SHYAM LAL COLLEGE

ENERGY AUDIT REPORT

Prepared by
EHS ALLIANCE SERVICES

Contents

CERTIFICATE No. EHSAC2124C

CERTIFICATE

M/s Shyam Lal College

University of Delhi

G.T. Road, Shahdara, New Delhi- 110032

Has been assessed by us for the comprehensive study of Energy Audit on institutional working framework to fulfill the requirement of

Energy Audit

The energy saving initiatives carried out by the college has been verified on the report submitted and was found to be satisfactory.

The efforts taken by management and faculty towards all type of energy used in college and sustainability are highly appreciated and noteworthy

Date of Audit: 17 Dec, 2021

BEE No.- EM7059
Manoj Kumar
For EHS Alliance Services
EHS ALLIANCE SERVICES

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1. INTRODUCTION AND BACKGROUND

Shyam Lal College (SLC), a co-educational constituent college of the University of Delhi, was established in 1964 by the great visionary and entrepreneur Padmashree (late) Shri Shyam Lal Gupta, the then Chairman of Shyam Lal charitable trust. The foundation stone of the college was laid down by Dr. Zakir Hussain, the then Hon'ble Vice President of India and Chancellor of the University of Delhi. The aim of the college, at the time of inception, was to make quality education accessible to the students, especially girls, from the economically and educationally disadvantaged community of East Delhi. Since its establishment in 1964, SLC has come a long way and has become a centre of academic excellence in University of Delhi.

The broad objective of Energy Audit is to review the present Energy consumption scenario, implementation status of Energy Saving & Conservation, monitoring and analyzing the use of Energy and further exploring the potential area of energy saving.

2.0 ENERGY CONSUMPTION

To understand the Energy Consumption trends and for analyzing the average monthly consumption we have collected electricity energy bills from Dec 20 to Nov 2021.

The details of **"Meter Connection"** at **Shyam Lal College** are as follows-

Name	**-**	**Shyam Lal College**
Address	**-**	**G.T. Road, Shahdara, New Delhi**
Supply Authority	-	BSES
Supply Voltage	-	HT Supply
CA No.	-	100011991
Cont. Demand	-	253 KVA

2.1 ENERGY AUDIT TEAM

Energy Audit team detail is given below:-

1. Manoj Kumar
2. Krishnalal
3. Pawan Kumar

Audit participants from SLC:

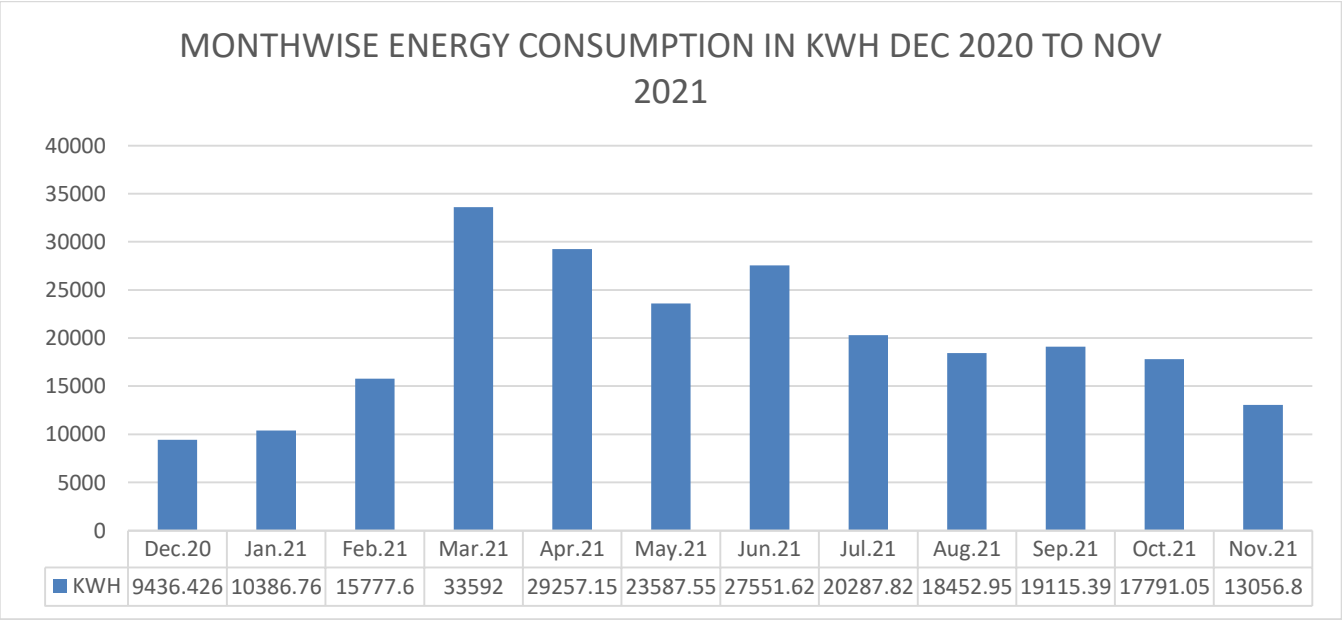
Name	**Position/Department**
Prof. (Dr.) Rabi Narayan Kar	Principal of Shyam Lal College
Ms. Niti Agrawal	Associate Professor - Physics
Prof. Kusha Tiwari	Convener, Garden Committee
Mr Atul Kumar Jain	Administrative Officer
Dr. Sunaina Zutshi	Member, Eco Club and Garden Committee
Mr. Anand Singh	Office Attendant

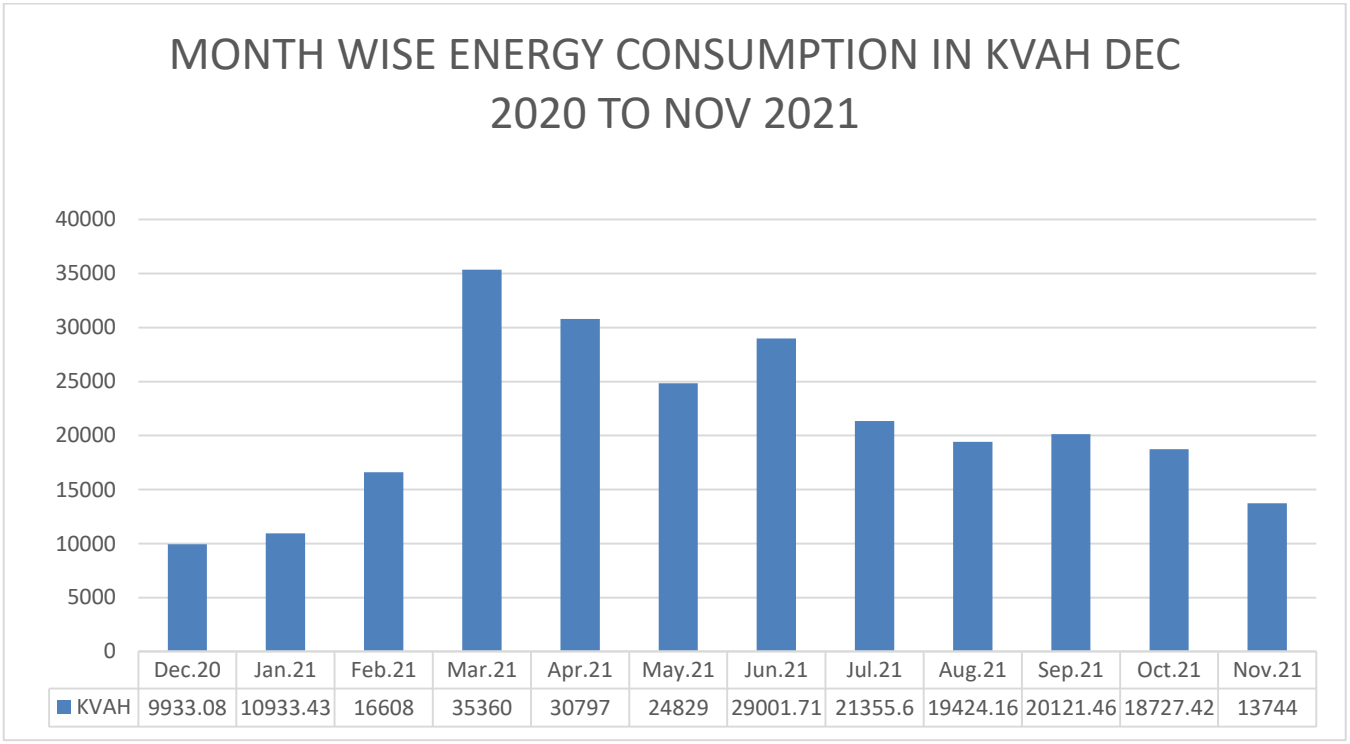
3.0 Review of Electricity Bills, Contract Demand, Power Factor

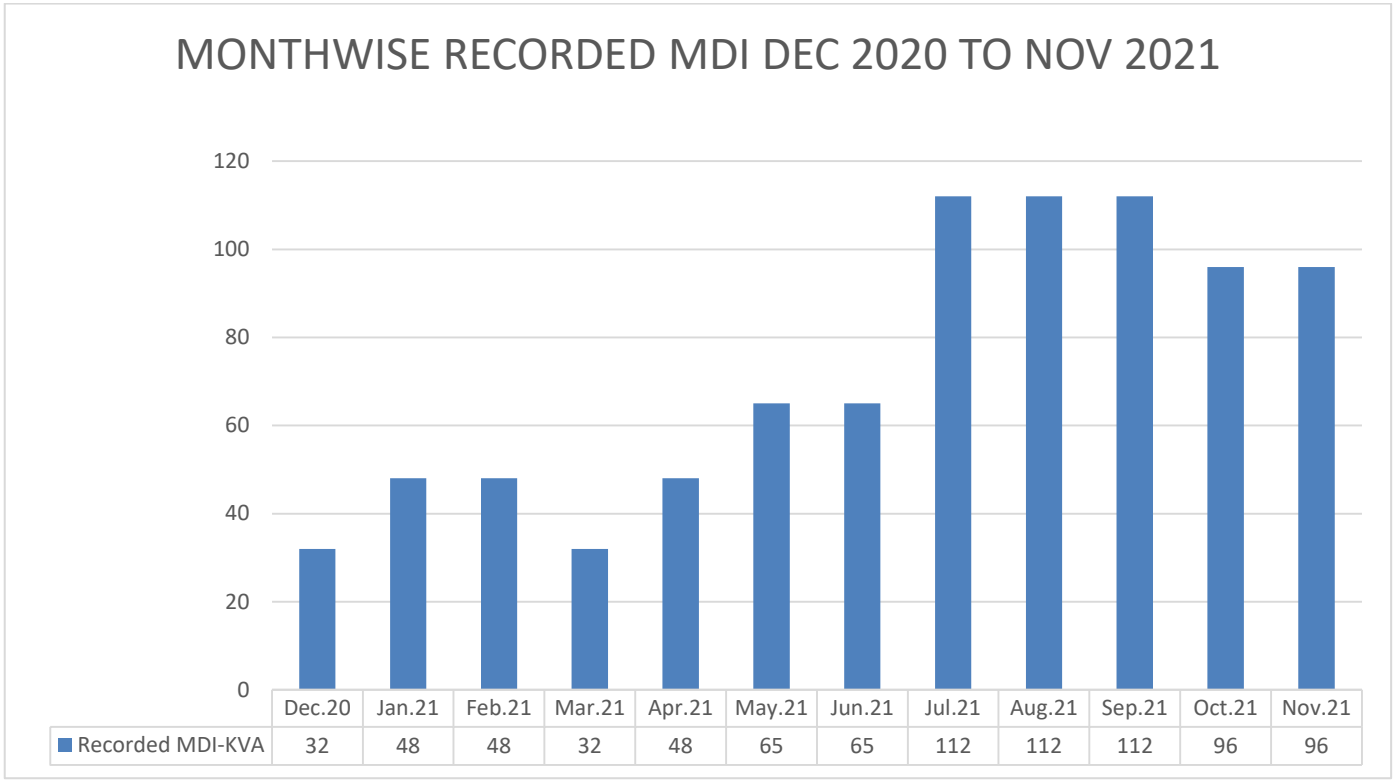
3.1 SUMMARY OF MONTHLY ELECTRICITY CONSUMPTION AND TOTAL BILL AMOUNT

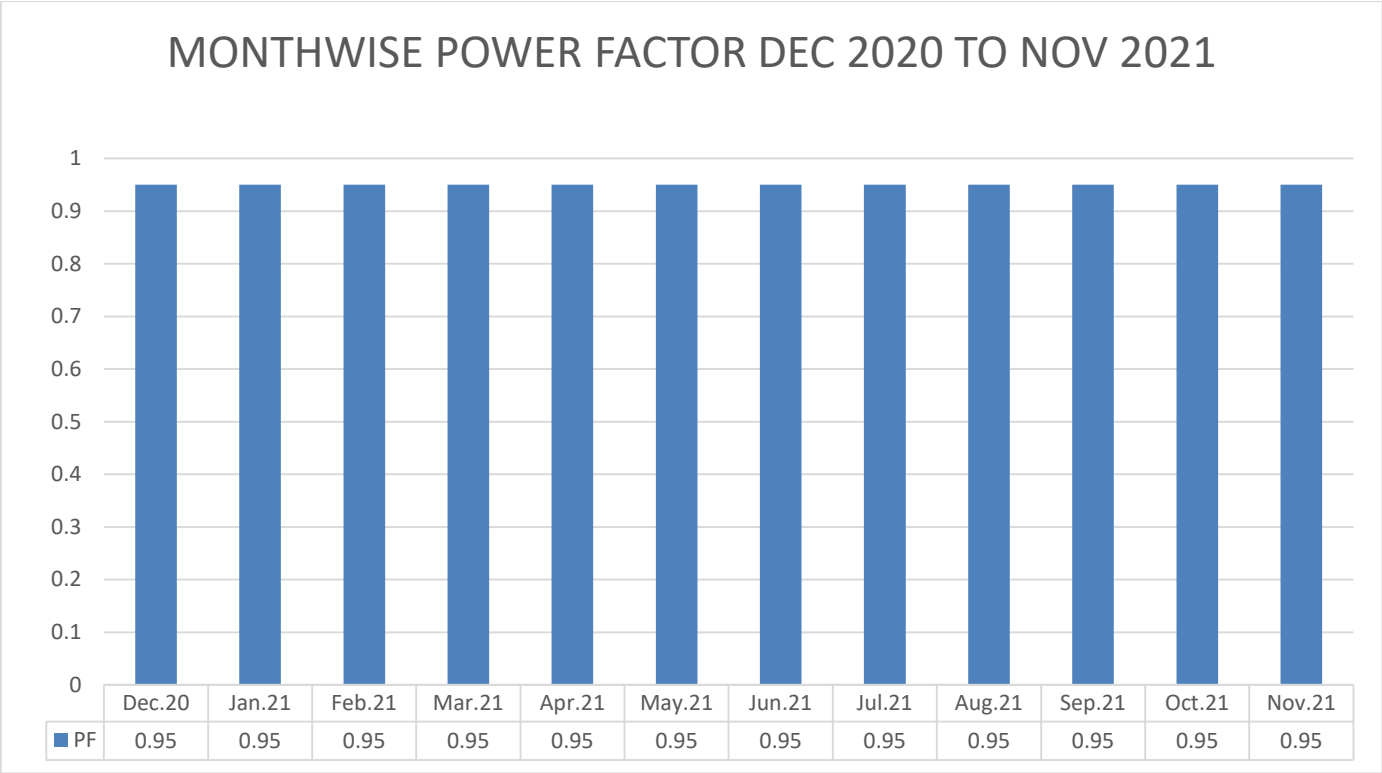
To understand the Energy consumption trend and for developing the baseline parameter we have collected monthly energy bill for the last available 12 month i.e. from Dec 20 to Nov 21.

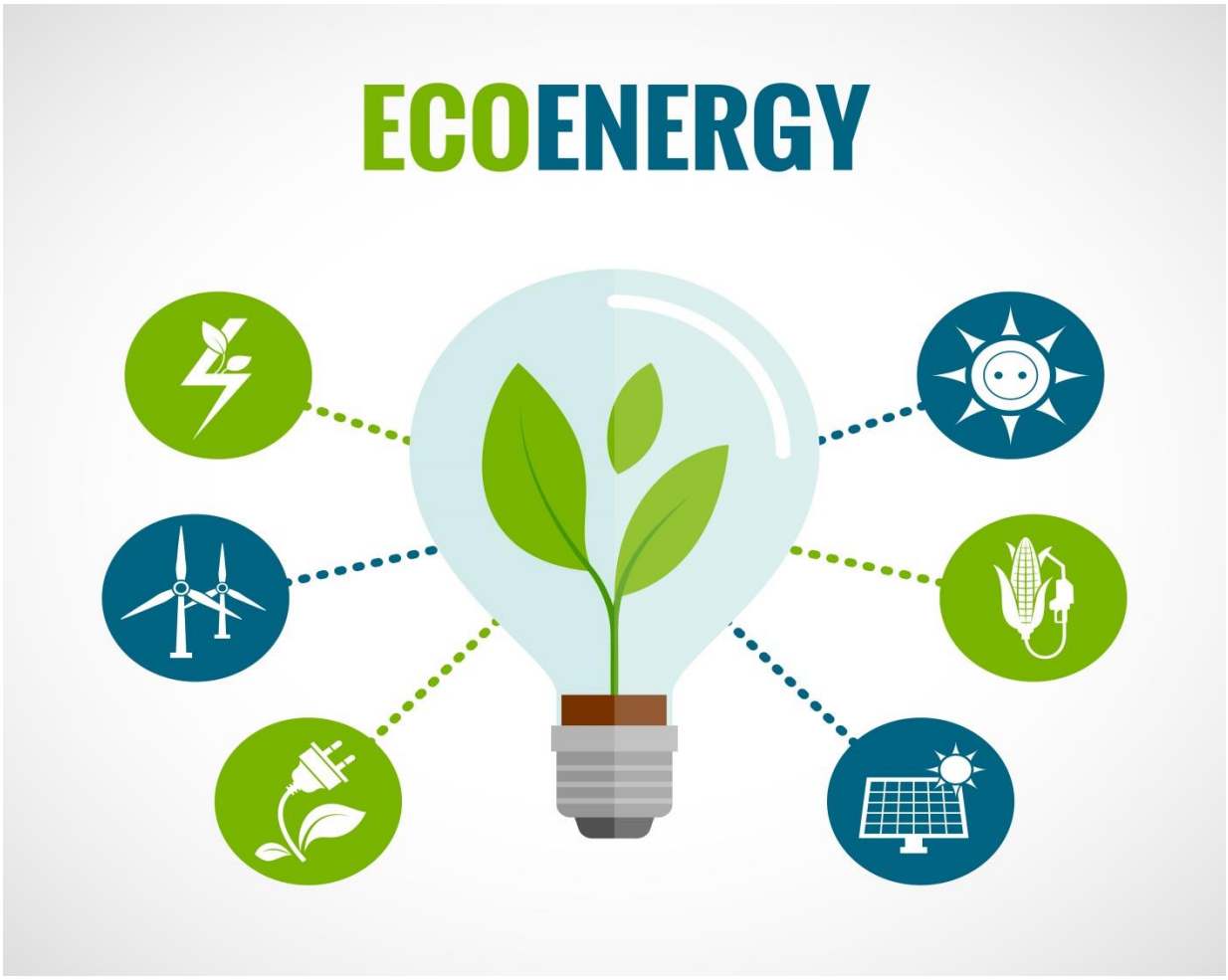
MONTH WISE ELECTRICITY BILL DEC 2020 TO NOV 2021						
SR. No.	Period	KWH	KVAH	Contract Demand-KVA	Recorded MDI-KVA	PF
1	Dec.20	9436.426	9933.08	253	32	0.95
2	Jan.21	10386.7585	10933.4	253	48	0.95
3	Feb.21	15777.6	16608	253	48	0.95
4	Mar.21	33592	35360	253	32	0.95
5	Apr.21	29257.15	30797	253	48	0.95
6	May.21	23587.55	24829	253	65	0.95
7	Jun.21	27551.6245	29001.7	253	65	0.95
8	Jul.21	20287.82	21355.6	253	112	0.95
9	Aug.21	18452.952	19424.2	253	112	0.95
10	Sep.21	19115.387	20121.5	253	112	0.95
11	Oct.21	17791.049	18727.4	253	96	0.95
12	Nov.21	13056.8	13744	253	96	0.95




MONTH WISE ENERGY CONSUMPTION IN KVAH DEC 2020 TO NOV 2021
40000
35000
30000
25000
20000
15000
10000
5000
0
Dec.20 Jan.21 Feb.21 Mar.21 Apr.21 May.21 Jun.21 Jul.21 Aug.21 Sep.21 Oct.21 Nov.21
KVAH 9933.08 10933.43 16608 35360 30797 24829 29001.71 21355.6 19424.16 20121.46 18727.42 13744


MONTHWISE RECORDED MDI DEC 2020 TO NOV 2021
120
100
80
60
40
20
0
Dec.20 Jan.21 Feb.21 Mar.21 Apr.21 May.21 Jun.21 Jul.21 Aug.21 Sep.21 Oct.21 Nov.21
Recorded MDI-KVA 32 48 48 32 48 65 65 112 112 112 96 96


MONTHWISE POWER FACTOR DEC 2020 TO NOV 2021
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Dec.20 Jan.21 Feb.21 Mar.21 Apr.21 May.21 Jun.21 Jul.21 Aug.21 Sep.21 Oct.21 Nov.21
PF 0.95 0.95 0.95 0.95 0.95 0.95 0.95 0.95 0.95 0.95 0.95 0.95


ECOENERGY

4.0 ANALYSIS OF DG SETS

Shyam Lal Collegeis having two nos. Diesel Generator (DG) sets for its electrical power needs in case of BSES power failure. Total installed DG sets capacity is 125KVA.

- (DG-1) Kirloskar :- 125 kVA

During the energy audit study; performance of DG Sets has been carried out which detail is given below:-

5.1 Performance of DG Set-1

DG Set Performance		
Description	**Unit**	**DG**
Design details:		
Rated capacity	kVA	**125**
Hz		**50**
Make		Kirloskar
Volts	Volts	415
PF		0.8
Phase		3
RPM		1500
Mfg.		2010
Operating details:		
Operating hours during testing	Hours	0.50
% Loading	%	66.34
Energy Generation	kWh	32.78
Load	KVA	82.9
Fuel consumption during testing	Liters	10.10
Specific energy generation	kWh/liter	**3.25**

Observation and Suggestions:- As per the trial taken during the energy audit the percentage loading of DG set is 66.34% which is ok and specific energy consumption of DG Sets 3.25 KWH/Liter which is satisfactory because as per manufacturer recommendation, best practices for SEC in DG sets range from 3.0 to 3.5 kWh/litre and above.

5.0 AC SYSTEM

There are Split ACs installed in Shyam Lal College Offices in various areas of various capacity which detail is given below:-

Energy Efficiency Ratio (EER):

Performance of smaller chillers and rooftop units is frequently measured in EER rather than kW/ton. EER is calculated by dividing a chiller's cooling capacity (in Btu/h) by its power input (in watts) at full-load conditions. The higher the EER, the More efficient the unit.

- The cooling effect produced is quantified as tons of refrigeration. (TR)
  The above TR is also called as air-conditioning tonnage.

Location	Type of AC	Rated capacity (TR)	Room Temp. (°C)	AC-Tout (°C)	AC-Tin (°C)	Room-RH (%)	Area (m2)	Air velocity (m/s)	Enthalpy Hout	Enthalpy Hin	Heat Load in TR	KW supplied	(Eff.)Power per Ton (KW/TON)	EER
THEORETICAL LAB(UNDER STAIR)	Split	1.5	24	12	20	52	0.03	2.6	25	38	0.35	0.57	1.61	2.18
PHYSICS LABORATORY	Split	2	22	10.5	21	52	0.062	2.4	22	39	0.88	1.53	1.74	2.02
	Split	2	22	10.5	20	52	0.062	2.1	21	38	0.77	1.28	1.67	2.10
ELECTRONICS LABORATORY	Window	1.5	22	11.5	22	52	0.03	2.1	23	43	0.44	0.77	1.77	1.99
MORNING OFFICE	Split	1.5	23	12	20	52	0.03	2.6	25	38	0.35	0.62	1.76	2.00
	Window	2	24	11	19	53	0.062	2.6	24	38	0.78	1.45	1.85	1.90
	Window	2	24	10.5	20	53	0.062	2.2	21	38	0.81	1.45	1.80	1.95
	Window	2	24	12	22	53	0.062	2.1	25	43	0.81	1.41	1.73	2.04
	Window	2	24	11	21	53	0.062	2.2	22	41	0.90	1.44	1.60	2.19
	Window	1.5	24	12	21	53	0.03	2.3	24	39	0.36	0.65	1.82	1.94
	Window	1.5	24	11.5	19	53	0.03	2.3	23	38	0.36	0.64	1.79	1.96
PRINCIPAL OFFICE	Split	1.5	23	13	22	53	0.03	2.2	26	42	0.37	0.60	1.63	2.16
	Split	2	23	11	21	53	0.062	2.1	22	41	0.86	1.44	1.67	2.11
	Split	2	23	11	20	53	0.062	2.3	22	39	0.84	1.37	1.62	2.17
	Window	2	24	10.5	18	52	0.062	2.5	21	37	0.86	1.46	1.70	2.07
LIBRARY RESOURCE ROOM	Split	2	23	12	22	53	0.062	2	24	42	0.78	1.36	1.75	2.01
	Split	2	23	11	21	53	0.062	2.1	22	41	0.86	1.44	1.67	2.11
	Split	2	23	11	20	53	0.062	2.3	22	39	0.84	1.37	1.62	2.17
PWD ROOM	Split	1.5	24	11	20	52	0.03	2.3	22	38	0.38	0.65	1.69	2.08

LIBRARIAN ROOM	Split	2	23	12	21	53	0.062	2.1	24	41	0.77	1.32	1.72	2.04
ROOM NO - 11	Split	1.5	24	11	19	52	0.03	2.6	24	37	0.35	0.64	1.83	1.92
POTA CABIN-4	Split	1.5	24	10	18	52	0.03	2.4	24	37	0.33	0.58	1.78	1.97
	Window	1.5	24	11.5	19	53	0.03	2.3	23	38	0.36	0.64	1.79	1.96
IQAC ROOM (P5)	Split	2	23	10.5	20	53	0.062	2.4	22	39	0.88	1.48	1.68	2.09
CHEMISTRY LABORATORY	Split	2	23	11	21	53	0.062	2	22	41	0.82	1.42	1.73	2.03
	Window	2	24	11	19	52	0.062	2.4	22	37	0.78	1.38	1.78	1.98
ROOM NO 17(CCTV ROOM)	Split	2	23	11	21	53	0.062	2	22	41	0.82	1.42	1.73	2.03
SERVER ROOM	Split	1.5	24	12	22	51	0.03	2	25	43	0.38	0.63	1.68	2.09
	Window	2	24	11	18	52	0.062	2.5	22	37	0.81	1.43	1.77	1.98
	Window	2	24	11.5	20	52	0.062	2.3	23	38	0.74	1.36	1.83	1.92
COMPUTER LAB-1	Window	2	24	11	19	52	0.062	2.4	22	37	0.78	1.38	1.78	1.98
	Window	2	24	12	21	52	0.062	2.5	25	39	0.75	1.36	1.80	1.95
	Split	2	23	10	19	53	0.062	2.2	21	38	0.81	1.40	1.74	2.03
COMPUTER LAB-2	Split	2	23	11	18	53	0.062	2.3	22	37	0.74	1.32	1.78	1.98
	Split	2	23	10.5	20	53	0.062	2.4	22	39	0.88	1.46	1.66	2.11
SPORTS DEPARTMENT	Split	2	23	12	22	53	0.062	2.1	24	42	0.81	1.35	1.65	2.13
BOARD ROOM (106)	Split	2	23	11	19	51	0.062	2.4	23	37	0.72	1.34	1.85	1.90
	Split	2	23	11	20	51	0.062	2.4	23	38	0.78	1.37	1.76	1.99
SEMINAR HALL	Split	2	23	11	21	53	0.062	2.2	22	41	0.90	1.46	1.63	2.16
	Split	2	23	11	20	53	0.062	2.2	22	39	0.81	1.33	1.65	2.13
	Split	2	23	11	21	51	0.062	2.3	24	39	0.74	1.29	1.74	2.03
	Split	2	23	12	21	51	0.062	2.5	25	39	0.75	1.27	1.69	2.09
FACULTY ROOM	Window	1.5	24	12	21	52	0.03	2.2	24	39	0.34	0.66	1.92	1.83

Remarks: - We have checked Energy Efficiency Ratio of all AC's and EER of all AC's is acceptable.

6.0 CEILLING FANS

In the Shyam Lal Collegepremises 498 nos. Ceiling Fans are installed and observation and suggestion are given below:-

CEILING FANS DETAILS		
SL. NO.	**DEPARTMENTS/ CLASSROOM**	**CEILING FAN (60 WATT)**
1	ROOM NO -1	5
2	ROOM NO -2	2
3	ROOM NO -3	4
4	ROOM NO -4	2
5	ROOM NO -5	4
6	ROOM NO -6	3
7	ROOM NO -7	3
8	ROOM NO -8	4
9	THEORYTICAL LAB(UNDER STAIR)	1
10	PHYSICS LABORATORY	24
11	ROOM NO -9	3
12	ROOM NO -10	5
13	ELECTRONICS LABORATORY	3
14	MORNING OFFICE	6
15	PRINCIPAL OFFICE	4
16	STAFFROOM	5
17	LIBRARY HALL G.F.	3
18	POTA CABIN -3	4
19	ELECTRICIAN ROOM	2
20	ROOM NO - 11	2
21	POTA CABIN-4	2
22	IQAC ROOM (P5)	5
23	GUARD ROOM	1
24	S.UNIAN ROOM	1
25	SAFAI KARMI ROOM	1

26	IGNOU LIBRARY	2
27	CANTEEN	12
28	CHEMISTRY LABORATORY	17
29	ROOM NO - 28	5
30	ROOM NO 19	5
31	ROOM NO 18	5
32	ROOM NO 17(CCTV ROOM)	2
33	ROOM NO 16	5
34	COMPUTER LAB-2	3
35	ROOM NO-20	4
36	ROOM NO-21	4
37	ROOM NO-22	4
38	ROOM NO-23	4
39	ROOM NO-24	4
40	ROOM NO-25	4
41	ROOM NO-26	2
42	ROOM NO-27	2
43	GCR	8
44	LIBRARY HALL	20
45	ROOM NO - 29	2
46	ROOM NO - 30	2
47	ROOM NO - 31	2
48	ROOM NO - 32	2
49	ROOM NO - 33	2
50	ROOM NO - 34	2
51	ROOM NO - 35	2
52	ROOM NO - 36	2
53	ROOM NO - 37	2
54	ROOM NO - 38	1
55	ROOM NO - 39	2
56	ROOM NO - 40	6
57	ROOM NO - 41	5
58	POTACABIN STORE-1	2
59	POTACABIN STORE-2	2
60	SPORTS DEPARTMENT	6

61	COMPUTER LAB -3	4
62	COMPUTER LAB-4	4
63	BIOLOGY LAB	4
64	NEW BUILDING PORTA CABINS	0
65	ROOM NO - 101	10
66	ROOM NO - 102	10
67	ROOM NO - 103A	4
68	ROOM NO - 103B	4
69	ROOM NO - 104	10
70	ROOM NO - 105	10
71	BOARD ROOM (106)	10
72	ROOM NO - 107A	4
73	ROOM NO - 107B	4
74	ROOM NO - 108A	4
75	ROOM NO - 108B	4
76	ROOM NO - 109A	4
77	ROOM NO - 109B	4
78	ROOM NO - 110A	4
79	ROOM NO - 110B	4
80	SEMINAR HALL	12
81	ROOM NO - 201	10
82	ROOM NO - 202	10
83	ROOM NO - 203	10
84	ROOM NO - 204	10
85	ROOM NO - 205	10
86	ROOM NO - 206	10
87	ROOM NO - 207	10
88	ROOM NO - 208	10
89	ROOM NO - 209	10
90	PANEL ROOM	2
91	FACULTY ROOM	2
92	NEW CONSTRUCTED CLASSROOM & COMPUTER LABORATORIES AT SECOND FLOOR	
93	COMPUTER LAB-I	6
94	COMPUTER LAB-II	6

95	COMPUTER LAB-III	6
96	CLASSROOM-1	2
97	CLASSROOM-2	4
98	CLASSROOM-3	2
99	CLASSROOM-4	4
100	CLASSROOM-5	2
101	CLASSROOM-6	2
102	STP	3
	TOTAL	**498**

ECRM-1-Energy saving by replacing 60W fans with energy efficient 30W ceiling fans

Total no of Ceiling Fans (60W)	-	498	Nos.
Total wattage of 60W Ceiling Fans	-	29880	Watt
Total wattage of BEE 5 Star rated Fans (30W)	-	14940	Watt
Total saving in Wattage after replacement	-	14940	Watt
Operating hours per day	-	8	Hours
Operating days per annum	-	240	Days
Energy charges per unit in Rs.	-	8.5	Rs.
Saving in Rs./annum	-	2,43,820.80	INR
Investment INR	-	14,94,000.00	INR
Payback period:- Months	-	73.53	Months

Note:- Energy saving will increase or decrease if operating hours of machine /equipment will be increase or decrease and payback period will also increase or decrease if cost of investment(Cost of machine/equipment/accessories of machine) will increase or decrease because cost of investment is taken on tentative basis.

7.0 ANALYSIS OF LIGHTING SYSTEM

7.1 Brief description of existing system

For assessing energy efficiency of lighting system, Inventory of the Lighting System has been noted / collected, with the aid of a lux meter, measurement and documentation of the lux levels at various locations at working level has been done.

7.2 Inventory of Lighting

LIGHTING DETAILS				
S.NO.	**DEPARTMENTS/ CLASSROOM**	**LED LIGHTS**	**FLURECENT LIGHT (40 WATT)**	**CFL LIGHTS (18 WATT)**
1	ROOM NO -1	6 (20 WATT)	0	0
2	ROOM NO -2	4(20 WATT)	0	0
3	ROOM NO -3	5(20 WATT)	0	0
4	ROOM NO -4	4(20 WATT)	0	0
5	ROOM NO -5	5(20 WATT)	0	0
6	ROOM NO -6	4(20 WATT)	1	0
7	ROOM NO -7	4(20 WATT)	2	0
8	ROOM NO -8	4(20 WATT)	1	0
9	CORIDOOR (ROOM NO 1 TO 8)	0	6	0
10	THEORETICAL LAB(UNDER STAIR)	0	3	0
11	PHYSICS LABORATORY	29(13 -36 WATT & 16 - 20 WATT)	13	0
12	ROOM NO -9	0	8	0
13	ROOM NO -10	4(36 WATT)	9	0
14	ELECTRONICS LABORATORY	0	12	0
15	CORIDOOR (PHYSICS LAB TO LADIES TOILET G.F.)	0	5	0
16	LADIES TOILET(G.F.)	0	2	0
17	VERANDHA G.F.	6(20 WATT)	10	0
18	CORIDOOR (LIBRARY GENTS TOILET G.F.)	0	3	0
19	GENTS TOILET(G.F.)	0	2	0

20	CORIDOOR (PRINCIPAL OFFICE TO STAFF ROOM)	15(18 WATT)	0	0
21	MORNING OFFICE	9(18 WATT)	4	37
22	PRINCIPAL OFFICE	10(6 -36 WATT)	5	0
23	STAFF ROOM	0	1	18
24	MAIN PORCH	15(18 WATT)	0	0
25	HOUSE KEEPING ROOM	0	1	0
26	OLD IGNOU OFFICE	0	0	0
27	LIBRARY RESOURCE ROOM	0	0	18
28	PWD ROOM	0	0	2
29	LIBRARIAN ROOM	0	1	3
30	LIBRARY HALL G.F.	2(18 WATT)	4	0
31	LIBRARY PROPERTY COUNTER	0	2	0
32	READING ROOM	0	0	12
33	POTA CABIN -2	0	0	6
34	POTA CABIN -3	0	1	6
35	ELECTRICIAN ROOM	0	4	0
36	ROOM NO - 11	0	4	0
37	POTA CABIN-4	2(18 WATT)	0	3
38	IQAC ROOM (P5)	3(18 WATT)	0	8
39	GUARD ROOM	0	2	0
40	S.UNIAN ROOM	0	2	0
41	STORE A/C	0	1	0
42	SAFAI KARMI ROOM	0	1	0
43	GENRAL TOILET	0	5	0
44	H. TOILET -LADIES	0	1	0
45	H. TOILET -GENTS	0	1	0
46	IGNOU LIBRARY	0	4	0
47	CANTEEN	0	24	0
48	STAIRS (ROOM NO 1 TO S.FLOOR)	0	1	0
49	STAIRS (PHYSICS TO CHEMISTRY LAB)	0	1	0
50	STAIRS (STAFFROOM TO GCR)	0	1	0

51	STAIRS (PRINCIPAL OFFICE TO F.FLOOR)	0	0	0
52	CHEMISTRY LABORATORY	6(36 WATT)	63	0
53	ALUMINUM CABIN	2(18 WATT)	0	0
54	ROOM NO - 28	2(36 WATT)	10	0
55	ROOM NO 15			
56	LADIES TOILET(F.F.)	0	2	0
57	CORIDOOR (CHEMISTRY LAB TO LADIES TOILET F.F.)	0	5	0
58	ROOM NO 19	0	5	0
59	ROOM NO 18	0	4	0
60	ROOM NO 17(CCTV ROOM)	4(18 WATT)	0	0
61	ROOM NO 16	0	5	0
62	SERVER ROOM	0	0	3
63	COMPUTER LAB-1	0	0	15
64	COMPUTER LAB-2	4(18 WATT)	2	0
65	STORE-COMPUTER LAB	0	1	0
66	ROOM NO-20	0	5	0
67	ROOM NO-21	0	5	0
68	ROOM NO-22	0	5	0
69	ROOM NO-23	0	5	0
70	ROOM NO-24	0	5	0
71	ROOM NO-25	0	5	0
72	ROOM NO-26	0	3	0
73	ROOM NO-27	0	3	0
74	GCR	0	7	0
75	GCR TOILET	0	1	0
76	CORIDOOR (COMPUTER LAB TO GCR)	0	19	0
77	CORIDOOR (LIBRARY HALL TO GENTS TOILET)	0	3	0
78	SAIRS F.F. TO S.F.	0	0	0
79	LIBRARY HALL	0	60	0
80	LIBRARY GENRAL SECTION	0	30	0

81	LIBRARY STAIR G.F. TO GENRAL SECTION	0	2	0
82	GENTS TOILET F.F.	0	2	0
83	STAIRS F.F. TO S.F.	0	0	0
84	ROOM NO - 29	0	3	0
85	ROOM NO - 30	0	3	0
86	ROOM NO - 31	0	3	0
87	ROOM NO - 32	0	2	0
88	ROOM NO - 33	0	3	0
89	ROOM NO - 34	0	3	0
90	ROOM NO - 35	0	1	0
91	ROOM NO - 36	0	3	0
92	ROOM NO - 37	0	3	0
93	ROOM NO - 38	0	3	0
94	ROOM NO - 39	0	3	0
95	ROOM NO - 40	0	9	0
96	ROOM NO - 41	0	10	0
97	LADIES TOILET S.F.	0	2	0
98	GENTS TOILET S.F.	0	2	0
99	MUMTY	0	2	0
100	CORIDOOR (ROOM NO 29 TO 40 & 41)	0	15	0
101	POTACABIN STORE-1	6(18 WATT)	0	0
102	POTACABIN STORE-2	6(18 WATT)	0	0
103	SPORTS DEPARTMENT	2(18 WATT)	8	4
104	STAFF TOILET S.D.	0	2	0
105	STUDENT TOILET S.D.	1(18 WATT)	1	0
106	COMPUTER LAB -3	0	12	0
107	COMPUTER LAB-4	0	12	0
108	BIOLOGY LAB	0	12	0
	TOTAL	**164**	**277**	**135**
NEW BUILDING PORTA CABINS				
1	ROOM NO - 101	0	11	0
2	ROOM NO - 102	0	12	0
3	ROOM NO - 103A	0	6	0

4	ROOM NO - 103B	0	4	0
5	ROOM NO - 104	0	12	0
6	ROOM NO - 105	0	12	0
7	BOARD ROOM (106)	13(36 WATT)	0	0
8	ROOM NO - 107A	0	5	0
9	ROOM NO - 107B	0	6	0
10	ROOM NO - 108A	0	6	0
11	ROOM NO - 108B	0	4	0
12	ROOM NO - 109A	0	6	0
13	ROOM NO - 109B	0	6	0
14	ROOM NO - 110A	0	7	0
15	ROOM NO - 110B	0	6	0
16	SEMINAR HALL	0	0	28
17	ROOM NO - 201	0	12	0
18	ROOM NO - 202	0	12	0
19	ROOM NO - 203	0	12	0
20	ROOM NO - 204	0	12	0
21	ROOM NO - 205	0	12	0
22	ROOM NO - 206	0	12	0
23	ROOM NO - 207	0	12	0
24	ROOM NO - 208	0	12	0
25	ROOM NO - 209	0	12	0
26	PANEL ROOM	0	5	0
27	FACULTY ROOM	0	4	0
28	GENTS TOILET	0	3	0
29	LADIES TOILET	0	6	0
30	HANDICAPED TOILET	0	2	0
31	CORIDOOR G.FLOOR	0	25	0
32	CORIDOOR F.FLOOR	0	24	0
	TOTAL	**13**	**280**	**28**
NEW CONSTRUCTED CLASSROOM & COMPUTER LABORATORIES AT SECOND FLOOR				
1	COMPUTER LAB-I	12(36 WATT)	0	0
2	COMPUTER LAB-II	12(36 WATT)	0	0
3	COMPUTER LAB-III	12(36 WATT)	0	0
4	CLASSROOM-1	6(36 WATT)	0	0

5	CLASSROOM-2	12(36 WATT)	0	0
6	CLASSROOM-3	6(36 WATT)	0	0
7	CLASSROOM-4	12(36 WATT)	0	0
8	CLASSROOM-5	9(36 WATT)	0	0
9	CLASSROOM-6	9(36 WATT)	0	0
10	CORIDOOR (COMPUTER LAB TO ROOM NO-29)	9(36 WATT)	0	0
11	CORIDOOR (ROOM NO 39 TO NEW SEMINAR)	8(18 WATT)	0	0
12	STP	6(36 WATT)	0	0

S.NO.	**PLACE**	**LED BULB/LIGHT (POLE LIGHTS) (18 WATT)**	**LED FLOOD LIGHTS (150 WATT)**
1	GARDEN-I (FRONT OF MORNING OFFICE)	34	1
2	GARDEN-2 (FRONT OF MAIN PORCH)	16	2
3	GARDEN-3(FRONT OF NEW BUILDING)	26	5
4	GARDEN-4(BEHIND OF NEW BUILDING)	0	7
5	STUDENT PARKING	0	2
6	STAFF PARKING	0	1
7	MAIN ENTRY GATE NO- 1	0	2
8	ENTRY GATE NO - 3	0	1
9	STREET LIGHTS NEAR POTA CABIN 1,2,3	0	1
10	PORCH TERRACE	0	3
11	TERRACE OF SPORTS DEPARTMENT	0	2

7.3 Lux Measurement

SL.NO.	DEPARTMENTS/ CLASSROOM	LUX LEVEL
1	ROOM NO -1	60 to 170
2	ROOM NO -2	65 to 194
3	ROOM NO -3	70 to 200
4	ROOM NO -4	60 to 205
5	ROOM NO -5	65 to 204
6	ROOM NO -6	54 to 198
7	ROOM NO -7	54 to 203
8	ROOM NO -8	67 to 210
9	CORIDOOR (ROOM NO 1 TO 8)	40 to 80
10	THEORETICAL LAB(UNDER STAIR)	130 to 220
11	PHYSICS LABORATORY	125 to 230
12	ROOM NO -9	34 to 194
13	ROOM NO -10	45 to 200
14	ELECTRONICS LABORATORY	134 to 210
15	CORIDOOR (PHYSICS LAB TO LADIES TOILET G.F.)	35 to 85
16	LADIES TOILET(G.F.)	34 to 68
17	VERANDHA G.F.	50 to 150
18	CORIDOOR (LIBRARY GENTS TOILET G.F.)	25 to 65
19	GENTS TOILET(G.F.)	26 to 67
20	CORIDOOR (PRINCIPAL OFFICE TO STAFF ROOM)	26 to 70
21	MORNING OFFICE	120 to 203
22	PRINCIPAL OFFICE	150 to 230
23	STAFF ROOM	98 to 210
24	MAIN PORCH	50 to 140
25	HOUSE KEEPING ROOM	50 to 130
26	OLD IGNOU OFFICE	130 to 201
27	LIBRARY RESOURCE ROOM	130 to 203
28	PWD ROOM	123 to 210
29	LIBRARIAN ROOM	90 to 200
30	LIBRARY HALL G.F.	150 to 240

31	LIBRARY PROPERTY COUNTER	120 to 203
32	READING ROOM	150 to 230
33	POTA CABIN -2	98 to 201
34	POTA CABIN -3	95 to 210
35	ELECTRICIAN ROOM	80 to 186
36	ROOM NO - 11	85 to 200
37	POTA CABIN-4	120 to 198
38	IQAC ROOM (P5)	100 to 196
39	GUARD ROOM	50 to 140
40	S.UNIAN ROOM	120 to 202
41	STORE A/C	98 to 198
42	SAFAI KARMI ROOM	45 to 130
43	GENRAL TOILET	25 to 68
44	H. TOILET -LADIES	35 to 76
45	H. TOILET -GENTS	32 to 68
46	IGNOU LIBRARY	150 to 220
47	CANTEEN	56 to 140
48	STAIRS (ROOM NO 1 TO S.FLOOR)	35 to 75
49	STAIRS (PHYSICS TO CHEMISTRY LAB)	34 to 80
50	STAIRS (STAFFROOM TO GCR)	35 to 74
51	STAIRS (PRINCIPAL OFFICE TO F.FLOOR)	36 to 76
52	CHEMISTRY LABORATORY	135 to 220
53	ALUMINUM CABIN	110 to 198
54	ROOM NO - 28	56 to 180
55	ROOM NO 15	60 to 195
56	LADIES TOILET(F.F.)	35 to 76
57	CORIDOOR (CHEMISTRY LAB TO LADIES TOILET F.F.)	32 to 70
58	ROOM NO 19	86 to 195
59	ROOM NO 18	76 to 189
60	ROOM NO 17(CCTV ROOM)	120 to 200
61	ROOM NO 16	102 to 201
62	SERVER ROOM	50 to 140
63	COMPUTER LAB-1	150 to 240
64	COMPUTER LAB-2	154 to 238
65	STORE-COMPUTER LAB	159 to 249

66	ROOM NO-20	70 to 200
67	ROOM NO-21	60 to 205
68	ROOM NO-22	65 to 204
69	ROOM NO-23	54 to 198
70	ROOM NO-24	54 to 203
71	ROOM NO-25	67 to 210
72	ROOM NO-26	65 to 204
73	ROOM NO-27	54 to 198
74	GCR	50 to 150
75	GCR TOILET	45 to 75
76	CORIDOOR (COMPUTER LAB TO GCR)	35 to 80
77	CORIDOOR (LIBRARY HALL TO GENTS TOILET)	45 to 85
78	SAIRS F.F. TO S.F.	35 to 74
79	LIBRARY HALL	120 to 185
80	LIBRARY GENRAL SECTION	101 to 200
81	LIBRARY STAIR G.F. TO GENRAL SECTION	35 to 75
82	GENTS TOILET F.F.	30 to 60
83	STAIRS F.F. TO S.F.	34 to 67
84	ROOM NO - 29	150 to 240
85	ROOM NO - 30	120 to 203
86	ROOM NO - 31	150 to 230
87	ROOM NO - 32	98 to 201
88	ROOM NO - 33	95 to 210
89	ROOM NO - 34	80 to 186
90	ROOM NO - 35	85 to 200
91	ROOM NO - 36	120 to 198
92	ROOM NO - 37	100 to 196
93	ROOM NO - 38	50 to 140
94	ROOM NO - 39	120 to 202
95	ROOM NO - 40	98 to 198
96	ROOM NO - 41	110 to 200
97	LADIES TOILET S.F.	35 to 75
98	GENTS TOILET S.F.	34 to 65
99	MUMTY	45 to 120
100	CORIDOOR (ROOM NO 29 TO 40 & 41)	35 to 80

101	POTACABIN STORE-1	100 to 196
102	POTACABIN STORE-2	50 to 140
103	SPORTS DEPARTMENT	120 to 202
104	STAFF TOILET S.D.	98 to 198
105	STUDENT TOILET S.D.	110 to 200
106	COMPUTER LAB -3	140 to 230
107	COMPUTER LAB-4	135 to 234
108	BIOLOGY LAB	140 to 239
	TOTAL	
NEW BUILDING PORTA CABINS		
1	ROOM NO - 101	150 to 240
2	ROOM NO - 102	120 to 203
3	ROOM NO - 103A	150 to 230
4	ROOM NO - 103B	98 to 201
5	ROOM NO - 104	95 to 210
6	ROOM NO - 105	80 to 186
7	BOARD ROOM (106)	85 to 200
8	ROOM NO - 107A	120 to 198
9	ROOM NO - 107B	100 to 196
10	ROOM NO - 108A	50 to 140
11	ROOM NO - 108B	120 to 202
12	ROOM NO - 109A	98 to 198
13	ROOM NO - 109B	110 to 200
14	ROOM NO - 110A	98 to 201
15	ROOM NO - 110B	95 to 210
16	SEMINAR HALL	80 to 186
17	ROOM NO - 201	85 to 200
18	ROOM NO - 202	120 to 198
19	ROOM NO - 203	120 to 210
20	ROOM NO - 204	100 to 196
21	ROOM NO - 205	120 to 203
22	ROOM NO - 206	120 to 202
23	ROOM NO - 207	98 to 198
24	ROOM NO - 208	110 to 200
25	ROOM NO - 209	120 to 202

26	PANEL ROOM	50 to 160
27	FACULTY ROOM	130 to 202
28	GENTS TOILET	45 to 75
29	LADIES TOILET	43 to 73
30	HANDICAPED TOILET	38 to 85
31	CORIDOOR G.FLOOR	45 to 90
32	CORIDOOR F.FLOOR	46 to 92
	TOTAL	
NEW CONSTRUCTED CLASSROOM & COMPUTER LABORATORIES AT SECOND FLOOR		
1	COMPUTER LAB-I	130 to 240
2	COMPUTER LAB-II	135 to 235
3	COMPUTER LAB-III	145 to 239
4	CLASSROOM-1	120 to 194
5	CLASSROOM-2	98 to 198
6	CLASSROOM-3	110 to 200
7	CLASSROOM-4	98 to 201
8	CLASSROOM-5	95 to 210
9	CLASSROOM-6	80 to 186
10	CORIDOOR (COMPUTER LAB TO ROOM NO-29)	36 to 76
11	CORIDOOR (ROOM NO 39 TO NEW SEMINAR)	32 to 73
12	STP	50 to 94

SL.NO.	PLACE	LUX LEVEL
1	GARDEN-I(FRONT OF MORNING OFFICE)	30 to 60
2	GARDEN-2 (FRONT OF MAIN PORCH)	32 to 59
3	GARDEN-3(FRONT OF NEW BUILDING)	30 to 62
4	GARDEN-4(BEHIND OF NEW BUILDING)	34 to 58
5	STUDENT PARKING	45 to 80
6	STAFF PARKING	46 to 75
7	MAIN ENTRY GATE NO- 1	25 to 70

8	ENTRY GATE NO - 3	36 to 73
9	STREET LIGHTS NEAR POTA CABIN 1,2,3	25 to 88
10	PORCH TERRACE	35 to 85
11	TERRACE OF SPORTS DEPARTMENT	38 to 90

Analysis

It suggested replacing the existing lighting system with most energy efficient lighting solution of Light Emitting Diodes or LED. LED lighting is gaining in popularity and availability. LEDs are more efficient and provide higher quality than even FTLs and MH light. LEDs saves energy, the life span is much greater and emit virtually no heat. Table below shows the performance characteristics comparison of all luminaries.

Table 8.1 Luminous Performance Characteristics of Commonly Used Luminaries					
Type of Lamp	Lumens / Watt		Colour Rendering Index	Typical Application	Typical Life (hours)
	Range	Avg.			
Incandescent	8-18	14	Excellent (100)	Homes, restaurants, general lighting, emergency lighting	1000
Fluorescent lamps	46-60	50	Good w.r.t. coating (67-77)	Offices, shops, hospitals, homes	5000
Compact fluorescent lamps (CFL)	40-70	60	Very good (85)	Hotels, shops, homes, offices	8000-10000
High pressure mercury (HPMV)	44-57	50	Fair (45)	General lighting in factories, garages, car parking, flood lighting	5000
Halogen lamps	18-24	20	Excellent (100)	Display, flood lighting, stadium exhibition grounds, construction areas	2000-4000
High pressure sodium (HPSV) SON	67-121	90	Fair (22)	General lighting in factories, ware houses, street lighting	6000-12000
Low pressure sodium (LPSV) SOX	101-175	150	Poor (10)	Roadways, tunnels, canals, street lighting	6000-12000
Metal halide lamps	75-125	100	Good (70)	Industrial bays, spot lighting, flood lighting, retail stores	8000
LED lamps	30-50	40	Good (70)	Reading lights, desk lamps, night lights, spotlights, security lights, signage lighting, etc.	40,000-1,00,000

ECRM-2 REPLACEMENT 18W CFL

CFL-18 Watt			
A.	**Title Recommendation**	:	Replace all the 18W CFL with 9W LED Bulb
B.	**Description of Existing system**	:	At present they are using 18W CFL
C.	**Recommendation**	:	It should be replace with 9W LED Bulb
D.	**Energy Saving Calculation**		
Average power consumption of 18W CFL		:	21 W
Average power consumption of 9W LED		:	10 W
Average power saving after replacement		:	11 W

Average working hour per day	:	8 hrs.
Average No. of working days	:	280 days
Approximate No. of fixture	:	163
E. Cost Benefit Calculation		
Annual Energy Saving potential	:	4016.32 units
Power tariff	:	Rs. 8.5 per unit
Annual Cost Saving	:	Rs. 34138.72
Cost of fitting	:	Rs. 100 per fixture
Total investment cost	:	Rs. 16300
Simple Payback Period	:	5.7 Months

ECRM-3 REPLACEMENT 40 W TUBE LIGHT

T12 40 W Tube Light		
A. Title Recommendation	:	Replace all the 40W T12 fixture with electronic ballast by 20W T8 LED Light
B. Description of Existing system	:	At present they are using 40W T12 fixture
C. Recommendation	:	It should be replace with 20W T8 LED Light
D. Energy Saving Calculation		
Average power consumption of 40 W T12 fixture	:	56 W
Average power consumption of 20W T8 LED Light	:	22 W
Average power saving after replacement	:	34 W
Average working hour per day	:	8 hrs.
Average No. of working days	:	280 days
Approximate No. of fixture	:	557
E. Cost Benefit Calculation		
Annual Energy Saving potential	:	42421.12 units
Power tariff	:	Rs. 8.5 per unit
Annual Cost Saving	:	Rs. 360579.52
Cost of fitting	:	Rs. 400 per fixture
Total investment cost	:	Rs. 222800
Simple Payback Period	:	7.4 Months

Recommendation and Suggestion

- LEDs in white light, general illumination applications are one of today's most energy-efficient and rapidly-developing technologies. While LEDs are more expensive at this early stage, they still save money because they last a long time and have very low energy use.

- In the Shyam Lal College old ceiling fans of 60W are installed but BEE 5 Star Rated of 30W Ceiling Fans are present in the market. Therefore we are suggesting replacing BEE 5 Star rated fans of 30W.

- The college should go for more energy efficient way in coming future with purchase of BEE high rated equipment.

- College should have more energy saving posters for awareness.

- ECBC compliance is recommended for all future building expansions.

- Installation of sensor based lights in corridors and other similar places, is recommended.

***** END OF THE REPORT *****