecturer. Plagiarism will be penalized severely.

Do not copy the work of other students.

Do not share your work with other students (except where required for a group activity or assessment)

Course schedule

	Week #	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
	Weeks 1	Refrigeration and Air conditioning, Working principle of R&AC. unit of refrigeration and C.O.P. - Mechanical refrigeration - types of ideal cycles of refrigeration, Necessity and applications	CO-1,2	Chalk and Board
	Weeks 2	Air refrigeration: Bell Coleman cycle -open and dense air systems, Bootstrap air refrigeration system, types of air cycles, advantages and its advantages. refrigeration systems used in air crafts and problems.	CO-2	Chalk and Board
	Week 3	Working principle and essential components of the plant - simple vapour compression refrigeration cycle - COP representation of cycle on T-S and p-h charts, actual cycle influence of various parameters on system performance - use of p-h charts - numerical problems.	CO-3,1	Chalk and Board
	Week 4	Comparison of VCRS & VARS, Advantages of VARS Refrigeration Systems, Types of VARS Systems (practical water -NH ₃ cycle Li-Br system) and its working, Electrolux Refrigeration Systems.	CO-1,3	Chalk and Board
	Week 5	Development, classification, designation of refrigerants, secondary refrigerants, future industrial refrigerants.	CO-1,3	Chalk and Board
	Week 6	Determination of condition of air entering conditioned space. Air conditioning systems - summer, winter and year-round-year air conditioning systems --central and unitary systems. Requirement of air conditioning	CO-1,4	Chalk and Board

Week 7	human comfort - comfort chart and limitations effective temperature - factors governing effective temperature - design considerations.	CO-1,3	Chalk and Board
Week 8	Classification, system components, all air, all water, air water systems, room air conditioners, packaged air conditioning plant, central air conditioning systems, split air conditioning systems.	CO-1,4	Chalk and Board
Week 9	Compressors, condensers, expansion devices, evaporators its types construction and working, comparison and selection, refrigeration piping accessories and controls, thermal insulation properties and classification, thickness of insulation.	CO-1,4	Chalk and Board
Week 10	Air filters - humidifiers - fan - blowers control systems for temperature and humidity - noise control. Installation and charging of refrigeration unit, Testing for leakage, Cause for faults and rectification.	CO-1,3	Chalk and Board
Week 11	Various heat sources contributing heat load - solar load - equipment load - infiltration air load Factors affecting the thermal conductivity, types of insulating materials, reflective insulating blinds,	CO-1,4	Chalk and Board
Week 12	heat transfer through insulation used for air-conditioning, economical thickness of insulation, few insulated systems, importance of relative humidity for the selection of insulation.	CO-1,4	Chalk and Board