

ENERGY AUDIT REPORT

Shikshan Prasarak Mandali's,
TILAK COLLEGE OF EDUCATION,
S. P. College Campus, Pune 411 030



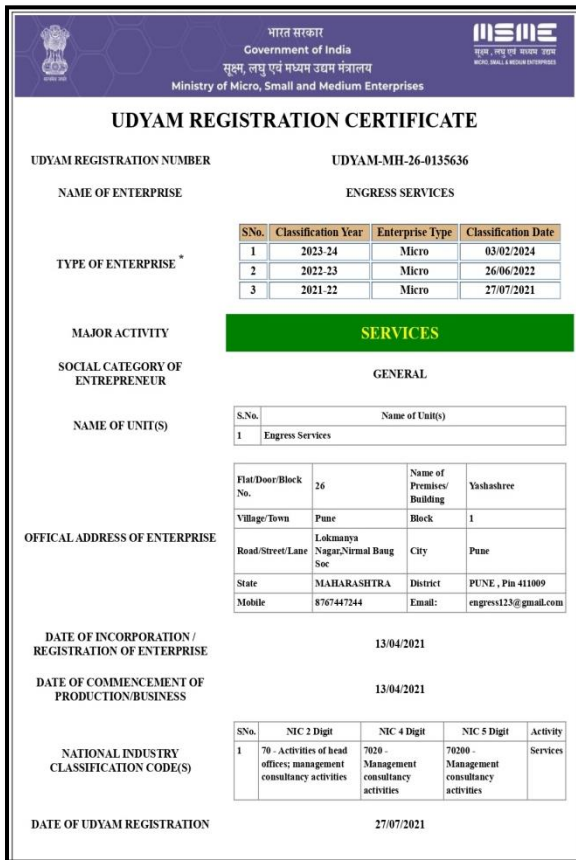
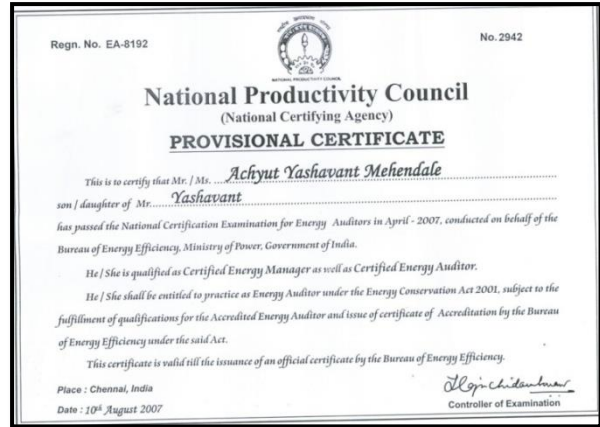
Year: 2023-24

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INDEX

Sr. No	Particulars	Page No
I	Acknowledgement	4
II	Executive Summary	5
III	Abbreviations	6
1	Introduction	7
2	Study of Connected Load	8
3	Study of Present Energy Consumption	9
4	Study of Energy Performance Index	10
5	Study of Lighting	11
6	Study of Renewable Energy & Energy Efficiency	12

ACKNOWLEDGEMENT

We at Engress Services, Pune, express our sincere gratitude to the management of Shikshan Prasarak Mandali's Tilak College of Education, S. P. College Campus, Pune 411 030, for awarding us the assignment of Energy Audit of their campus for the Academic Year: 2023-24.

We are thankful to all the Staff members for helping us during the field study.

EXECUTIVE SUMMARY

1. Shikshan Prasarak Mandali's Tilak College of Education, Pune consumes Energy in the form of **Electrical Energy**; used for various equipment.

2. Present Connected Load & Energy Consumption:

No	Particulars	Value	Unit
1	Total Connected Load		kW
2	Annual Energy Purchased	8703	kWh

3. Per Capita Energy Consumption:

No	Particulars	Value	Unit
1	Total Annual Energy Purchased	8703	kWh
2	Energy Generated by Solar PV Plant	12000	kWh
3	Total Energy Consumed= 1+2	20703	kWh
4	Total No of Students	451	Nos
5	Energy Performance Index =(3) / (4)	46	kWh/Annum

4. Study of % Usage of LED Lighting:

No	Particulars	Value	Unit
2	% of Usage of LED Lighting to Total Lighting Load	55	%

5. Renewable Energy & Energy Efficiency Projects:

- Usage of Energy Efficient LED fittings
- Installation of **10 kWp** Roof Top Solar PV Plant

6. Assumptions:

1. **1 kWh** of Electrical Energy releases **0.93 Kg of CO₂** into atmosphere
2. Energy generated by Roof Top Solar PV Plant: **4 kWh/kWp per Day**
3. Annual Solar Energy generation Days: **300 Nos**

7. References:

- Audit Methodology: www.mahaurja.com
- Energy Conservation Building Code: ECBC-2017: www.beeindia.gov.in
- For CO₂ Emissions: www.ccd.gujarat.gov.in
- For Solar PV Energy generation: www.solarrooftop.gov.in

ABBREVIATIONS

AC	:	Air conditioner
LED	:	Light Emitting Diode
PL	:	Pin Type Light Fitting
kWh	:	kilo-Watt Hour
Qty	:	Quantity
W	:	Watt
kW	:	Kilo Watt
D/L	:	Down Lighter
PC	:	Personal Computer
MT	:	Metric Ton

CHAPTER-I INTRODUCTION

1.1 Introduction:

An Energy Audit is conducted at Shikshan Prasarak Mandali's Tilak College of Education, S. P. College Campus, Pune 411 030.

The guidelines followed for conducting the Energy Audit are:

- BEE India's Energy Conservation Building Code: ECBC-2017
- Maharashtra Energy Development Agency (www.mahaurja.com)
- Tata Power: www.tatapower.com

1.2 Key Study Points:

No	Particulars
1	Study of Present Connected Load
2	Study of Present Energy Consumption
3	Study of Per Capita Energy Consumption
4	Study of Lighting
5	Study of Energy Efficiency & Renewable Energy

1.3 College Location Image:



College
Campus

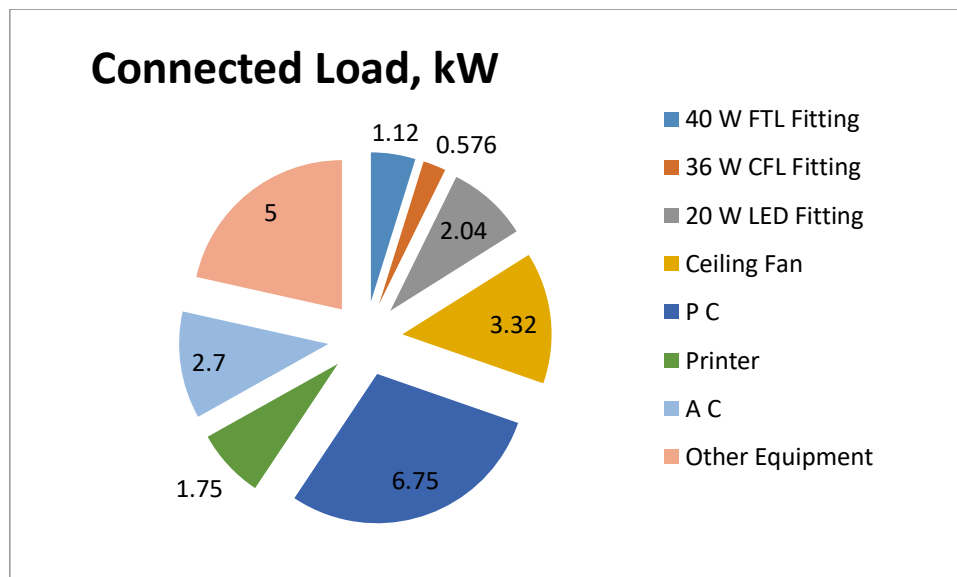
CHAPTER-II STUDY OF CONNECTED LOAD

The major contributors to the connected load of the College include:

Table No 1: Study of Equipment wise Connected Load:

No	Equipment	Qty	Load, W/unit	Load, kW
1	40 W FTL Fitting	28	40	1.12
2	36 W CFL Fitting	16	36	0.576
3	20 W LED Fitting	102	20	2.04
4	Ceiling Fan	51	65	3.32
5	P C	45	150	6.75
6	Printer	10	175	1.75
7	A C	2	1350	2.7
8	Other Equipment	25	200	5
9	Total			23.25

Chart No 1: Study of Connected Load:



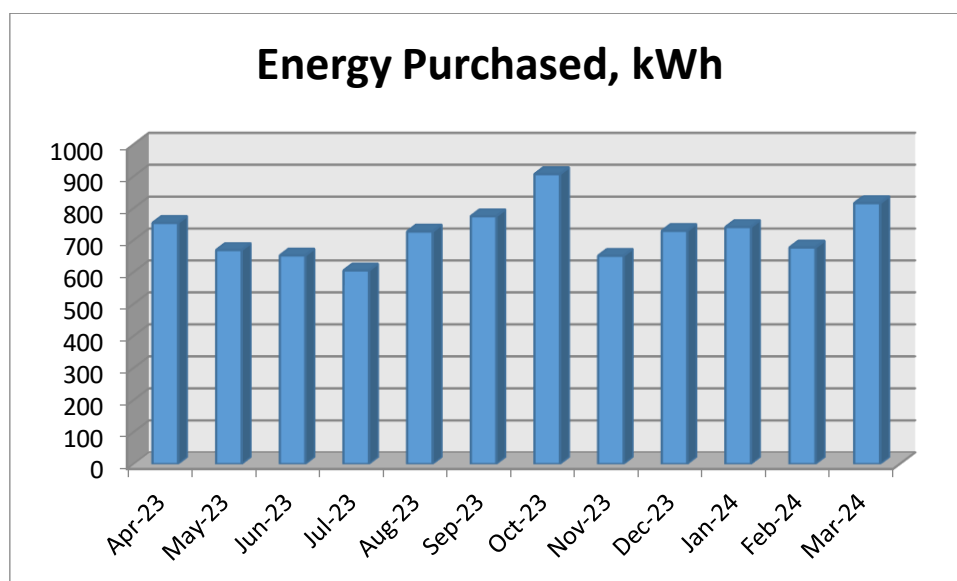
CHAPTER-III STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the analysis of Electrical Energy Consumption.

Table No 2: Electrical Energy Consumption Analysis- 2023-24:

No	Month	Energy Purchased, kWh	CO2 Emissions, MT
1	Apr-23	754	0.70
2	May-23	669	0.62
3	Jun-23	652	0.61
4	Jul-23	605	0.56
5	Aug-23	727	0.68
6	Sep-23	775	0.72
7	Oct-23	907	0.84
8	Nov-23	651	0.61
9	Dec-23	729	0.68
10	Jan-24	741	0.69
11	Feb-24	677	0.63
12	Mar-24	816	0.76
13	Total	8703	8.09
14	Maximum	907	0.84
15	Minimum	605	0.56
16	Average	725.25	0.67

Chart No 2: Variation in Monthly Energy Purchased, kWh:



CHAPTER-IV STUDY OF PER CAPITA ENERGY CONSUMPTION

Per Capita Energy Consumption Index: Per Capita Energy Consumption Index of an educational Institute/College is its Annual Energy Consumption in Kilo Watt Hours per student studying in the Institute/College.

It is determined by:

$$\text{Per Capita Energy Consumption Index} = \frac{\text{Annual Energy Consumption in kWh}}{\text{(Total No of students studying)}}$$

Now we compute the EPI for the College as under:

Table No 3: Computation of Energy Performance Index:

No	Particulars	Value	Unit
1	Total Annual Energy Purchased	8703	kWh
2	Energy Generated by Solar PV Plant	12000	kWh
3	Total Energy Consumed= 1+2	20703	kWh
4	Total No of Students	451	Nos
5	Energy Performance Index =(3) / (4)	46	kWh/Annum

CHAPTER-V

STUDY OF LIGHTING

Terminology:

1. Lumen is a unit of light flow or luminous flux. The lumen rating of a lamp is a measure of the total light output of the lamp. The most common measurement of light output (or luminous flux) is the lumen. Light sources are labeled with an output rating in lumens.

2. Lux is the metric unit of measure for illuminance of a surface. One lux is equal to one lumen per square meter.

3. Circuit Watts is the total power drawn by lamps and ballasts in a lighting circuit under assessment.

4. Installed Load Efficacy is the average maintained illuminance provided on a horizontal working plane per circuit watt with general lighting of an interior. Unit: lux per watt per square metre (lux/W/m²)

5. Lamp Circuit Efficacy is the amount of light (lumens) emitted by a lamp for each watt of power consumed by the lamp circuit, i.e. including control gear losses. This is a more meaningful measure for those lamps that require control gear. Unit: lumens per circuit watt (lm/W)

In this Chapter we compute the percentage usage of LED Lighting to total Lighting Load of the College.

Table No 4: Percentage Usage of LED Lighting to Total Lighting Load:

No	Particulars	Value	Unit
1	No of 40 W FTL Fittings	28	Nos
2	Load of 40 W FTL Fitting	40	W/unit
3	Total Load of 40 W FTL Fitting	1.12	kW
4	No of 36 W CFL Fittings	16	Nos
5	Load of 36 W CFL Fitting	36	W/unit
6	Total Load of 36 W CFL Fitting	0.576	kW
7	No of 20 W LED Fittings	102	Nos
8	Load of 20 W LED Fitting	20	W/unit
9	Total Load of 20 W LED Fitting	2.04	kW
10	Total LED Lighting Load = 9	2.04	kW
11	Total Lighting Load =3+6 9	3.736	kW
12	% of LED to Total Lighting Load=10*100/11	54.60	%

CHAPTER-VI

STUDY OF RENEWABLE ENERGY & ENERGY EFFICIENCY

6.1 Usage of Renewable Energy:

The College has installed:

- Roof Top Solar PV Plant of Capacity 50 kWp

Photograph of Roof Top Solar PV Plant:



6.2 Energy Efficiency Measures adopted:

- The College has Energy Efficient LED Fittings.

Photographs of LED Lighting:

