



ગુજરાત કેન્દ્રીય વિશ્વવિદ્યાલય
CENTRAL UNIVERSITY OF GUJARAT

CENTRAL UNIVERSITY OF GUJARAT

ENERGY AUDIT REPORT

2021-2022

PREPARED BY
EHS ALLIANCE SERVICES

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AUDIT CERTIFICATE

PRESENTED TO

CENTRAL UNIVERSITY OF GUJARAT (CUG)

Sector-29 Gandhinagar - 382030

Has been assessed by EHS Alliance Services 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 University have been verified in the report submitted and were found to be satisfactory.

The efforts taken by management and faculty towards all types of energy used in the University and sustainability are highly appreciated and noteworthy.



AUDITOR SIGNATURE



10.05.2022

DATE OF AUDIT

ACKNOWLEDGEMENT

EHS Alliance Services would like to thank the management of Central University of Gujarat for assigning this important work of Green Audit. We appreciate the co-operation to the teams for completion of assessment.

We would also like to thank **Prof. Atanu Mohaparta – Director IQAC**, for his continuous support and guidance, without which the completion of the project will not be possible. We are also thankful to other staff members who were actively involved while collecting the data and conducting field measurements.

We are also thankful to

Mr. Jay Prakash M. Soni

Deputy Registrar

Mr. Pawan Pathak

Executive Engineer

Mr. Nilesh Kumar

Jr. Engineer (Electrical)

Dr. Rajesh Singh

Assistant Professor – SESD

Prof. Bhawana Pathak

UBA Coordinator

Dr. Rajneesh Kumar Gupta

In-Charge NSS

Last but not the least, we would like to thank **Prof. Rama Shanker Dubey – Hon'ble Vice Chancellor and Prof. H. B. Patel – Registrar**, Central University of Gujarat for giving us an opportunity to evaluate the environmental performance of the campus.

DISCLAIMER

EHS Alliance Services Energy Audit Team has prepared this Energy Audit Report for Central University of Gujarat based on input data submitted by the representatives of University complemented with the best judgment capacity of the expert team.

While all reasonable care has been taken in its preparation, details contained in this report have been compiled in good faith based on information gathered.

It is further informed that the conclusions are arrived following best estimates and no representation, warranty or undertaking, express or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any use of the information, statements or forecasts in the report.

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BEE No.-EM7059

Manoj Kumar
Lead Auditor EMS & Energy





Dr. Uday Pratap
Co-Auditor EMS & Energy

ABBREVIATION

A	Amps
AC	Air Conditioner
AC	Alternating Current
AMET	Academy of Maritime Education and Training
CFL	Compact fluorescent lamp
CIP	Comprehensive Inspection Programme
DC	Direct Current
HSD	High Speed Diesel
Hz	Hertz
kg	Kilogram
kVA	kilo-volt-ampere
kW	kilo Watts
kWh	kilowatt hour
kWp	Kilowatt peak
LED	Light Emitting Diode
LPG	Liquefied Petroleum Gas
MMS	Module mounting structure
MPPT	Maximum Power Point Tracker
NAAC	The National Assessment and Accreditation Council
SEC	Specific Energy Consumption
SPV	Solar Photovoltaic
STC	Standard Test Condition
TV	Television
V	Volts
W	Watts
W/m²	watt per square metre

OVERVIEW OF THE UNIVERSITY

Established by Parliament of India through the Central Universities Act (2009), Central University of Gujarat (CUG) considers its main objectives to be dissemination and advancement of knowledge creation and sharing. The University is committed to make special provisions for integrated and interdisciplinary courses, to educate and train human resources for the country's development, to initiate appropriate measures for promoting innovation in teaching and learning and to pay special attention to improve the social and economic conditions and welfare of the people, especially pertaining to their intellectual, academic and cultural development. The University was ranked overall 60th in India and 2nd among all the Universities in Gujarat in NIRF 2016 rankings. According to NIRF 2017, the University ranked among the top 150 Universities in the country.

MOTTO

Providing a Global Platform for Knowledge and Employability to our Students along with Society and Industry Interface.



Institution's Distinctiveness

Since its inception, Central University of Gujarat has incorporated interdisciplinary and multi-disciplinary approach in its academic curriculum, pedagogy and research. It has unique undergraduate courses like Integrated Social Management and various inter

disciplinary Post Graduate courses in Industrial Chemistry, Environmental Science, Nano Technology, Defence and Strategic Studies, Social Sciences, International Studies, library science and Education. The University has been encouraging teaching and research not only across the discipline but also across knowledge domain. The University is also encouraging inter-disciplinary research in all schools with a special centre devoted to Diaspora Studies.

The success of the courses is manifested in its achievements where 16 patents were registered for its innovations out of which two are commercialised that are aligned with the Hon'ble Prime Minister's call for Self Reliant India and Vocal for Local. Besides, University has published 1717 research publications in the form of Books, Papers and Chapters in edited books in reputed national and international publication houses.



CENTRAL INSTRUMENTATION FACILITY

The Central Instrumentation Facility (CIF) at the University is one of the best in the country. Currently, the CIF has a range of instruments which include 500 CUGz FT-NMR



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Spectrometer, Single Crystal and Powder XRD, Atomic Absorption Spectrophotometer, Elemental Analyzer (CHNS/O) and many more

CENTRAL LIBRARY

The Central Library has a wide collection of resources taking into consideration the course contents and research needs of the university. Library's learning resource collections are developed aiming at providing the highest level of research and teaching support to the programmes and research thrust areas. Collection is reviewed every year in order to be relevant to the emerging and developing areas of research. The Library is growing in its breadth and depth it holds about 30,000 plus books, and subscribes to over 66 print journals and magazines and over 8000+ e-journals. The Library has KOHA software and computerized library facilities.

The Cyber Library provides seamless access to e-journals available at the university. Its main aim is to provide access to computers and internet to the students coming from economically weaker sections who are not able to buy computers/laptop individually. It has over 29 Pentium workstations with broadband internet access. CUG has successfully migrated towards the internet age by adding 8000+ online journals to its collection. The Library also provides access to several databases.



WI-FI AND ICT FACILITY

The University is wi-fi enabled and students can access the internet on the basis of a personal id and password provided by the University. The University also has a CyberLab that enables students to access a large variety of resources on the web that includes journals, databases, and books.

HOSTEL FACILITY

Limited Hostel accommodation both for men and women is available on a first come first allotment basis. The hostel fees are stipulated as per the norms of the University. Private accommodation on a shared basis is available in the city of Gandhinagar at reasonable rates.

GAMES AND SPORTS

The University is aware of the importance of physical activities and organised sports and games programmes, which should be combined with the students academic pursuits. Keeping in view the limited space available at the present location of the University, basic sports facilities are available in the campus.

CANTEEN

The University offers a canteen facility where snacks, tea, coffee/dining in facility is available.

TRANSPORT FACILITY

The University has its own AC bus which is available for the students and University staff for their convenience

CONFERENCE FACILITY

The University has well-equipped facilities for conferences, workshops and seminars with seating capacity ranging from 45 to 170 persons.

VISION

The vision of CUG is to establish itself as a centre of excellence with social commitment by integrating modern, scientific and technological knowledge and skills with the basic human ethos and values. The University shall set forth a model in teaching, research and personality development and create skilled human resource with a sense of responsiveness towards society, the country and the world at large..

AUDIT PARTICIPANTS

On behalf of University

Name - Designation/Department	
Prof. Atanu Mohaparta	Director – IQAC
Mr. Jay Prakash M. Soni	Deputy Registrar
Mr. Pawan Pathak	Executive Engineer
Mr. Nilesh Kumar	Jr. Engineer (Electrical)
Dr. Rajesh Singh	Assistant Professor – SESD
Prof. Bhawana Pathak	UBA Coordinator
Dr. Rajneesh Kumar Gupta	In-Charge NSS

On behalf of EHS Alliance Services

Name	Position	Qualifications
Mr. Manoj Kumar	Lead Auditor	Energy Auditor, BEE Certified
Dr. Uday Pratap	Co-Auditor	Ph.D., EMS: Lead Auditor ISO14001:2015, QCI-WASH



EXECUTIVE SUMMARY

The purpose of this Energy Audit was to seek opportunities to improve the energy efficiency of the Central University of Gujarat. Reducing the energy consumption despite improving the human comfort, health and safety were of primary concern.

Beyond just identifying the energy consumption pattern, this audit sought to detect and categorize the most energy efficient appliances. Additionally, some daily practices relating common appliances have been shared which may help reducing the energy consumption. Data collection for energy audit of the University was carried out by the EHS Alliance Team. The Energy Audit Report accounts for the energy consumption patterns of the university on actual survey and detailed analysis during the audit.

The work comprehends the area wise consumption traced using suitable equipment. The analysis was carried out by our team with the support of the staff members from Central University of Gujarat. The report provides a list of possible actions to preserve and efficiently access the available source, resources and their saving potential was also identified. We look forward towards optimization that the authorities, students and staff members would follow the recommendations in the best possible way. The report is based on certain generalizations including the approximations wherever necessary. The views conveyed may not reveal the general opinion. They merely represent the opinion of the team guided by the interviews of clients. We are happy to submit this Energy audit report to the Central University of Gujarat.

ENERGY AUDIT - ANALYSIS

1. ENERGY CONSUMPTION

To understand the Energy Consumption trends and for analyzing the average monthly consumption we have collected electricity energy bills from April 2021 to March 2022

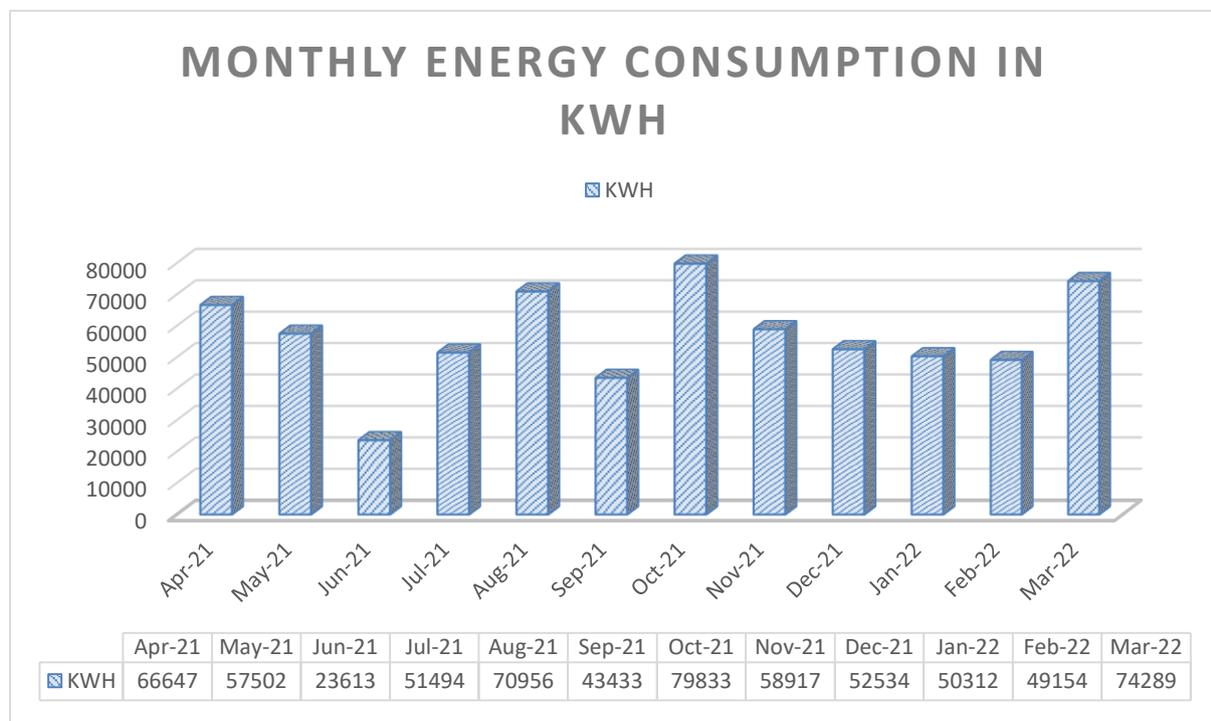
The details of “**Meter Connection**” at “**Central University of Gujarat**” are as follows-

Name	-	Central University of Gujarat
Consumer No.	-	100516785

1.1 Summary of Monthly Electricity Consumption and Total Bill Amount

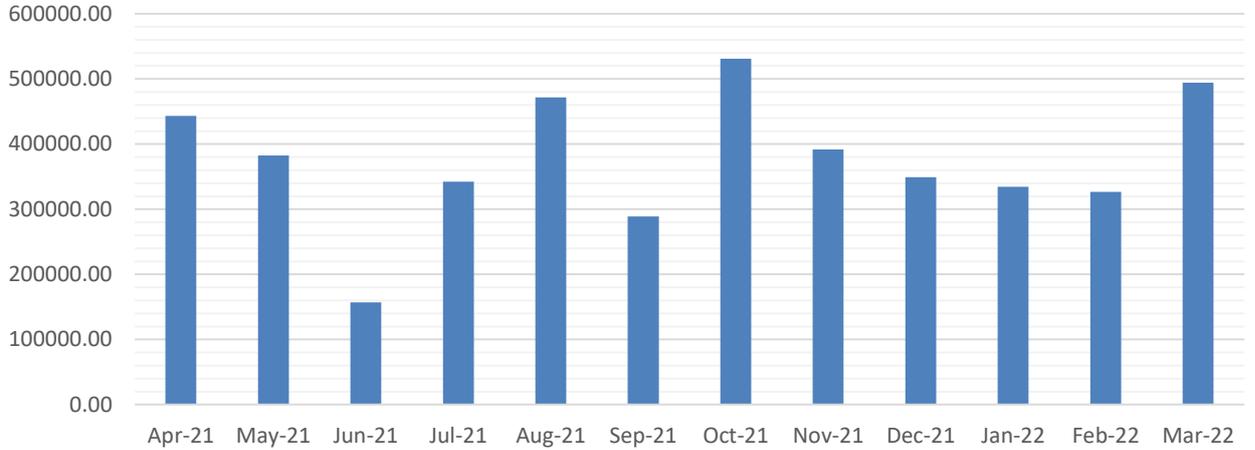
To understand the Energy consumption trend and for developing the baseline parameter we have collected monthly energy bill for the 11 months i.e. from April 2021 to Mar 2022

Month	Net Reading	Solar P V	Total	Rate INR	Amount in INR
Apr-21	66647	600	67,247	6.65	443,203
May-21	57502	600	58,102	6.65	382,388
Jun-21	23613	600	24,213	6.65	157,026
Jul-21	51494	600	52,094	6.65	342,435
Aug-21	70956	600	71,556	6.65	471,857
Sep-21	43433	600	44,033	6.65	288,829
Oct-21	79833	600	80,433	6.65	530,889
Nov-21	58917	600	59,517	6.65	391,798
Dec-21	52534	600	53,134	6.65	349,351
Jan-22	50312	600	50,912	6.65	334,575
Feb-22	49154	600	49,754	6.65	326,874
Mar-22	74289	600	74,889	6.65	494,022
SUM	678,684	7,200	685,884		





Monthly Energy Charges - from April 2021 to March 2022

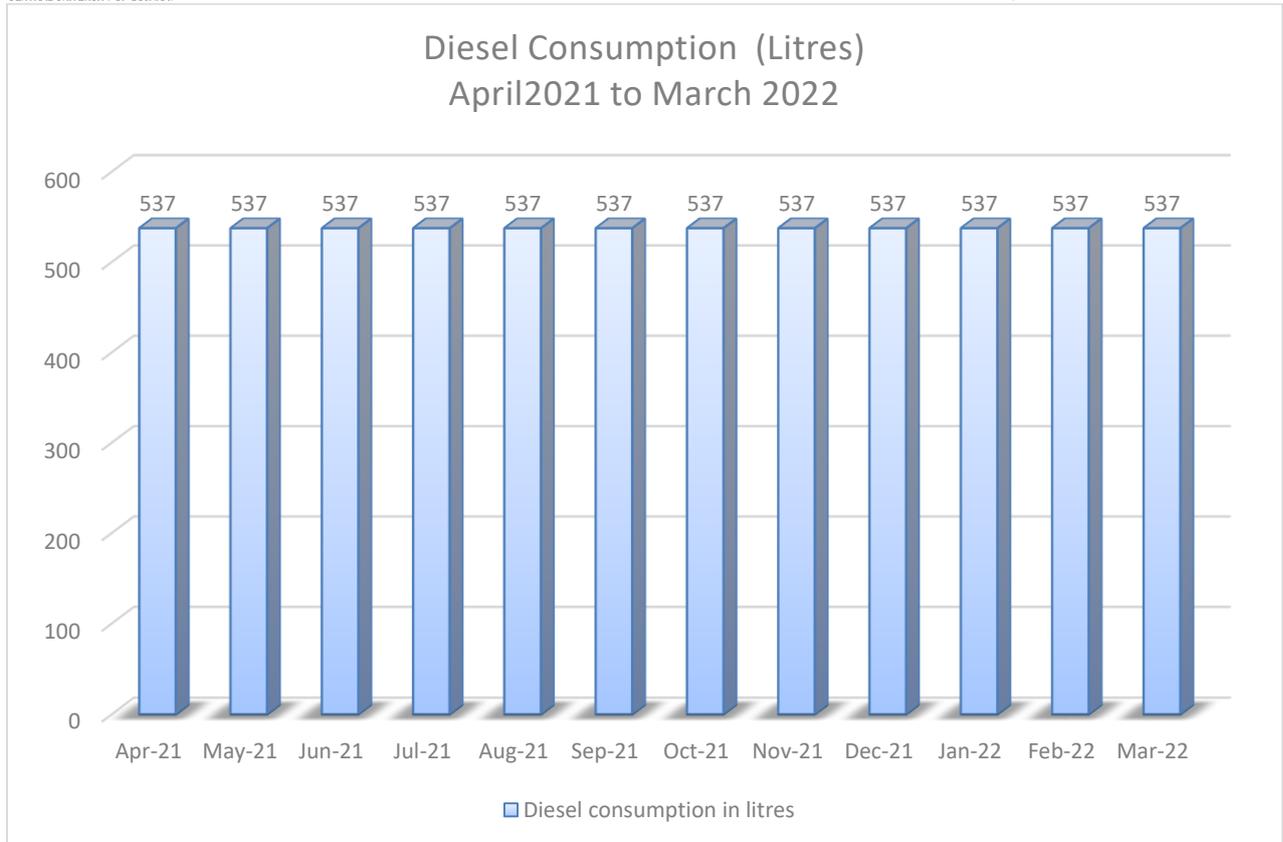


	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22
■ Rs	443202.5	382388.3	157026.4	342435.1	471857.4	288829.4	530889.4	391798.0	349351.1	334574.8	326874.1	494021.8

2. DIESEL CONSUMPTION

Below is the diesel consumption details in litres from from April 2021 to March 2022.

Period	Diesel consumption (in litres)
Apr-21	537
May-21	537
Jun-21	537
Jul-21	537
Aug-21	537
Sep-21	537
Oct-21	537
Nov-21	537
Dec-21	537
Jan-22	537
Feb-22	537
Mar-22	537
Total	6448



3. ANALYSIS OF DG SETS

In the University, there is one Diesel Generator (DG) sets for its electrical power needs in case of Grid power failure. Total installed DG sets capacity is 15 kVA.

DG Set Design Details		
Description	Unit	DG at Station
Rated capacity	kVA	15 KVA
Hz		50
Sl No.		1208X2837
Make		M/s Sudhir Gensets Ltd
Volts	Volts	415 Volts
PF		0.9
Phase		3 Phase
RPM		1500
Amps	Amps	20.9
Mfg. Year		2012

DG Set Operation details		
Operating hours during testing	Hours	1.0
% Loading	%	72.53
Energy Generation	kWh	26.87
Load	KVA	74.6
Fuel consumption during testing	Litre	3.5
Specific energy generation	kWh/litre	3.23

Observation and Suggestions:- As per the trial taken during the energy audit the percentage loading of DG set is 72.53% which is ok and specific energy consumption of DG Sets 3.23 KWH/Litre 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.

4. AC SYSTEM

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.



There are Split ACs installed in Central University of Gujarat in various areas of various capacity which detail is given below:-

S. No.	Location	Quantity	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
1	Room No 104	3	1.0	23	12	20	52	0.03	2.3	25	38	0.33	0.55	1.67	2.11
2	Room No 1	1	1.0	23	12	20	52	0.03	2.2	25	38	0.32	0.55	1.74	2.03
3	Room No 2	1	1.0	23	12	19	52	0.03	2.3	24	37	0.33	0.58	1.74	2.02
4	Room No 3	1	1.0	24	11	20	52	0.03	2.3	22	38	0.38	0.65	1.69	2.08
5	Room No 4	1	1.0	24	12	20	53	0.03	2.5	25	38	0.34	0.6	1.79	1.97
6	Room No 5	1	1.0	24	12	20	53	0.03	2.4	25	38	0.33	0.58	1.78	1.98
7	Room No 11	1	1.0	22	10.5	21	52	0.062	2.4	22	39	0.88	1.53	1.74	2.02
8	Room No 12	1	1.0	22	10.5	20	52	0.062	2.1	21	38	0.77	1.28	1.67	2.1
9	Room No 13	1	1.0	24	12	20	53	0.03	2.4	25	38	0.33	0.58	1.78	1.98
10	Room No 14	1	1.0	22	10.5	21	52	0.062	2.4	22	39	0.88	1.53	1.74	2.02
11	Room No 15	1	1.0	22	10.5	20	52	0.062	2.1	21	38	0.77	1.28	1.67	2.1
12	IQAC-106	2	1.0	22	10.5	21	52	0.062	2.4	22	39	0.88	1.53	1.74	2.02
13	Manu Shirma Lab	1	1.5	23	11	19	53	0.03	2.4	22	38	0.4	0.81	2.02	1.74
14	Prefab lab - 1	1	1.5	22	11.5	22	52	0.03	2.1	23	43	0.44	0.77	1.77	1.99
15	Prefab lab - 2	1	1.5	22	10	19	52	0.03	2.2	20	37	0.39	0.78	1.99	1.77
16	Prefab lab - 3	1	1.5	23	11	21	53	0.03	2.5	24	40	0.42	0.74	1.77	1.99
17	Prefab lab - 4	1	1.5	24	11	20	52	0.03	2.3	22	38	0.38	0.65	1.69	2.08
18	Prefab lab - 5	1	1.5	24	12	20	53	0.03	2.5	25	38	0.34	0.6	1.79	1.97
19	Prefab lab - 6	1	1.5	24	12	20	53	0.03	2.4	25	38	0.33	0.58	1.78	1.98
20	Prefab lab - 7	1	1.5	22	10.5	20	52	0.062	2.1	21	38	0.77	1.28	1.67	2.1
21	Prefab lab - 8	1	1.5	22	10.5	21	52	0.062	2.4	22	39	0.88	1.53	1.74	2.02
22	Prefab lab - 9	1	1.5	22	10.5	20	52	0.062	2.1	21	38	0.77	1.28	1.67	2.1
23	Prefab lab - 10	1	1.5	23	11	19	53	0.03	2.4	22	38	0.4	0.81	2.02	1.74
24	Prefab lab - 11	1	1.5	22	11.5	22	52	0.03	2.1	23	43	0.44	0.77	1.77	1.99



25	Server room	3	1.5	23	11	21	52	0.03	2.4	24	40	0.4	0.72	1.8	1.95
26	Room No 102 Lab	2	1.5	22	10.5	21	52	0.062	2.4	22	39	0.88	1.53	1.74	2.02
27	Room No 103	2	1.5	24	11	20	52	0.03	2.3	22	38	0.38	0.65	1.69	2.08
28	Room No 103 Lab	1	1.5	24	12	20	53	0.03	2.4	25	38	0.33	0.58	1.78	1.98
29	Room No 105 lab	1	1.5	22	10.5	21	52	0.062	2.4	22	39	0.88	1.53	1.74	2.02
30	Room No 1	1	1.5	22	10.5	20	52	0.062	2.1	21	38	0.77	1.28	1.67	2.1
31	Room No 1 Lab	1	1.5	22	10.5	21	52	0.062	2.4	22	39	0.88	1.53	1.74	2.02
32	Room No 3 Lab	1	1.5	22	10.5	20	52	0.062	2.1	21	38	0.77	1.28	1.67	2.1
33	Room No 3	1	1.5	23	11	19	53	0.03	2.4	22	38	0.4	0.81	2.02	1.74
34	Lab - 03	1	1.5	23	11	21	52	0.03	2.4	24	40	0.4	0.72	1.8	1.95
35	Lab - 05	2	1.5	22	10	19	52	0.03	2.2	20	37	0.39	0.78	1.99	1.77
36	Lab - 04	2	1.5	24	11	20	52	0.03	2.3	22	38	0.38	0.65	1.69	2.08
37	Lab - 06	2	1.5	22	10.5	21	52	0.062	2.4	22	39	0.88	1.53	1.74	2.02
38	Lab 4 to 6 Corridor	2	1.5	23	11	19	53	0.03	2.4	22	38	0.4	0.81	2.02	1.74
39	Lab - 02	1	1.5	23	11	21	53	0.03	2.5	24	40	0.42	0.74	1.77	1.99
40	Lab 1 to 3 corridor	2	1.5	23	12	19	52	0.03	2.3	24	37	0.33	0.58	1.74	2.02
41	Room No - 1	1	1.5	24	12	20	53	0.03	2.4	25	38	0.33	0.58	1.78	1.98
42	Room No - 3	1	1.5	22	10.5	21	52	0.062	2.4	22	39	0.88	1.53	1.74	2.02
43	Room No - 3 Lab	1	1.5	22	10.5	21	52	0.062	2.4	22	39	0.88	1.53	1.74	2.02
44	Room No - 5	1	1.5	22	10.5	20	52	0.062	2.1	21	38	0.77	1.28	1.67	2.1
45	Room No - 7	1	1.5	24	12	20	52	0.03	2.6	25	38	0.35	0.57	1.61	2.18
46	Room No - 10	1	1.5	22	10.5	21	52	0.062	2.4	22	39	0.88	1.53	1.74	2.02
47	Lab SESD	4	1.5	22	10.5	20	52	0.062	2.1	21	38	0.77	1.28	1.67	2.1
48	Room No - 1	1	1.5	24	10.5	20	53	0.062	2.2	21	38	0.81	1.45	1.8	1.95
49	Room No - 2	1	1.5	24	12	22	53	0.062	2.1	25	43	0.81	1.41	1.73	2.04
50	Room No - 3	1	1.5	24	11	21	53	0.062	2.2	22	41	0.9	1.44	1.6	2.19
51	Room No - 4	1	1.5	24	12	21	53	0.03	2.3	24	39	0.36	0.65	1.82	1.94
52	Room No - 5	1	1.5	24	11.5	19	53	0.03	2.3	23	38	0.36	0.64	1.79	1.96
53	Room No - 6	1	1.5	23	13	22	53	0.03	2.2	26	42	0.37	0.6	1.63	2.16
54	Room No - 7	1	1.5	23	11	21	53	0.062	2.1	22	41	0.86	1.44	1.67	2.11
55	Room No - 8	1	1.5	23	11	20	53	0.062	2.3	22	39	0.84	1.37	1.62	2.17
56	Room No - 9	1	1.5	24	10.5	18	52	0.062	2.5	21	37	0.86	1.46	1.7	2.07
57	Room No - 10	1	1.5	23	12	22	53	0.062	2	24	42	0.78	1.36	1.75	2.01
58	Room No - 11	1	1.5	23	11	21	53	0.062	2.1	22	41	0.86	1.44	1.67	2.11
59	Room No -	1	1.5	23	11	20	53	0.062	2.3	22	39	0.84	1.37	1.62	2.17



12															
60	Room No - 13	1	1.5	24	11	20	52	0.03	2.3	22	38	0.38	0.65	1.69	2.08
61	Room No - 14	1	1.5	23	12	21	53	0.062	2.1	24	41	0.77	1.32	1.72	2.04
62	Room No - 15	1	1.5	24	11	19	52	0.03	2.6	24	37	0.35	0.64	1.83	1.92
63	Room No - 16	1	1.5	24	10	18	52	0.03	2.4	24	37	0.33	0.58	1.78	1.97
64	Room No - 17	1	1.5	24	11.5	19	53	0.03	2.3	23	38	0.36	0.64	1.79	1.96
65	Room No - 18	1	1.5	23	10.5	20	53	0.062	2.4	22	39	0.88	1.48	1.68	2.09
66	Room No - 19	1	1.5	23	11	21	53	0.062	2	22	41	0.82	1.42	1.73	2.03
67	Room No - 20	1	1.5	24	11	19	52	0.062	2.4	22	37	0.78	1.38	1.78	1.98
68	Room No - 21	1	1.5	23	11	21	53	0.062	2	22	41	0.82	1.42	1.73	2.03
69	Room No - 22	1	1.5	24	12	22	51	0.03	2	25	43	0.38	0.63	1.68	2.09
70	Room No - 23	1	1.5	24	11	18	52	0.062	2.5	22	37	0.81	1.43	1.77	1.98
71	Room No - 25	1	1.5	24	11.5	20	52	0.062	2.3	23	38	0.74	1.36	1.83	1.92
72	Room No - 26	1	1.5	24	11	19	52	0.062	2.4	22	37	0.78	1.38	1.78	1.98
73	Room No - 27	1	1.5	24	12	21	52	0.062	2.5	25	39	0.75	1.36	1.8	1.95
74	Room No - 28	1	1.5	23	10	19	53	0.062	2.2	21	38	0.81	1.4	1.74	2.03
75	Room No - 29	1	1.5	23	11	18	53	0.062	2.3	22	37	0.74	1.32	1.78	1.98
76	Room No - 30	1	1.5	23	10.5	20	53	0.062	2.4	22	39	0.88	1.46	1.66	2.11
77	Room No - 31	1	1.5	23	12	22	53	0.062	2.1	24	42	0.81	1.35	1.65	2.13
78	Room No - 32	1	1.5	23	11	19	51	0.062	2.4	23	37	0.72	1.34	1.85	1.9
79	Room No - 33	1	1.5	23	11	20	51	0.062	2.4	23	38	0.78	1.37	1.76	1.99
80	Room No - 34	1	1.5	23	11	21	53	0.062	2.2	22	41	0.9	1.46	1.63	2.16
81	Room No - 35	1	1.5	23	11	20	53	0.062	2.2	22	39	0.81	1.33	1.65	2.13
82	Room No - 36	1	1.5	23	11	21	51	0.062	2.3	24	39	0.74	1.29	1.74	2.03
83	Room No - 37	1	1.5	23	12	21	51	0.062	2.5	25	39	0.75	1.27	1.69	2.09
84	Room No - 38	1	1.5	24	12	21	52	0.03	2.2	24	39	0.34	0.66	1.92	1.83
85	Library	2	1.5	24	12	20	52	0.03	2.6	25	38	0.35	0.57	1.61	2.18
86	CIF Lab	10	1.5	22	10.5	20	52	0.062	2.1	21	38	0.77	1.28	1.67	2.1
87	Hitech Lab	8	1.5	23	11	21	53	0.062	2.1	22	41	0.86	1.44	1.67	2.11
88	Green	3	1.5	24	11	19	52	0.03	2.6	24	37	0.35	0.64	1.83	1.92



	House														
89	Room No - 213	3	1.5	23	10.5	20	53	0.062	2.4	22	39	0.88	1.48	1.68	2.09
90	Room No - 206	3	1.5	23	11	21	53	0.062	2	22	41	0.82	1.42	1.73	2.03
91	V.C. Office	2	1.5	24	11.5	20	52	0.062	2.3	23	38	0.74	1.36	1.83	1.92
92	PS to VC office	1	1.5	24	12	21	52	0.062	2.5	25	39	0.75	1.36	1.8	1.95
93	Board Room	1	1.5	23	10	19	53	0.062	2.2	21	38	0.81	1.4	1.74	2.03
94	Registrar Office	1	1.5	23	11	18	53	0.062	2.3	22	37	0.74	1.32	1.78	1.98
95	PS to Registrar	1	1.5	23	10.5	20	53	0.062	2.4	22	39	0.88	1.46	1.66	2.11
96	D.R. Office	1	1.5	23	12	22	53	0.062	2.1	24	42	0.81	1.35	1.65	2.13
97	Admin Office	2	1.5	23	11	19	51	0.062	2.4	23	37	0.72	1.34	1.85	1.9
98	HR Department	1	1.5	23	11	21	53	0.062	2.2	22	41	0.9	1.46	1.63	2.16
99	Store office	1	1.5	23	11	20	53	0.062	2.2	22	39	0.81	1.33	1.65	2.13
100	A&A Section	2	1.5	23	11	21	51	0.062	2.3	24	39	0.74	1.29	1.74	2.03
101	Dean Office	2	1.5	24	12	21	52	0.03	2.2	24	39	0.34	0.66	1.92	1.83
102	Tender Room	1	1.5	22	10.5	21	52	0.062	2.4	22	39	0.88	1.53	1.74	2.02
103	Store Room	1	1.5	22	10.5	20	52	0.062	2.1	21	38	0.77	1.28	1.67	2.1
104	F.O. Office	1	1.5	22	11.5	22	52	0.03	2.1	23	43	0.44	0.77	1.77	1.99
105	D.R. Office	1	1.5	23	12	20	52	0.03	2.6	25	38	0.35	0.62	1.76	2
106	F&A (Finance)	2	1.5	24	11	19	53	0.062	2.6	24	38	0.78	1.45	1.85	1.9
107	F&A	1	1.5	24	11	19	53	0.062	2.6	24	38	0.78	1.45	1.85	1.9
108	DDO Office	1	1.5	24	11	21	53	0.062	2.2	22	41	0.9	1.44	1.6	2.19
109	IAO	1	1.5	24	12	21	53	0.03	2.3	24	39	0.36	0.65	1.82	1.94
110	HR Application	3	1.5	24	11.5	19	53	0.03	2.3	23	38	0.36	0.64	1.79	1.96
111	Maintenance	2	1.5	23	11	20	53	0.062	2.3	22	39	0.84	1.37	1.62	2.17
112	Conference Room	3	1.5	23	12	22	53	0.062	2	24	42	0.78	1.36	1.75	2.01
113	Conference Hall Block A	4	1.5	24	11	20	52	0.03	2.3	22	38	0.38	0.65	1.69	2.08
114	Room No 112	2	1.5	24	11.5	19	53	0.03	2.3	23	38	0.36	0.64	1.79	1.96
115	Room No 113	2	1.5	23	11	21	53	0.062	2	22	41	0.82	1.42	1.73	2.03
116	Room No 111	2	1.5	23	11	21	53	0.062	2	22	41	0.82	1.42	1.73	2.03
117	Room No 6	1	1.5	24	11	18	52	0.062	2.5	22	37	0.81	1.43	1.77	1.98
118	Room No 7	1	1.5	24	11.5	20	52	0.062	2.3	23	38	0.74	1.36	1.83	1.92
119	Room No 8	1	1.5	24	11	19	52	0.062	2.4	22	37	0.78	1.38	1.78	1.98
120	Room No 9	1	1.5	24	12	21	52	0.062	2.5	25	39	0.75	1.36	1.8	1.95



121	Room No 10	1	1.5	23	10	19	53	0.062	2.2	21	38	0.81	1.4	1.74	2.03
122	Room No 1	1	1.5	23	11	18	53	0.062	2.3	22	37	0.74	1.32	1.78	1.98
123	Room No 3	1	1.5	23	10.5	20	53	0.062	2.4	22	39	0.88	1.46	1.66	2.11
124	Room No 4	1	1.5	23	12	22	53	0.062	2.1	24	42	0.81	1.35	1.65	2.13
125	Room No 5	1	1.5	23	11	19	51	0.062	2.4	23	37	0.72	1.34	1.85	1.9
126	Room No 6	1	1.5	23	11	20	51	0.062	2.4	23	38	0.78	1.37	1.76	1.99
127	Room No 7	1	1.5	23	11	21	53	0.062	2.2	22	41	0.9	1.46	1.63	2.16
128	Room No 8	1	1.5	23	11	20	53	0.062	2.2	22	39	0.81	1.33	1.65	2.13
129	Room No 9	1	1.5	23	11	21	51	0.062	2.3	24	39	0.74	1.29	1.74	2.03
130	Room No 10	1	1.5	23	12	21	51	0.062	2.5	25	39	0.75	1.27	1.69	2.09
131	Room No 11	1	1.5	24	12	21	52	0.03	2.2	24	39	0.34	0.66	1.92	1.83
132	Room No 12	1	1.5	24	12	20	52	0.03	2.6	25	38	0.35	0.57	1.61	2.18
133	Room No 13	1	1.5	22	10.5	21	52	0.062	2.4	22	39	0.88	1.53	1.74	2.02
134	Room No 14	1	1.5	22	10.5	20	52	0.062	2.1	21	38	0.77	1.28	1.67	2.1
135	Room No 15	1	1.5	22	11.5	22	52	0.03	2.1	23	43	0.44	0.77	1.77	1.99
136	Room No 16	1	1.5	23	12	20	52	0.03	2.6	25	38	0.35	0.62	1.76	2
137	Room No 17	1	1.5	24	11	19	53	0.062	2.6	24	38	0.78	1.45	1.85	1.9
138	Room No 18	1	1.5	24	10.5	20	53	0.062	2.2	21	38	0.81	1.45	1.8	1.95
139	Room No 19	1	1.5	24	12	22	53	0.062	2.1	25	43	0.81	1.41	1.73	2.04
140	Room No 20	1	1.5	24	11	21	53	0.062	2.2	22	41	0.9	1.44	1.6	2.19
141	Room No 1	1	1.5	24	12	21	53	0.03	2.3	24	39	0.36	0.65	1.82	1.94
142	Room No 2	1	1.5	24	11.5	19	53	0.03	2.3	23	38	0.36	0.64	1.79	1.96
143	Room No 3	1	1.5	23	13	22	53	0.03	2.2	26	42	0.37	0.6	1.63	2.16
144	Room No 4	1	1.5	23	11	21	53	0.062	2.1	22	41	0.86	1.44	1.67	2.11
145	Room No 5	1	1.5	23	11	20	53	0.062	2.3	22	39	0.84	1.37	1.62	2.17
146	Room No 6	1	1.5	24	10.5	18	52	0.062	2.5	21	37	0.86	1.46	1.7	2.07
147	Room No 7	1	1.5	23	11	21	53	0.062	2.1	22	41	0.86	1.44	1.67	2.11
148	Room No 8	1	1.5	23	11	20	53	0.062	2.3	22	39	0.84	1.37	1.62	2.17
149	Room No 9	1	1.5	24	11	20	52	0.03	2.3	22	38	0.38	0.65	1.69	2.08
150	Room No 10	1	1.5	23	12	21	53	0.062	2.1	24	41	0.77	1.32	1.72	2.04
151	Room No 11	1	1.5	24	11	19	52	0.03	2.6	24	37	0.35	0.64	1.83	1.92
152	Room No 12	1	1.5	24	10	18	52	0.03	2.4	24	37	0.33	0.58	1.78	1.97
153	IQAC-106	1	1.5	24	11.5	19	53	0.03	2.3	23	38	0.36	0.64	1.79	1.96
154	GYM	1	1.5	23	10.5	20	53	0.062	2.4	22	39	0.88	1.48	1.68	2.09
155	V L R C	1	1.5	23	11	21	53	0.062	2	22	41	0.82	1.42	1.73	2.03
156	Library	1	1.5	24	11	19	52	0.062	2.4	22	37	0.78	1.38	1.78	1.98
157	Green House	1	1.5	23	11	21	53	0.062	2	22	41	0.82	1.42	1.73	2.03
158	Lab 106	2	1.5	24	12	22	51	0.03	2	25	43	0.38	0.63	1.68	2.09
159	Library	1	1.5	24	11.5	20	52	0.062	2.3	23	38	0.74	1.36	1.83	1.92



160	Room No 102 Lab	1	2.0	24	11	19	52	0.062	2.4	22	37	0.78	1.38	1.78	1.98
161	Room No 105	1	2.0	24	12	21	52	0.062	2.5	25	39	0.75	1.36	1.8	1.95
162	Lab - 02	2	2.0	23	10	19	53	0.062	2.2	21	38	0.81	1.4	1.74	2.03
163	Room No - 3	1	2.0	23	10.5	20	53	0.062	2.4	22	39	0.88	1.46	1.66	2.11
164	Library	9	2.0	23	12	22	53	0.062	2.1	24	42	0.81	1.35	1.65	2.13
165	CIF Lab	3	2.0	22	10.5	21	52	0.062	2.4	22	39	0.88	1.53	1.74	2.02
166	Hitech Lab	1	2.0	23	12	20	52	0.03	2.6	25	38	0.35	0.62	1.76	2
167	Physical Experimental lab	2	2.0	24	11	19	53	0.062	2.6	24	38	0.78	1.45	1.85	1.9
168	M.P. Hall	4	2.0	24	12	22	53	0.062	2.1	25	43	0.81	1.41	1.73	2.04
169	Room No - 215	2	2.0	23	13	22	53	0.03	2.2	26	42	0.37	0.6	1.63	2.16
170	Room No - 209	2	2.0	23	11	20	53	0.062	2.3	22	39	0.84	1.37	1.62	2.17
171	Seminar Hall - 29	10	2.0	23	12	22	53	0.062	2	24	42	0.78	1.36	1.75	2.01
172	V L R C	2	2.0	24	11	19	52	0.062	2.4	22	37	0.78	1.38	1.78	1.98
173	Library	3	2.0	24	12	22	51	0.03	2	25	43	0.38	0.63	1.68	2.09

Remarks: - We have checked Energy Efficiency Ratio of all AC's and EER of all AC's is fairly OK. But in future you should purchase 5-Star rated inverter based split AC's because power consumption of Inverter based BEE 5-Star rated AC's is less than non-star rated AC's.

5. CEILING FANS ANALYSIS

In the CUG, 601 Fans are installed, out of which 537 fans are 60W ceiling fans and 64 exhaust fans are of 60W. The observation and suggestion are given below.

Room No	Ceiling Fan	Exhaust Fan	2*2 LED	2*2 CFL	4 Feet LED	Tube light
Academic Block 104	3				3	2
106 (1)	4			5		
Room No. 105	3				2	3
Room No. 103	3				1	4



Room No. 101	3			1	4
Room No. 102	3			4	2
Gents wash Room		2		1	
Room No. 109	4		5		1
106 (2)	4		7		
Room No. 111	4	1	5		
Room No. 112	4		5		
Room No. 113	6		8		
Room No. 110	1		2		
Gents wash Room		2			3
Ladies wash Room				2	
Corridor Ground Floor			7	6	6
Conference Room	2		8		
Room No. 201	3			7	
Room No. 202	4			3	2
Room No. 205	3				5
Room No. 207	3				5
Room No. 204	3			4	1
Room No. 206	1		11	1	
Room No. 209	7		11		
Room No. 208	3		6		
Room No. 211	3		6	1	
Room No. 212	3			7	
Room No. 210	8		11	1	
Room No. 213	6		8		
Room No. 215	5		5		2
Gents wash Room First Floor		2		1	4
Corridor First Floor				5	10
Gents wash Room First Floor		1			
Ladies wash Room First Floor		1		1	
Room No. 214					1
Seminar Hall	18		36		2
VLRC Faculty Block 1	1		2		
Room No. 2	1		2		
Room No. 3	1		2		
Room No. 4	1		2		
Room No. 5	1		2		
Room No. 6	1		2		
Room No. 7	1		2		
Room No. 8	1		2		
Room No. 9	1		2		



Room No. 10	1		2			
Gents Wash Room		1				
Ladies Wash Room		2				
Accountant Store	3		5			
Language Labouratory	10		5			
Conference Room	12		18		6	
Wash room		2				
Placement Cell	6		6			
Computer Lab	20		30			
Corridor			12			
Canteen	13				8	2
Gym	6					
Class Room Block-D 301	5		6			
Room No. 302	5		6			
Room No. 303	5		6			
Room No. 304	5		6			
Admin Building: VC Office	6	1	10			
PA to VC	2			4		
Board Room	2			4		
Finance Office	2			4		
Registrar Office	2			4		
Room No. 7	1		1	1		
Room No. 6	1		1	1		
Room No. 8	1		1	1		
Room No. 9	1		1	1		
Room No. 10	2			4		
Room No. 11	2			4		
HR Department	1		1	1		
Room No. 15	1			2		
Store and Purchase Dept	1			2		
Internal Audit Office	1			2		
Electric Store					1	
Academic and Authority	2		4			
Teaching Application Room	2		4			
Dean Office	2		4			
HR Department 02	2		4			
Admin Store	1		2			
Santry Material Store	1		2			
IWD Office	3		4		1	
Corridor	1		2	4		
Gents Washroom		2			1	1
Ladies Washroom		2				2
Parking	2				8	



Block: A 1	1			2		
Room No. 2	1			2		
Room No. 3	1			2		
Room No. 4	1			2	1	
Room No. 5	1			2		
Room No. 6	1			2		
Room No. 7	1			2		
Room No. 8	1			2		
Room No. 9	1			2		
Room No. 10	1			2		
Room No. 11	1			2		
Room No. 12	1			2		
Room No. 13	1			2		
Room No. 14	1			2		
Room No. 15	1			2		
Room No. 16	1			2		
Room No. 17	1			2		
Room No. 18	1			2		
Room No. 19	1			2		
Room No. 20	1			2		
Conference Hall: 21 to 29	1		9	1		
Gents Washroom		2			1	
Ladies Washroom		1			1	
Corridor	1			4		1
Block: B 1	1			2		
Room No. 2	1			2		
Room No. 3	1			2		
Room No. 4	1			2		
Room No. 5	1			2		
Room No. 6	2			2	1	
Room No. 7	1			2		
Room No. 8	1			2		
Room No. 9	1			2		
Room No. 10	1			2		
Room No. 11	1			2		
Room No. 12	1			2		
Gents Washroom		3			1	
Ladies Washroom		2			1	
Corridor						
Block: C 01	1			4		
Room No. 2	1			4		
Room No. 3	1			4		
Room No. 4	1			4		



Room No. 5	1			4		
Room No. 6	1			4		
Room No. 7	1			4		
Room No. 8	1			4		
Room No. 9	1			4		
Room No. 10	1			4		
Room No. 11	1			4		
Room No. 12	1			4		
Room No. 13	1			4		
Room No. 14	1			4		
Room No. 15	1			4		
ICT Department	1				1	
Corridor						
Block D: 01	1		2			
Room No. 2	1		2			
Room No. 3	1		2			
Room No. 4	1		2			
Room No. 5	1		2			
Room No. 6	1		2			
Room No. 7	1		2			
Room No. 8	1		2			
Room No. 9	1		2			
Room No. 10	1		2			
Room No. 11	1		2			
Room No. 12	1		2			
Corridor						
Room No. 13	1		2			
Room No. 14	1		2			
Room No. 15	1		2			
Room No. 16	1		2			
Wash Room near Block: D		4				
Academic Block 1	4	2		4	1	2
Room No. 2	4			5		
Room No. 3	3			3	2	
Room No. 4	4			3	2	
Room No. 5	4			5		
Room No. 6	4				3	
Room No. 7	3			5		
Room No. 8	4			2	2	
Room No. 9	4			1	4	
Room No. 10	4		5			
Toilet Gents Ladies		4			2	
LAB	4	1			7	



CIF 01	6			11		
CIF 02	3			10		
Round Light						
Hightech	4			8		
Side LAB		2			1	5
Dabba LAB 01		1			2	
Room No. 2						
Room No. 3					3	
Room No. 4		1			3	
Room No. 5		1			2	
Room No. 6					2	
Room No. 7						
Room No. 8		1				
Room No. 9						
Room No. 10		1				
Room No. 11		1				
Room No. 12		1				
Room No. 13						
Room No. 14						
MP Hall	7			6	6	
Reading Room	3				6	
Canteen	22	2		33	20	
Main Building 1	5				3	3
Room No. 2	3	1			3	4
Room No. 3	4				3	6
Room No. 4	6				4	2
Room No. 5	4	1			4	2
Room No. 6	2	2			8	
Corridor					1	3
Toilet		6			3	1
Room No. 101						
Room No. 102	6				5	1
Room No. 103	5				5	
Room No. 104						
Room No. 105	2	2			8	
Room No. 106	8				2	1
Corridor	1				3	1
Toilet					1	
Library Hall	11				14	
Reading Hall 1	6				7	
Book Section (Main)	18				12	4
Hindi Section	5				7	
Magazine Section					1	2



ગુજરાત કેન્દ્રીય વિશ્વવિદ્યાલય
CENTRAL UNIVERSITY OF GUJARAT



Manoj Sir's Office	2				4	
Faculty Section 1	1					
Room No. 2	2					
Room No. 3	1					
Room No. 4	1					
Room No. 5	1					
Room No. 6	1				1	
Room No. 7	1				2	
Room No. 8	1				1	
Room No. 9	1				1	
Room No. 10	1					
Room No. 11	1					
Room No. 12	1				1	
Room No. 13	1					
Room No. 14	1					
Room No. 15	1				1	
Room No. 16	1					
Room No. 17	1					
Room No. 18	1				3	
Room No. 19	1				1	
Room No. 20	1				1	
Room No. 21	1					
Room No. 22	1				1	
Room No. 23	1					
Room No. 24	1				1	
Room No. 25	1					
Room No. 26	1					
Room No. 27	1				1	
Room No. 28	1				1	
Room No. 29	1					
Room No. 30	1				2	
Room No. 31	1				2	
Room No. 32	1					
Room No. 33	1				1	
Room No. 34	1					
Room No. 35	1				1	
Room No. 36	1				1	
Room No. 37	1				1	
Room No. 38	1				2	
Toilet Ladies		2				
Corridor						
Toilet Gents		1			1	
TOTAL	537	64	207	410	276	100

Observation and Suggestions:-

In the University, existing ceiling fans of 60 W are installed but BEE 5 Star Rated of 30W Ceiling Fans are present in the market. The buyback period of the 5 star ratings appliance is too high, therefore we do not recommend to replace BEE 5 Star rated fans of 30W. However the institute can opt for buying 5 star rated appliance while replacing the old fans.

ECRM-1-Energy saving by replacing 120 W fans with energy efficient 30W ceiling fans

Total no of Ceiling Fans (60W)	=	537	Nos.
Total wattage of 60W Ceiling Fans	=	32220	Watt
Total wattage of BEE 5 Star rated Fans (30W)	=	16110	Watt
Total saving in Wattage after replacement	=	16110	Watt
Operating hours per day	=	8	Hours
Operating days per annum	=	180	Days
Energy charges per unit in Rs.	=	6.67	INR
Saving in Rs./annum	=	154733	INR
Investment INR	=	1611000	INR
Payback period:- Months	=	10.41	YEARS

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.

6. ANALYSIS OF LIGHTING SYSTEM

6.1 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.

6.2 Inventory of Lighting

Lights Type	Watt	Quantity
36 Watt Light	36 Watt	100
18 Watt Light	18 Watt	276
36 Watt CFL	36 Watt	410
9 Watt sensor LED	9 Watt	10
18 Watt LED	18 Watt	207

Detailed Inventory is added in above table containing fans details.

6.3 Lux Measurement

Description	Lux	Remark
Class Rooms	120 to 235	Acceptable
Offices	130 to 240	Acceptable
Corridors	35 to 90	Acceptable
Washrooms	45 to 76	Acceptable
Outdoor	36 to 95	Acceptable
Computer Lab	150 to 289	Acceptable
Parking area	45 to 94	Acceptable
Canteen	69 to 185	Acceptable

Observation

University have initiated LED based lighting solution, but still there are 401 (36W) CFL lights and 100 tube lights. LEDs save energy, the life span is much greater and emit virtually no heat. We recommend to replace the tube lights and CFL lights with LEDs.

We also recommend to use solar lights for open areas like parking, ground, street lights, etc. Table below shows the performance characteristics comparison of all luminaries.

Table - Luminous Performance Characteristics of Commonly Used Luminaries					
Type of Lamp	Lumens/Watt		Colour Rendering Index	Typical Application	Typical Life
	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	22	Excellent (100)	Display, flood lightening, stadium exhibition grounds, construction areas	2000 - 4000
High pressure sodium (HPSV) SON	67-121	90	Fair (22)	General lighting in ware houses, factories, 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 lights, etc.	40000 - 100000

7. OTHER POWER CONSUMPTION

60W Exhaust Fan	64
Water Cooler-200W	16
Pump No.-1	15 HP/ 11.1 KW
Pump No.-2	15 HP/11.1 KW
Pump No.-3	5 HP/3.73 KW
Pump No.-4	1 HP/0.75 KW
Pump No.-5	1 HP/0.75 KW

ANALYSIS

There should be regular maintenance schedule of equipment like geyser, water coolers, pumps, etc. University should use solar water heater instead of electric geysers. Solar geysers are convenient to use and cost effective as well as environment friendly. Computers, more than 3 year or 5 years (as per their life) should be replaced with new computers/laptops.

8. CAPACITOR BANK

Sl. No.	Identification	Capacity in KVAR
1	Sub station I	NA
2	Sub station II	NA

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