

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme	Diploma Engineering				Branch	Mechanical Engineering			
Semester	V				Version	1.0.0.0			
Effective from Academic Year			2020-21		Effective for the batch Admitted in			July 2018	
Subject code	1ME2505		Subject Name		Thermal engineering-II				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites:
Basics of thermodynamics.

Course Learning Outcomes:
<p>The course content should be taught and implemented with an aim to develop different skills leading to the achievement of the following competencies and course learning outcomes:</p> <p>CO1. To Understand the performance of ICs by operating them and observing changes in thermodynamic properties during each stroke of ICs.</p> <p>CO2. Analyse the performance of Vapour Compression Refrigeration System (VCRS), by operating them and observing the changes in properties of refrigerant during each process on VCRS (and using thermodynamic charts/diagrams.)</p> <p>CO 3.Explain working of various air-conditioning equipments, ducts and fans.</p> <p>CO 4.Identify the elements of gas turbines.</p>

Course Content				
Name of UNIT	Unit Content	Unit Learning Outcomes	Marks	Hrs
UNIT – 1 Internal combustion engines	1.1 Concept of IC engine and External Combustion Engine 1.2 Classification, terms regarding IC Engine 1.3 Working principle of IC engine 1.4 Main components of IC engine And their functions. 1.5 Working principles of Petrol engines (Spark Ignition-SI) & diesel engines (Compression Ignition-CI)-two strokes and four strokes both Cycles on P-V and T-s diagram. 1.6 Comparison between SI & CI Engines.	1a. Classify ICs. 1b. Difference between ICE and External Combustion engine- ECE 1c. Explain the working principle of the ICs 1d. Explain terms used in ICs. 1e. To understand the working of ICs with functions of each element. 1f. Describe combustion process in CI & SI engines.	23	17

	<p>1.7 Theoretical and actual Valve timing diagrams.</p> <p>1.8 Various systems-fuel supply system, cooling system, ignition system, governing system (quality, quantity and hit and miss governing), fuel injection, Multi Point Fuel Injection (MPFI).</p> <p>1.9 Concept of Common Rail Direct Injection System-(CRDI) for diesel engine Concept of scavenging and supercharging.</p> <p>1.10 Concept of alternate fuels and their applications.</p> <p>1.11 Performance testing of IC engines -Rope brake Dynamometer-Formulae for Brake power, Indicated power Mechanical efficiency, Indicated thermal efficiency, Brake thermal efficiency, Air standard efficiency, Relative efficiency, Volumetric efficiency Concept of Heat balance sheet for an engine</p> <p>1.12 Simple numerical problems based on testing of I.C. engines and heat balance sheet</p>	<p>1g. List the steps to perform testing of ICEs.</p>		
<p>UNIT – 2 Refrigeration</p>	<p>2.1 Introduction - Definition of Refrigeration, units of refrigeration, Coefficient of performance (COP).</p> <p>2.2 Reversed Carnot cycle & Bell column cycle. (No numerical)</p> <p>2.3 Vapour compression refrigeration cycle (VCRS), working with the help of P-V, T-s & P-h diagrams.</p> <p>2.4 Effect of sub cooling, super heating.</p> <p>2.5 actual vapour compression system</p> <p>2.6 VCRS various components types, construction, working, applications. (Components include compressor- Reciprocating, Rotary, Screw and scroll; Condensers- Air</p>	<p>2a. Explain various processes and elements of VCRS with their functions.</p> <p>2b. Operate VCRSs, observe the changes in properties of refrigerant during each process on VCRS and calculate / analysis the performance using thermodynamic charts/ Diagrams.</p> <p>2c. Explain VARS with advantages over VCRS.</p> <p>2d. List characteristics of refrigerants used for VCRSs.</p> <p>2e. Detect the leakages in VCRS by using appropriate tools and</p>	18	14

	<p>cooled and water cooled. Evaporators- Dx type, flooded, shell and tube type. Expansion devices- Automatic, thermostatic expansion valve and capillary tube, High side float valve).</p> <p>2.7 simple numerical problem based on VCRS</p> <p>2.8 Application of VCRS: with block diagram, Components and working of domestic refrigerator, deep Freeze, Ice Plant, cold storage, water cooler.</p> <p>2.9 Principle and working of simple Vapour absorption refrigeration system (VARS).</p> <p>2.10 Advantages of VARS over VCRS.</p> <p>2.11 Commonly used Refrigerants (including R22, R134a, Hydro Carbon-HC and R717 (Ammonia) with its classification, Desirable properties & applications. Need of new Refrigerants.</p>	equipment.		
UNIT – 3 Air Conditioning	<p>3.1 Introduction –concept of air conditioning, classification and its Applications.</p> <p>3.2 Psychrometry- Definition, properties of air.</p> <p>3.3 Representation of psychometric properties on chart</p> <p>3.3 Various air conditioning processes on psychometric charts.</p> <p>3.4 Various components and working of Dessert cooler, window and split air conditioning.</p> <p>3.5 Concept of Ducts- need, classification, applications, constructional materials, common troubles with their remedies.</p> <p>3.6 Air conditioning fans-types, constructional features, applications and common troubles with their remedies.</p>	<p>3a. Explain various air conditioning processes on Psychrometric chart.</p> <p>3b. Measure various air Properties.</p> <p>3c. Explain working of various air-conditioning equipment.</p>	13	8

UNIT – 4 Gas Turbines	4.1. Introduction to Gas Turbines. 4.2. Classification of Gas Turbines. 4.3 Working and application of gas turbine. 4.4. Fuels for gas turbine and applications	4a. Classify gas turbine. 4b. Explain the working principle gas turbine. 4c. List characteristics and properties of fuels used for gas turbine.	6	6
		Total	60	45

List of Practical		
No.	Unit	Name of Practical
1	1	To study of different unit conversion and basic of thermodynamics
2	1	To Demonstration of IC engine parts: (i) Demonstrate and explain dismantling, assembling, working and inspection of fuel pump, fuel injector, carburettor and multipoint fuel injection system (ii) Sketch and explain working of fuel pump, fuel injector, and carburettor and MPFI system.
3	1	To study about Valve timing diagram: (i) Write specifications of IC engine undertaken for valve timing diagram. (ii) Perform and record angles and strokes. Prepare valve timing diagram. And Conclude your result
4	1	To Perform test on IC engine and prepare heat balance sheet. (i) Write specifications of IC engine undertaken for test. (ii) Demonstrate and perform test on IC engine. Observe and record test parameters required for heat balance sheet. (iii) Find out parameters- Indicated Power (IP), Break Power (BP), fuel consumption for varying load, efficiency, etc. and prepare heat balance sheet. (iv) Conclude your result.
5	2	To Demonstrate Refrigeration tubing operations. (i) Perform various tubing operations. (ii) Sketch and explain various tools used for refrigeration tubing operation.
6	2	To Demonstrate Leak detection, evacuation and refilling of the refrigerant
7	2	To find out of COP of VCRS. (i) Sketch block diagram of VCRS. Write specifications of each component of VCRS (ii) Perform, observe and record the parameters required to determine refrigeration effect (RE), work done (WD), mass flow rate and COP. And conclude your result.
8	3	Determination of properties of air. (i) List, sketch, demonstrate and explain working of various

		<p>psychometric instruments.</p> <p>(ii) Perform, observe and record the properties. Calculate properties (Teacher will assign) of air from the readings taken.</p> <p>(iii) Given the data (Teacher will assign the data for four to five processes.), plot the processes on psychometric chart</p>	
9	3	<p>Determination of capacity of window / split air conditioner.</p> <p>(i) Sketch block diagram of setup. Perform, observe and record the parameters required to determine the capacity. Determine the capacity.</p> <p>(ii) Thumb rules to estimate the capacity.</p>	
10	4	To study about gas turbine.	
11		<p>Industrial visit</p> <p>(i) Arrange Visit any ice plant, cold storage plant observe VCRS, different kinds of ducting. I C Engine manufacturing/ running or power plant working on I C Engine. (D.G. Power Plant.)</p> <p>(ii) Student will visit and prepare industrial visit report.</p>	
List of Instruments/Equipment/Trainer Board			
1	I C Engine cut section/ models- Cut model of 4 stroke petrol and diesel engine, cut model of 2 stroke petrol engine,		
2	I C Engine test rig- petrol and diesel – both.		
3	I C Engine tool kit		
4	VCRS test rig		
5	Tool kit for tubing operations for Refrigeration. Refrigerant evacuation pump /vacuum pump		
6	Window/ split air conditioner test set up		
7	Models of fans- includes radial, backward, forward curve blades etc.		
8	Brazing kit.		
Link of Text Books			
No.	Title of Books	Authors	Publication
1	I C Engine	Mathur and Sharma	DhanpatRai Publication
2	Refrigeration and Air Conditioning	Domkundwar	DhanpatRai and Sons, Delhi
3	A Text book of Thermal Engineering.	R S Khurmi& J.K. Gupta.	S Chand & Co.
List of Reference Books			
No.	Title of Reference Books	Authors	Publication
1	Principles of Refrigeration	Dossat	Pearson Education
2	A Text Book of Refrigeration and Air Conditioning	R S Khurmi	Eurasia Publishing House
3	Thermal engineering	P.L. Ballaney	Khanna Publication
4	Thermal Science and Engineering	Dr. D.S. Kumar	S.K .Kataria& Sons.
5	Thermodynamics and Heat power Engg.	Mathur and Mehta.	Tata Mcgraw- Hill.

Link of Learning Web Resource	
1	https://danfoss.sabacloud.com/Saba/Web_wdk/EU2PRD0064/index/prelogin.rdf
2	http://nptel.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Ref%20and%20Air%20Cond/New_index1.html
3	http://www.youtube.com/playlist?list=PLE2DA184A2E479885
4	http://www.kolpak.com/asset/?id=tugvr
5	http://nptel.ac.in/courses/112105128/

PO & CO Mapping						
Sr.NO.	Name of PO	Description	Co1	Co2	Co3	Co4
1	PO 1	Acquire fundamental knowledge of mathematics, science, and mechanical engineering.	Moder.	Moder.	Moder	Slight
2	PO 2	Design and conduct experiments, as well as analyze and interpret data.	Subst	Subst	Subst	Subst
3	PO 3	Use the techniques, skills, and modern engineering tools necessary for engineering practice	Subst	Subst	Subst	Moder
4	PO 4	Function in multi-disciplinary teams and identify, formulate, and solve engineering problems.	Moder.	Slight	Slight	Slight
5	PO 5	Clear understanding of his duties and responsibilities as a mechanical engineer.	Slight	Slight	Subst	Subst
6	PO 6	Develop effective communication skill and provide leadership for professional development.	Slight	Slight	Moder	Moder
7	PO 7	Engage in life-long learning in mechanical engineering field and comprehend issues related to environment and sustainable development.	Moder.	Subst	Subst	Moder
8	PO 8	Graduate will demonstrate knowledge of professional and ethical responsibilities.	Subst	Moder.	Moder	Moder
9	PO 9	Incorporate economics and business practice including project and risk management.	Moder.	Slight	Moder	Moder
10	PO 10	Graduated are able to share their knowledge to the industries as well as society.	Subst	Moder.	Subst	Subst
11	PO 11	Graduated will be able to apply their skill and knowledge for the sustainable development of nation.	Subst	Moder.	Moder	Subst
12	PO 12	Graduated are able to learn to work with the team and also with the inter discipliners.	Moder.	Slight	Slight	Moder