



**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING**

**(AUTONOMOUS)**

**Accredited by NAAC & NBA (CSE, IT, ECE, EEE & ME)**

**Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada**

**L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India**

## **DEPARTMENT OF MECHACNICAL ENGINEERING**

### **THERMAL ENGINEERING LAB**

**Course Objective:** The objective of this lab is to understand the basic principles in the areas of internal combustion engines, boilers and Refrigeration systems to under graduate and Post graduate students through a series of experiments. In this lab the experiments are performed to measure performance parameters of the systems such as Brake power, Efficiency, Torque , COP, mass of fuel. Students have a fairly good understanding of the theory underlying the experiments and the entire lab course is designed such that classroom lectures precede the lab work. The Thermal Engineering Laboratory is equipped with test facilities for doing research with in internal combustion engines for energy conversion.

#### **Course Outcomes:**

After the completion of the course, students should be able to

- CO 1:** Identify the various fuel characterizations through experimental testing.
- CO 2:** Analyze the performance characteristics of an internal combustion engines
- CO 3:** Evaluate the performance parameters of refrigeration systems
- CO4:** Analyze the air compressor characteristics

#### **Photographs:**

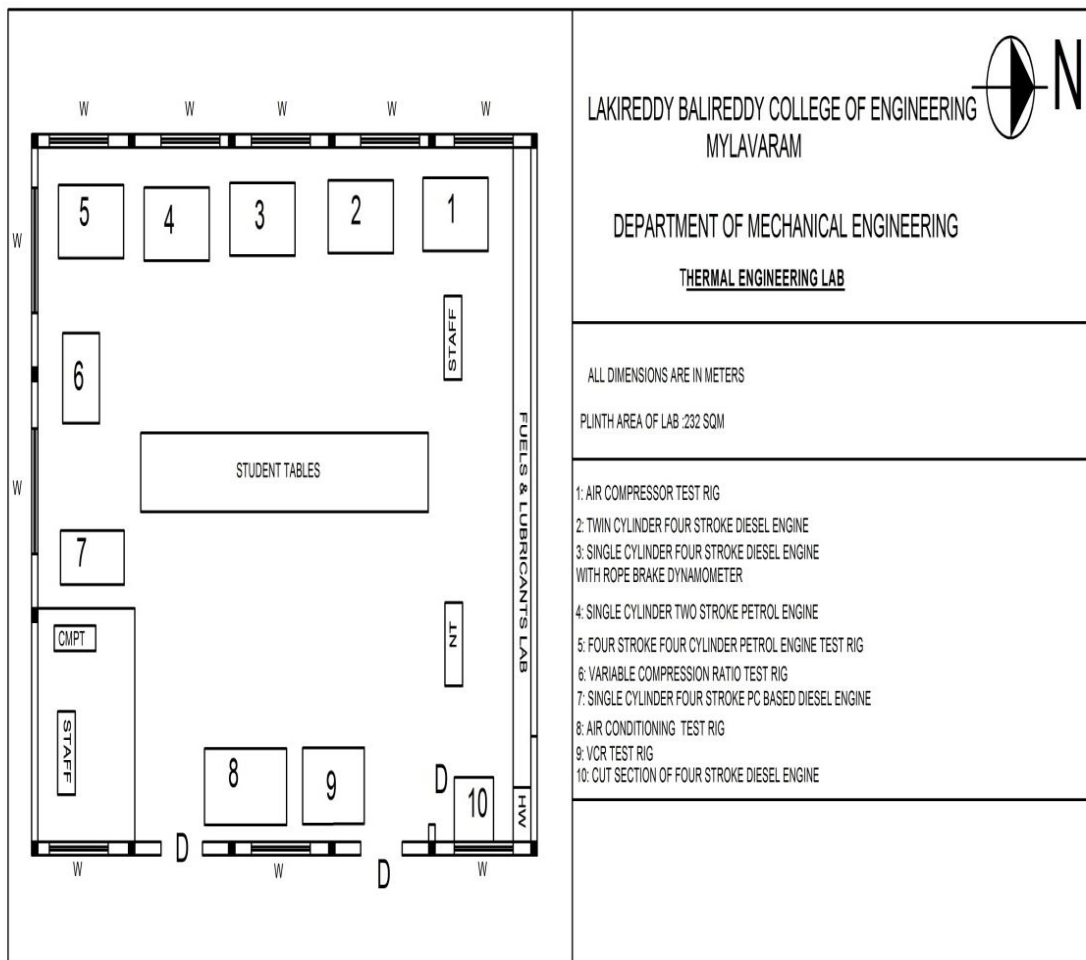


**Fig.1 Thermal Engineering Lab**



**Fig.2 Thermal Engineering Lab overview**

**Thermal Engineering Lab Layout:**



**Fig.3 Thermal Engineering Lab layout**

<b>Thermal Engineering Lab Overview</b>	
Area	225 Sq.m
Established in the year	1998
Total investment	Rs. 47,63,323/-
<b>Major equipment</b>	<ol style="list-style-type: none"> <li>1. Two-Cylinder, 4-Stroke, Water cooled Diesel Engine Test Rig-coupled with AC Alternator.</li> <li>2. Single Cylinder,4-Stroke, Water cooled Vertical Diesel Engine Test Rig-coupled With Rope Brake Dynamometer</li> <li>3. Four Cylinder, 4-Stroke, Water cooled Petrol Engine Test rig-coupled with Hydraulic Dynamometer.</li> <li>4. Vapour Compression Refrigeration Test Rig</li> <li>5. Two Stage Reciprocating Air Compressor Test Rig with swinging field Motor</li> <li>6. Air Conditioning Test Rig(1.5TON)</li> <li>7. P.C.Based 4 stroke single cylinder diesel engine with variable injection pressure and compression ratio.</li> <li>8. Solar Concentrator Training System</li> <li>9. Solar PV Module</li> <li>10. CRDI diesel engine setup</li> <li>11. AVL five gas analyser</li> </ol>

**R&D Facilities:**

- 1) P.C.Based 4 stroke single cylinder diesel engine with variable injection pressure and compression ratio.
- 2) Multi gas Analyser
- 3) Smoke meter
- 4) Trasesterification equipment for biodiesels

**Equipment details in Thermal Engineering Laboratory:**

List of Equipment in Thermal Engineering Lab

S. No.	Name of the laboratory	Name of the equipment	No. of available	Date of purchase	Total cost In Rs
1	Thermal Engineering	Two-Cylinder, 4-Stroke, Water cooled Diesel Engine Test Rig-coupled with AC Alternator.	01	23-09-2000	1,98,900/-
2		Single Cylinder,4-Stroke, Water cooled Vertical Diesel Engine Test Rig-coupled With Rope Brake	01	23-09-2000	68,165/-

		Dynamometer			
3		PI Meter	01	09-10-2004	15,932/-
4		Single Cylinder, 2-Stroke, Air cooled Petrol Engine Test Rig-coupled with DC Generator,	01	23-09-2000	1,10,224/-
5		Four Cylinder, 4-Stroke, Water cooled Petrol Engine Test rig-coupled with Hydraulic Dynamometer.	01	23-09-2000	1,60,778/-
6		Vapour Compression Refrigeration Test Rig.	01	23-09-2000	66,300/-
7		Rotameter	02	24-01-2006 15-07-2006	13,243/-
8		Cut Section Model of Single cylinder, 4-Stroke Petrol Engine.( Demonstration Model)	01	24-01-2006	4,538/-
9		Two Stage Reciprocating Air Compressor Test Rig with swinging field Motor	01	06-11-2000	74,588/-
10		Cut Section Model of Single cylinder, 4-Stroke, water cooled Diesel Engine.	01	27-11-2000	19,890/-
11		Cut Section Model of Single cylinder, 2-Stroke, Air Cooled Petrol Engine.	01	24-11-2000	19,890/-
12		<u>Steam Boilers :</u> a)Model of Lancashire, Bobcock & Wilcox,, Locomotive, Cochran, Loeffler Boilers	05	25-05-2002 14-06-2002	45,684/-
13		Hero Honda Old Enigne	01	26-03-2002	3,000/-
14		Bajaj Old Engine	01	26-03-2002	2,500/-
15		AC Test Rig(1.5TON), Variable Compression Ratio Engine,	01	03-01-2006	1,33,138/-
16		Variable Compression Ratio Engine	01	16-03-2007	1,43,438/-
17		Diesel Engine test Rig- Pc Based	01	30-4-2010	4,63,375/-
18		VRC Attachment for PC Based diesel engine test rig. Injection pressure measurement attachment for pc based diesel engine test rig.	02	04-12-2010	81,000/-
19		Multi gas analyzer model NPM-MGA -2(5 gas) with printer.SL.NO.234 Smoke meter model NPM-5M-III B with prize ripple oil temp & printer SL.NO. 8754	02	08-12-2010	3,25,499/-
20		Junker's gas calorimeter	01	21-03-2015	79,077/-
21		1.Abels flash point apparatus 2.Pensky marten apparatus 3.Redwood viscometer –I 4. Redwood viscometer –II 5.Englers viscometer	05	25-03-2015	61,898/-
22		Bomb calorimeter	01	31-03-2015	63,261/-
23		i)Single Cylinder, two stroke petrol	02	21-03-2016	2,32,350/-

	engine test rig with AC alternator electrical loading ii) Single Cylinder, for stroke diesel engine test rig with mechanical rope brake dynamometer			
24	Solar Concentrator Training System	01	23-03-2016	4,60,500/-
25	Automobile working models	05	21-04-2017	1,05,000
26	Solar PV Training and research system	01	15-03-2018	2,37,448/-
27	Single cylinder four stroke CRDI diesel engine with different operating parameters	01	24-03-2018	8,49,600/-
28	AVL gas analyser	01	24-03-2018	3,30,400/-
29	Single cylinder four stroke water cooled diesel engine with rope brake dynamometer	01	12-07-2018	1,41,836/-
30	Say bolt viscometer & Engine exhaust gas calorimeter	02	27-01-2019	33,571/-
31	AVL Smoke meter	01	02-11-2019	2,18,300/-
			<b>Total Amount</b>	<b>47,63,323/-</b>



**Fig.4 Four stroke single cylinder water cooled diesel engine**

**ENGINE SPECIFICATIONS :**

Make	:	Kirloskar
Power	:	5 H.P
Speed	:	1500 rpm.
No. of cylinders	:	01
Compression ratio	:	16.5 : 1
Bore	:	80 mm
Stroke	:	110 mm
Orifice diameter	:	20 mm
Type of ignition	:	Compression ignition



**Fig.5 Four stroke single cylinder water cooled variable compression ratio petrol engine**

**ENGINE SPECIFICATIONS :**

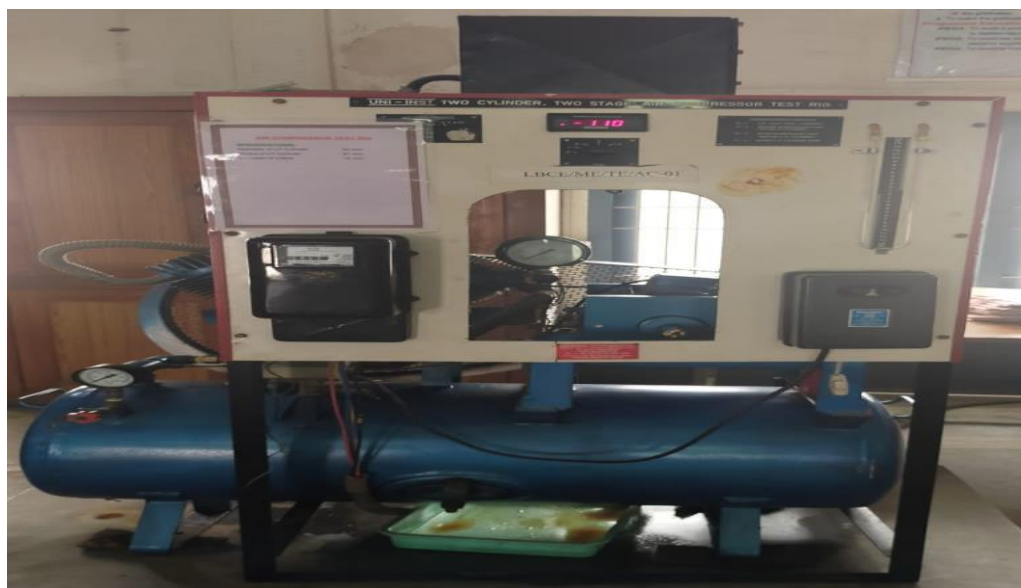
Make	:	Kirloskar
Power	:	2.5 H.P
Speed	:	2800 rpm.
No. of cylinders	:	01
Compression ratio	:	10 : 1
Bore	:	70 mm
Stroke	:	66.7 mm
Orifice diameter	:	17 mm
Type of ignition	:	Self- ignition
Method of loading	:	Eddy Current
Method of starting	:	Crank shaft
Method of cooling	:	Air



**Fig.6 Four stroke twin cylinder water cooled diesel engine electrical rheostat loading**

**ENGINE SPECIFICATIONS:**

BHP	:	10 HP
SPEED	:	1500 RPM
NO. OF CYLINDER	:	Two
COMPRESSION RATIO	:	17.5 : 1
BORE	:	87.5 mm
STROKE	:	110 mm
ORIFICE DIAMETER	:	20 mm
TYPE OF IGNITION	:	Compression
TYPE OF COOLING	:	Water cooled
TYPE OF STARTING	:	Crankshaft



**Fig.7 Two stage reciprocating air compressor**

### **SPECIFICATIONS:**

Diameter of LP Cylinder : 0.063 m  
Stroke of LP Cylinder : 0.087 m  
Diameter of orifice : 0.01 m



**Fig.8 Single cylinder 2 stroke air cooled petrol engine**

### **Engine Specifications**

- Type : 2-Stroke petrol Engine (Air cooled)
- Make : Bajaj
- Rated Power Output : 1.5 HP, 1500RPM
- Bore Diameter “D” : 57mm
- Stroke Length “L” : 57mm
- Compression Ratio : 7.4 : 1
- Starting : By kick start.
- Dia of Orifice : 12 mm.





**Fig.9 Air Conditioning Apparatus**



**Fig.10 Vapour compression refrigeration system**



**Fig.11 Valve timing diagram for 4 stroke diesel engine and Port timing diagram for 2 stroke petrol engine**

**List of Experiments:**

1. I.C. Engines Valve & Port Timing Diagrams
2. Performance Test on Variable Compression Ratio single cylinder 4-Stroke petrol Engine By using Eddy Current Dynamometer
3. Performance Test on single cylinder 4 -Stroke Diesel Engine by using Mechanical Dynamometer
4. Performance test on twin cylinder 4-stroke diesel engine.
5. Performance Test on single cylinder 2-Stroke Petrol Engine.
6. Evaluation of Engine friction power by conducting Morse test on Multi cylinder 4-Stroke Petrol Engine.
7. Evaluation of Engine friction by conducting Retardation test on 4-stroke Diesel Engine.
8. I.C. Engine Heat Balance.
9. Performance test on PC based diesel Engine test rig.
10. Measurement of pollutants and smoke of I.C Engine.
11. Performance Test on Reciprocating Air – Compressor.
12. Performance Test on Vapour Compression Refrigeration Unit.
13. Performance Test on Air Conditioning Unit.
14. Assembly / Disassembly of Engines.
15. Viscosity of lubricants by using Redwood/ Say bolt viscometer Apparatus
16. Flash and Fire Point of fuels by using pesky Martin Apparatus
17. Carbon Residue test
18. Determination of calorific value of fuel using calorimeter.

**Laboratory Utilization:**

<b>S. No</b>	<b>Laboratory Name</b>	<b>Branch(s)</b>
1	Fuel Testing Lab	Mechanical - II Semester
2	THPM Lab	EEE-II Semester
2	Thermal Engineering lab	Mechanical - V Semester
3	Thermal Engineering lab	Aerospace - IV Semester
4	Advanced Thermal Engineering lab	Thermal Engineering(P.G)- I Semester
5	Mini Projects	Mechanical , Aerospace
6	Major Projects	Mechanical , Aerospace
7	Project based Lab Experimentation	Mechanical, Aerospace

**Lab In-charge****Faculty In-charge: Dr.V.Dhana Raju****Lab Helper: N.Narasimha Rao**