



## **C.U.SHAH UNIVERSITY – Wadhwan City**

**FACULTY OF:** - Technology and Engineering (Diploma Engineering)

**DEPARTMENT OF:** - Mechanical Engineering

**SEMESTER:** - V **CODE:** - 2TE05THE1

**NAME OF SUBJECT:** - Thermal Engineering-II

### **Teaching & Evaluation Scheme:-**

Subject Code	Name of the Subject	Teaching Scheme				Credits	Evaluation Scheme							
		Th	Tu	Pr	Total		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hours	Marks	Hours	Pr/Viva	TW	Pr	
<u>2TE05THE1</u>	Thermal Engineering-II	4	0	2	6	5	30	1.5	70	3	--	20	30	150

### **Objective: -**

Subject knowledge of thermal engineering is required in many industries. The objective of this course is to establish basic fundamental and practical knowledge in the field of internal combustion engine, refrigeration, air conditioning, eco-friendly fuels, etc. These are major fields of mechanical engineering. Student will be able to understand different systems and apply its competencies in major fields in related industries. Knowledge of alternate fuels is required as emerging field and today's need of society which will be provided by the course content.

### **Prerequisites: -**

- Thermodynamics, Thermal Engineering-I

### **Course outline:-**

Sr. No.	Course Contents	Number of Hours
1	<b>Internal Combustion Engines:</b> IC Engine-concept (comparison with External Combustion engine- EC), classification, working principle and terminology used, Main components of IC engine and their functions, Petrol engines (Spark Ignition- SI) & diesel engines (Compression Ignition- CI)-two strokes and four strokes both: Working principles, Cycles on P-V and T-s diagram, Elements-sketch, working and functions, Various systems- cooling, fuel injection (includes carburetion, fuel pump, injectors, Multi Point Fuel Injection (MPFI), etc.), ignition, governing (quality, quantity and hit and miss governing), exhaust, etc, Comparison between SI & CI Engines, Theoretical and actual valve timing diagrams, MPFI- need and working, Concept of scavenging and turbocharger, Concept of Common Rail Direct Injection System-(CRDI) for diesel engine, Performance testing of IC engines and its heat balance sheet (Simple numerical examples) with familiarization with testing as per BIS.	22
2	<b>Alternate Fuels:</b> Alternatives fuels: Types, properties, compositions, advantages, disadvantages and Implementation issues- includes mainly Compressed Natural Gas (CNG), Liquefied Petroleum Gas (LPG) and Biodiesel. Effect of these fuels from pollution point of view, Supply system requirement for CNG and LPG as alternate fuel in vehicle, Conversion devices/ kits for SI Engines- vaporizer/ PRV for fuel compatibility, piping and allied needs.	06
3	<b>Refrigeration:</b> Introduction to refrigeration, Reversed Carnot cycle & Bell column cycle. (No numerical), Unit of refrigeration & basic terminology, Vapor compression refrigeration	16

	cycle (VCRS), working with the help of P-V, T-s & P-h diagrams, VCRS components, types, their construction, working, 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 expansion valve and capillary tube, High side float valve), Performance of VCRS based on coefficient of performance (COP), simple numerical, Effect of change in operating conditions (condenser pressure, evaporator pressure, sub cooling, superheating) on performance of VCRS & its representation on P-h diagram (with suitable numerical examples), Application of VCRS: Ice Plant, cold storage, water cooler, domestic refrigerator, deep freezer- block diagram, components, working, Basic concept of Vapor absorption refrigeration system, Refrigerant classification, Desirable properties of refrigerants, and properties & applications of commonly used refrigerants including R22, R134a, Hydro Carbon-HC and R717 (Ammonia), need of new refrigerants.	
4	<b>Air- Conditioning:</b> Introduction to air conditioning, Air conditioning- types and its applications, Psychrometry- properties of air, Representation of psychrometry properties on chart (simple numerical using chart), Various air conditioning processes on psychrometric charts, Dessert cooler, window and split air conditioners components and working, Ducts- need, types with applications, constructional materials, and installation, common troubles with their remedies, Air conditioning fans-types, constructional features, applications and common troubles with their remedies.	12

#### List of Experiments:-

- Demonstration of IC engine parts
- Valve timing diagram
- Perform test and prepare heat balance sheet of IC Engine.
- Sketch and explain Vapour compression refrigeration system.
- Determination of properties of air
- Demonstration of window / split air- conditioner.
- Industrial visit

#### Books Recommended:

- Thermal Engineering, R K Rajput, Laxmi. Publications
- I C Engine, Mathur and Sharma, Dhanpat Rai Publication
- I C Engine, Domkundwar, Khanna publication
- Refrigeration & air conditioning, Arora and domkundwar, Khanna publication.
- Thermal engineering, P.L.Ballaney, Khanna Publication