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)

6. Installed Power Density. The installed power density per 100 lux is the power needed per square metre of floor area to achieve 100 lux of average maintained illuminance on a horizontal working plane with general lighting of an interior. Unit: watts per square metre per 100 lux (W/m²/100 lux) 100 Installed power density (W/m²/100 lux)

7. Lighting Power Density: It is defined as Total Lighting Load in a room divided by the Area of that Room in square meters.

In this Chapter we compute the Lighting Power Density of Class Room and the percentage usage of LED Lighting to total Lighting Load of the College.
Now, we compute the usage of LED Lighting to Total Lighting Load, as under.
Table No 4: Computation of Lighting Power Density: IQAC Room:

No	Particulars	Value	Unit
1	Qty of 40 W Fittings in IQAC Room	2	Nos
2	Load of 40 W Fitting	40	W/unit
3	Total Load of 2 Nos, 40 W Fittings	80	W
4	Built up area of IQAC Room	26.76	m^2
5	**Lighting Power Density = (3)/(4)**	2.99	W/m^2

Table No 5: Percentage Usage of LED Lighting to Total Lighting Load:

No	Particulars	Value	Unit
1	No of 40 W FTL Fittings	240	Nos
2	Load per unit of 40 W FTL Fitting	40	W
3	Total Load of 40 W FTL Fittings	**9.6**	kW
4	No of 20 W LED Fittings	15	Nos
5	Load per unit of 20 W LED Fitting	20	W
6	Total Load of 20 W LED Fittings	**0.3**	kW
7	Total LED Lighting Load= 6	**0.3**	kW
8	Total Lighting Load= 3+6	**9.9**	kW
9	% of Usage of LEDs to Total Lighting Load=**7*100/8**	**3.03**	%

EXECUTIVE SUMMARY

1. Prabhakar Patil Education Society's, Arts, Commerce and Science College, Veshvi, Tal: Alibag, District: Raigad consumes Energy in the form of **Electrical Energy;** used for various gadgets, Office & other facilities.

2. Present Connected Load & Energy Consumption:

No	Particulars	Value	Unit
1	Total Connected Load	**43.58**	kW
2	Annual Energy Consumed	**30216**	kWh

3. Energy Performance Index:

No	Particulars	Value	Unit
1	Total Annual Energy Consumed	**30216**	kWh
2	Total Built up area of College	**4056.3**	m^2
3	Energy Performance Index =(1) / (2)	**7.45**	kWh/m^2

4. Study of Lighting Power Density & % Usage of LED Lighting:

No	Particulars	Value	Unit
1	Lighting Power Density	**2.99**	W/m^2
2	% of Usage of LED Lighting to Total Lighting Load	**3.03**	%

5. Renewable Energy & Energy Efficiency Projects:

- Usage of Energy Efficient LED fittings

6. Assumptions:

1. **1 kWh** of Electrical Energy releases **0.9 Kg** of CO_2 into atmosphere

7. References:

- Audit Methodology: www.mahaurja.com
- Energy Conservation Building Code: ECBC-2017: www.beeindia.gov.in
- For CO_2 Emissions: www.tatapower.com