GREEN AUDIT REPORT

of

Jayawant Shikshan Prasarak Mandal's,

RAJARSHI SHAHU COLLEGE OF PHARMACY & RESEARCH,

Tathawade, Pune 411 033

Year: 2022-23

Prepared by:

ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society

Near Muktangan English School, Parvati, Pune 411009

Phone: 09890444795 Email: engress123@gmail.com

ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society, Near Muktangan English School,
Parvati, Pune 411 009 Tel: 09890444795 Email: engress123@gmail.com
MEDA Registration No: ECN/2022-23/CR-43/1709
ISO: 9001-2015 Certified (Cert No: 23EQKC13),
ISO: 14001-2015 Certified (Cert No: 23EEKW20)

GREEN AUDIT CERTIFICATE

Certificate No: ES/RSCOPR /22-23/02 **Date: 11/6/2023**

This is to certify that we have conducted Green Audit at Jayawant Shikshan Prasarak Mandal's, Rajarshi Shahu College of Pharmacy & Research, Tathawade, Pune 411 033, in the Year 2022-23.

The College has adopted following Green & Sustainable Initiatives:

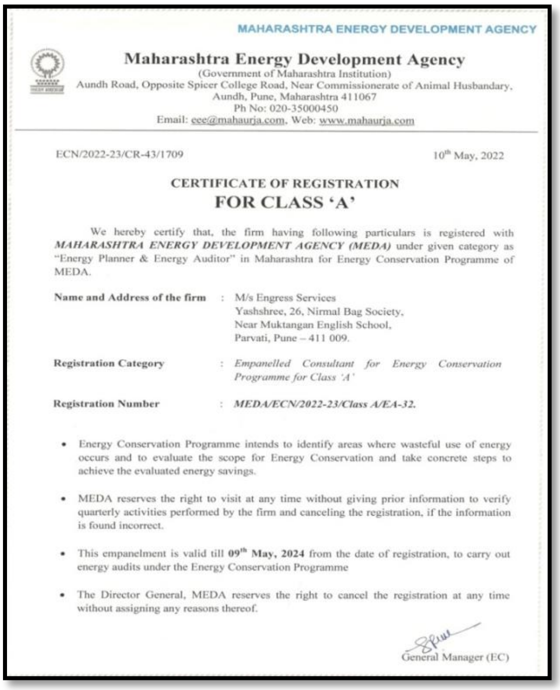
- Usage of Energy Efficient LED Light Fitting
- Usage of BEE STAR Rated Energy Efficient Equipment
- Installation of Roof Top Solar PV Plant of Capacity 10 kWp
- Segregation of Waste at source
- Installation of Vermi Composting Plant
- Implementation of Rain Water Harvesting Project
- Maintenance of good Internal Road
- Tree Plantation in the campus
- Provision of Ramp for Divyangajan
- Creation of Awareness on Water Conservation, by Display of Posters

We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & making the campus Green.

For Engress Services,

A Y Mehendale,
B E- Mech, M Tech-Energy, Certified Energy Auditor, EA-8192
ASSOCHAM GEM Certified Professional: GEM: 22/788

REGISTRATION CERTIFICATES



MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency
(Government of Maharashtra Institution)
Aundh Road, Opposite Spicer College Road, Near Commissionerate of Animal Husbandary,
Aundh, Pune, Maharashtra 411067
Ph No: 020-35000450
Email: eee@mahaurja.com, Web: www.mahaurja.com

ECN/2022-23/CR-43/1709 — 10th May, 2022

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

We hereby certify that, the firm having following particulars is registered with *MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)* under given category as "Energy Planner & Energy Auditor" in Maharashtra for Energy Conservation Programme of MEDA.

Name and Address of the firm	:	M/s Engress Services Yashshree, 26, Nirmal Bag Society, Near Muktangan English School, Parvati, Pune – 411 009.
Registration Category	:	*Empanelled Consultant for Energy Conservation Programme for Class 'A'*
Registration Number	:	*MEDA/ECN/2022-23/Class A/EA-32.*

- Energy Conservation Programme intends to identify areas where wasteful use of energy occurs and to evaluate the scope for Energy Conservation and take concrete steps to achieve the evaluated energy savings.
- MEDA reserves the right to visit at any time without giving prior information to verify quarterly activities performed by the firm and canceling the registration, if the information is found incorrect.
- This empanelment is valid till 09th **May, 2024** from the date of registration, to carry out energy audits under the Energy Conservation Programme
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

General Manager (EC)

ASSOCHAM
Ideate · Innovate · Impact

GEM Certificate

ASSOCHAM hereby certifies that

Mr. A Y Mehendale

has successfully passed the
Green and Eco-friendly Movement Certified Professional Test (GEM CP)
with
"Excellent Performance"
on
06 June, 2022

He/she is now eligible to execute the GEM Sustainability Certification Projects.
ASSOCHAM feels proud to award the GEM Certified Professional title to him/her.

Pankaj R. Dharkar, Chairman, GEM — GEM CP 22/788 — Deepak Sood, Secretary General, ASSOCHAM

MEDA REGISTRATION CERTIFICATE

ASSOCHAM GEM CP CERTIFICATE

Certificate of Registration

This is to Certify that
Quality Management System of

ENGRESS SERVICES

26, YASHASHREE, BLOCK 1, LOKMANYA NAGAR, NIRMAL BAUG SOC, PARVATI, PUNE- 411009, MAHARASHTRA, INDIA

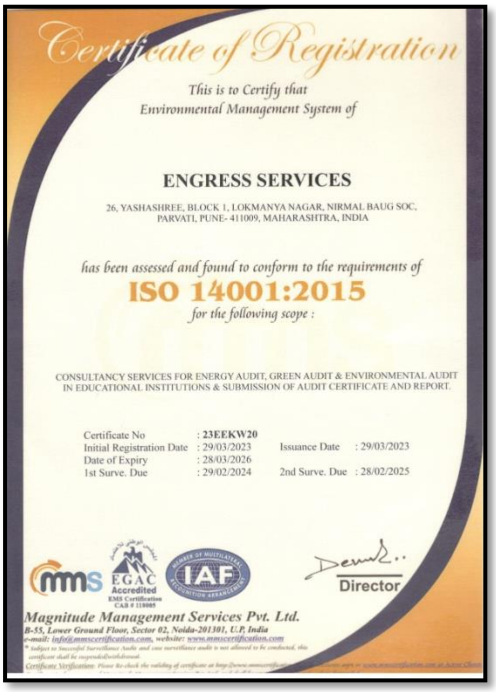
has been assessed and found to conform to the requirements of
ISO 9001:2015
for the following scope :

CONSULTANCY SERVICES FOR ENERGY AUDIT, GREEN AUDIT & ENVIRONMENTAL AUDIT IN EDUCATIONAL INSTITUTIONS & SUBMISSION OF AUDIT CERTIFICATE AND REPORT.

Certificate No	: 23EQKC13		
Initial Registration Date	: 27/03/2023	Issuance Date	: 27/03/2023
Date of Expiry	: 26/03/2026		
1st Surve. Due	: 27/02/2024	2nd Surve. Due	: 27/02/2025

Director

Magnitude Management Services Pvt. Ltd.
B-55, Lower Ground Floor, Sector 02, Noida-201301, U.P, India
e-mail: info@mmscertification.com, website: www.mmscertification.com



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Environmental Management System of

ENGRESS SERVICES

26, YASHASHREE, BLOCK 1, LOKMANYA NAGAR, NIRMAL BAUG SOC, PARVATI, PUNE- 411009, MAHARASHTRA, INDIA

has been assessed and found to conform to the requirements of
ISO 14001:2015
for the following scope :

CONSULTANCY SERVICES FOR ENERGY AUDIT, GREEN AUDIT & ENVIRONMENTAL AUDIT IN EDUCATIONAL INSTITUTIONS & SUBMISSION OF AUDIT CERTIFICATE AND REPORT.

Certificate No	: 23EEKW20		
Initial Registration Date	: 29/03/2023	Issuance Date	: 29/03/2023
Date of Expiry	: 28/03/2026		
1st Surve. Due	: 29/02/2024	2nd Surve. Due	: 28/02/2025

Director

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e-mail: info@mmscertification.com, website: www.mmscertification.com

ISO: 9001-2015 CERTIFICATE

ISO: 14001-2015 CERTIFICATE

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ACKNOWLEDGEMENT

We Engress Services, Pune, express our sincere gratitude to the management of Jayawant Shikshan Prasarak Mandal's Rajarshi Shahu College of Pharmacy & Research, Tathawade, Pune, for awarding us the assignment of Green Audit of their Campus for the Year: 2022-23.

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

EXECUTIVE SUMMARY

1. Jayawant Shikshan Prasarak Mandal's Rajarshi Shahu College of Pharmacy & Research, Tathawade, Pune consumes Energy in the form of **Electrical Energy;** used for various Electrical Equipment, office & other facilities.

2. Present Energy Consumption & CO_2 Emission:

No	Particulars	Value	Unit
1	Annual Energy Purchased	**34604**	kWh
2	Annual LPG Consumed	**114**	Kg
3	Annual CO_2 Emissions	**31.45**	MT

3. Renewable Energy & Reduction in CO_2 Emissions:

- The College has installed Roof Top Solar PV Plant of Capacity **10 kWp.**
- The Energy generated by Solar PV Plant in 22-23 is **12000 kWh**.
- Reduction in CO_2 Emissions in 22-23 is **10.8 MT**

4. Waste Management:

No	Head	Particulars
1	Solid Waste	Segregation of Waste at source
2	Organic Waste	Provision of Vermi Composting Pit
3	Chemical Fumes	Provision of Fumigation Chamber
4	E Waste Management	Disposed through Society

5. Rain Water Harvesting:

The College has installed the Rainwater harvesting project; the rain water falling on the terrace is collected and is used for increasing the underground water table.

6. Green & Sustainable Practices:

- Maintenance of good Internal Road
- Tree Plantation in the campus.
- Provision of Ramp for Divyangajan
- Creation of awareness on Water Conservation Display of Posters

7. Assumptions:

1. Energy Consumed is computed based on Load Utilization Factor
2. **1 kWh** of Electrical Energy releases **0.9 Kg** of **CO_2** into atmosphere
3. **1 Kg** of LPG releases **2.68 Kg** of **CO_2** into atmosphere
4. Energy generated by Roof Top Solar PV Plant: **4 kWh/kWp per Day**
5. Annual Solar Energy generation Days: **300 Nos**

8. References:

- For CO_2 Emissions: www.tatapower.com
- For Solar PV Energy generation: www.solarrooftop.gov.in

ABBREVIATIONS

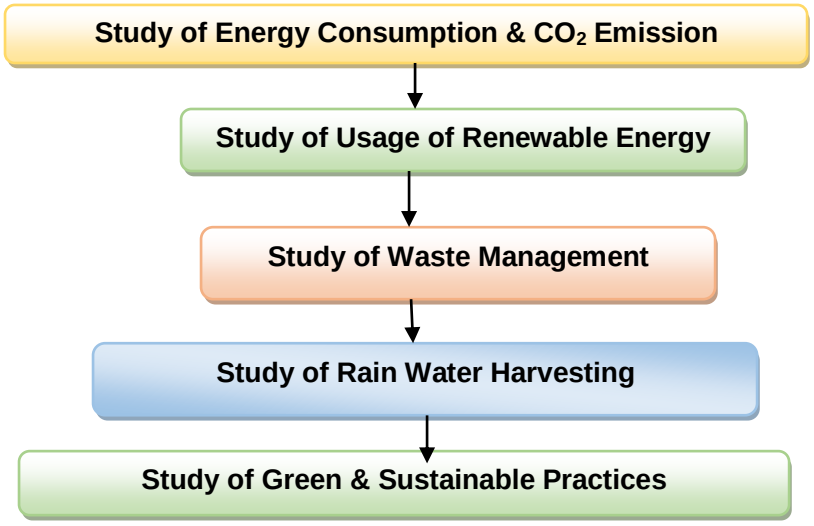
BEE	Bureau of Energy Efficiency
kWh	Kilo Watt Hour
LPD	Liters Per Day
Kg	Kilo Gram
MT	Metric Ton
CO_2	Carbon Di Oxide
Qty	Quantity

CHAPTER-I
INTRODUCTION

1.1 Introduction:

A Green Audit is conducted at Jayawant Shikshan Prasarak Mandal's, Rajarshi Shahu College of Pharmacy & Research, Tathawade, Pune 411 033.

1.2 Audit Procedural Steps:



1.3 College Location Image:

CHAPTER-II
STUDY OF ENERGY CONSUMPTION & CO_2 EMISSION

A Carbon Foot print is defined as the Total Greenhouse Gas emissions, emitted due to various activities.. The College uses Electrical Energy for various Electrical gadgets.

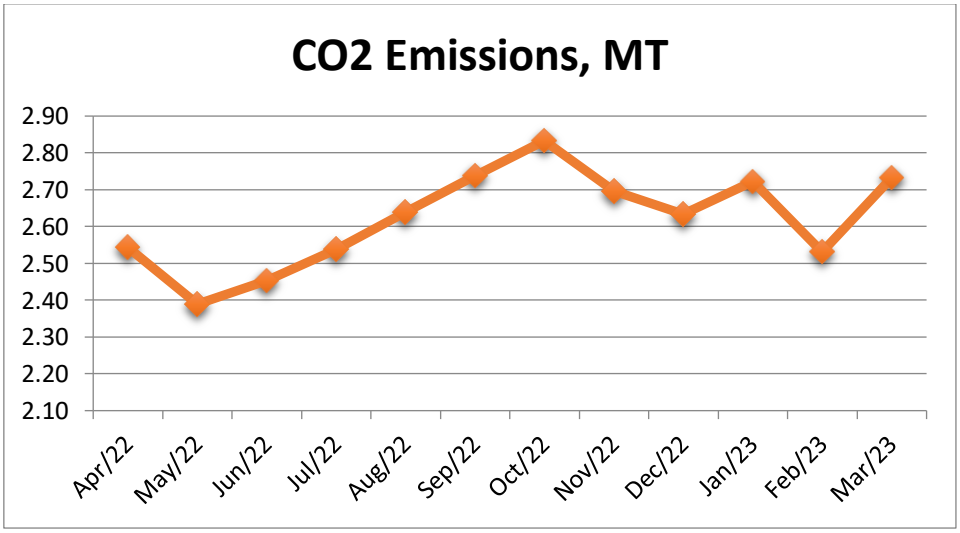
Basis for computation of CO_2 Emissions:

- **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere
- **1 Kg** of **LPG** releases **2.68 Kg of CO_2** into atmosphere.

Table No 1: Month wise Energy Consumption & CO_2 Emissions:

No	Month	Energy Purchased, kWh	LPG Consumed, Kg	CO_2 Emissions, MT
1	Apr-22	2796	10	2.54
2	May-22	2628	9	2.39
3	Jun-22	2696	10	2.45
4	Jul-22	2794	9	2.54
5	Aug-22	2905	9	2.64
6	Sep-22	3015	9	2.74
7	Oct-22	3118	10	2.83
8	Nov-22	2967	10	2.70
9	Dec-22	2896	10	2.63
10	Jan-23	2998	9	2.72
11	Feb-23	2785	9	2.53
12	Mar-23	3006	10	2.73
13	Total	34604	114	31.45
14	Maximum	3118	10	2.83
15	Minimum	2628	9	2.39
16	Average	2883.67	9.5	2.62

Chart No 1: Month wise CO_2 Emissions:



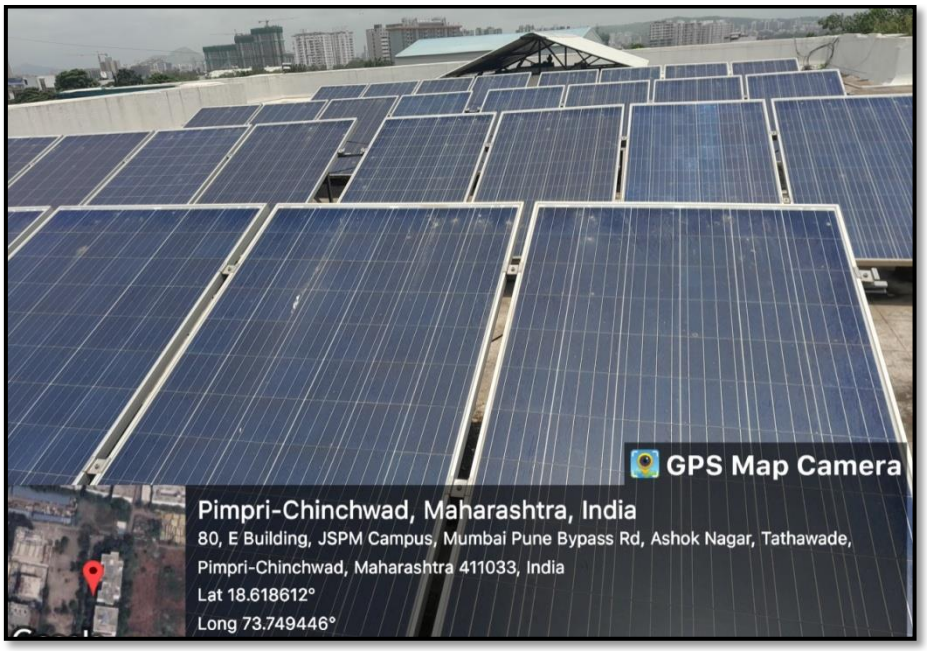
CHAPTER III
STUDY OF USAGE OF RENEWABLE ENERGY

The College has installed Roof Top Solar PV Plant of Capacity **10 kWp**
In the following Table, we present the reduction in CO_2 emissions due to Solar Energy:

Table No 3: Computation of Reduction in CO_2 Emissions:

No	Particulars	Value	Unit
1	Installed Capacity of Roof Top Solar PV Plant Capacity	10	kWp
2	Energy Generated in per kWp	4	4 kWh/kWp
3	Annual Solar Energy generation Days	300	Nos
4	Energy Generated in the Year: 22-23	**12000**	kWh
5	1 kWh of Electrical Energy saves	**0.9**	Kg/kWh
6	**Qty of CO_2 Saved by Solar PV Plant =(4)*(5) /1000**	**10.8**	**MT of CO_2**

Photograph of Roof Top Solar PV Plant:



CHAPTER IV
STUDY OF WASTE MANAGEMENT

4.1 Segregation of Waste at Source:

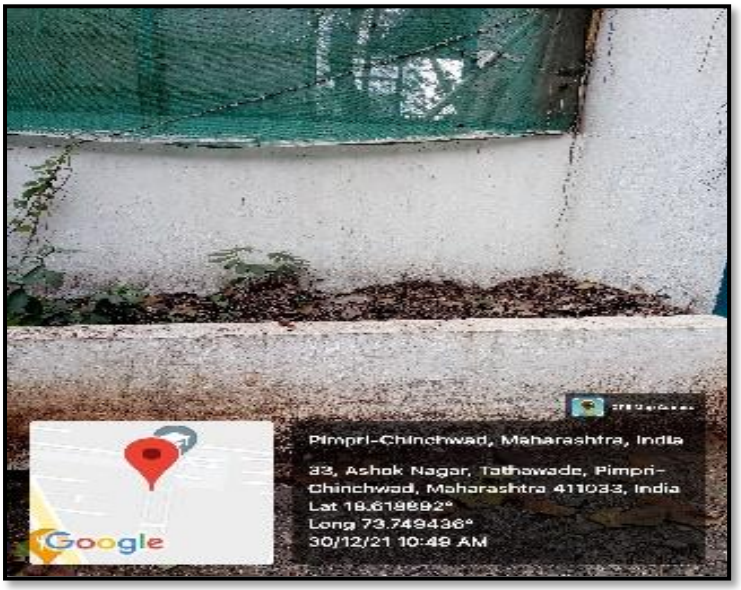
The recyclable waste, like paper, plastic waste is segregated at source and is handed over to Authorized Agency for further action.

Photograph of Waste Collection Bin:

4.2 Organic Waste Management:

The Organic Waste like leafy waste is composted in a Vermi composting Pit.

Photograph of Vermi Composting Pit:



4.3 Chemical Storage & Fumes Management:

The Chemicals are stored out of reach of students in a Fuming Chamber.

Photograph of Fuming Chamber:

4.4 E Waste Management:

The E Waste is collected in a common Bin & is disposed by the Society.

CHAPTER V
STUDY OF RAIN WATER HARVESTING

The College has installed Pipes from the terrace and the Rain water falling on the terrace is stored in an underground Tank and is further used for domestic purpose after treatment.

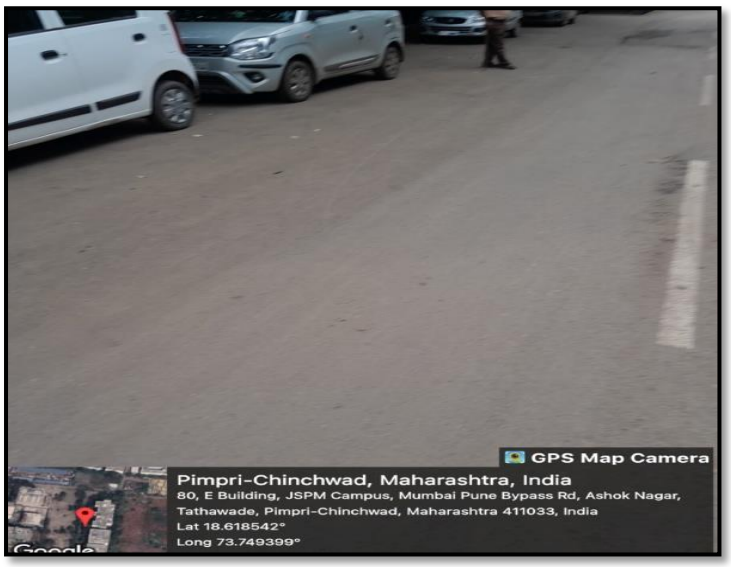
Photograph of Rain Water Carrying Pipe:

CHAPTER VI
STUDY OF GREEN & SUSTAINABLE PRACTICES

6.1 Pedestrian Friendly Road & Internal Tree Plantation:

The College has well maintained internal road to facilitate the easy movement of the students within the campus. The College has well maintained landscaped garden in the campus.

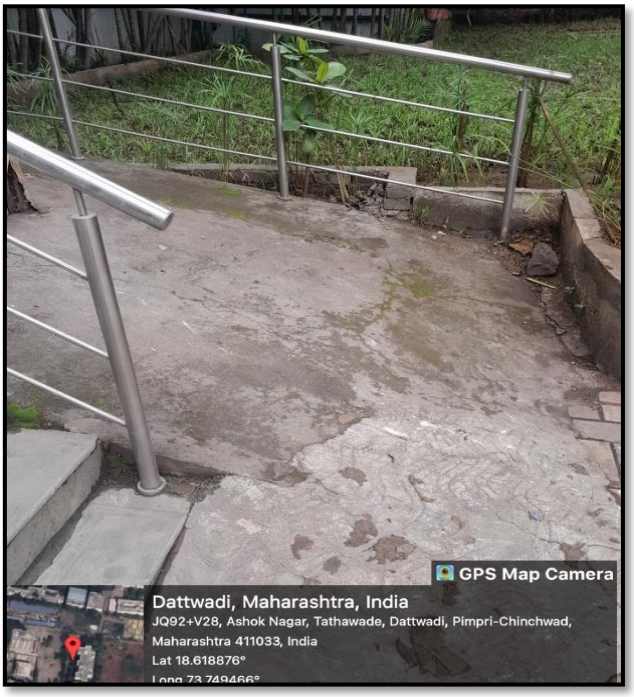
Photograph of Internal Road & Tree plantation:



6.2 Provision of Ramp for Divyangajan:

For easy movement of Divyangajan, the College has made provision of Ramp.

Photograph of Ramp:



6.3 Creation of Awareness about Water Conservation:

The College has displayed posters emphasizing on importance of Water Conservation.

Photograph of Poster on Water Conservation:

ANNEXURE-1:
DETAILS OF MEDICINAL PLANTS IN THE CAMPUS:

No	Common Name	No	Common Name
1	Tulsi	26	Mogara
2	Brahma Kamal	27	Moha
3	Adulasa	28	Limbu
4	Ghaytal Qaayapat	29	Nilgiri
5	Black Nirgundi	30	Morpankhi
6	Kadamb	31	Ajwain
7	Khus	32	Galfemia
8	Inulin	33	Ashwagandha
9	White Jaswand	34	Adulasa
10	Red Jaswand	35	Ilayachi
11	Dressinia	36	Gavati Chaha
12	Kanher	37	Nirgundi
13	Galfemia	38	Aritha
14	Khair	39	Mango
15	Phycus	40	Pimpal
16	White Champa	41	Gulvel
17	Rose.	42	Mix Spice
18	Sadaphuli	43	Mehendi
19	Curry Leaf	44	Champa
20	Tuti	45	Kamini
21	Furfuria	46	Vekhand
22	Jambhul	47	Panfuti
23	Clove	48	Prajakta
24	Cinnanom	49	Neem
25	Kachnar	50	Babhul

ENVIRONMENTAL AUDIT REPORT

of

Jaywant Shikshan Prasarak Mandal's,

RAJARSHI SHAHU COLLEGE OF PHARMACY & RESEARCH,

Tathawade, Pune 411 033

Year: 2022-23

Prepared by:

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Email: eee@mahaurja.com, Web: www.mahaurja.com

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He/she is now eligible to execute the GEM Sustainability Certification Projects.
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Pankaj R. Dharkar
Chairman, GEM

GEM CP 22/788

Deepak Sood
Secretary General, ASSOCHAM

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1. Jaywant Shikshan Prasarak Mandal's Rajarshi Shahu College of Pharmacy & Research, Tathawade, Pune consumes Energy in the form of **Electrical Energy;** used for various Electrical Equipment, office & other facilities.

2. Pollution due to College Activities:

- **Air pollution:** Mainly CO_2 on account of Electricity Consumption
- **Solid Waste:** Bio degradable Garden Waste
- **Liquid Waste:** Human liquid waste

3. Present Energy Consumption & CO_2 Emission:

No	Particulars	Value	Unit
1	Annual Energy Purchased	**34604**	kWh
2	Annual LPG Consumed	**114**	Kg
3	Annual CO_2 Emissions	**31.45**	MT

4. Renewable Energy & Reduction in CO_2 Emissions:

- The College has installed Roof Top Solar PV Plant of Capacity **10 kWp.**
- The Energy generated by Solar PV Plant in 22-23 is **12000 kWh**.
- Reduction in CO_2 Emissions in 22-23 is **10.4 MT**

5. Indoor Air Quality Parameters:

No	Parameter/Value	AQI	PM-2.5	PM-10
1	Maximum	**65**	**40**	**45**
2	Minimum	**60**	**35**	**39**

6. Indoor Comfort Conditions:

No	Parameter/Value	Temperature, ^0C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	**28.2**	**82**	**123**	**45**
2	Minimum	**28**	**80**	**98**	**39**

7. Waste Management:

No	Head	Particulars
1	Solid Waste	Segregation of Waste at source
2	Organic Waste	Provision of Vermi Composting Pit
3	Chemical Fumes	Provision of Fumigation Chamber
4	E Waste Management	Disposed through Society

8. Rain Water Harvesting:

The College has installed the Rainwater harvesting project; the rain water falling on the terrace is collected and is used for increasing the underground water table.

9. Environment Friendly Initiatives:

- Tree Plantation in the campus.
- Creation of awareness on Water Conservation Display of Posters

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5. Annual Solar Energy generation Days: **300 Nos**

11. References:

- For CO_2 Emissions: www.tatapower.com
- For Solar PV Energy generation: www.solarrooftop.gov.in
- For Various Indoor Air Parameters: www.ishrae.com
- For AQI & Water Quality Standards: www.cpcb.com

ABBREVIATIONS

Kg	:	Kilo Gram
MSEDCL	:	Maharashtra State Distribution Company Limited
MT	:	Metric Ton
kWh	:	kilo-Watt Hour
LPD	:	Liters per Day
LED	:	Light Emitting Diode
AQI	:	Air Quality Index
PM-2.5	:	Particulate Matter of Size 2.5 Micron
PM-10	:	Particulate Matter of Size 10 Micron
CPCB	:	Central Pollution Control Board
ISHRAE	:	The Indian Society of Heating & Refrigerating & Air Conditioning Engineers

CHAPTER-I
INTRODUCTION

1. Important Definitions:

1.1. Environment: Definition as per environment Protection Act: 1986

Environment includes water, air and land and the inter-relationship which exists among and between Water, Air, Land and Human beings, other living creatures, plants microorganism and property

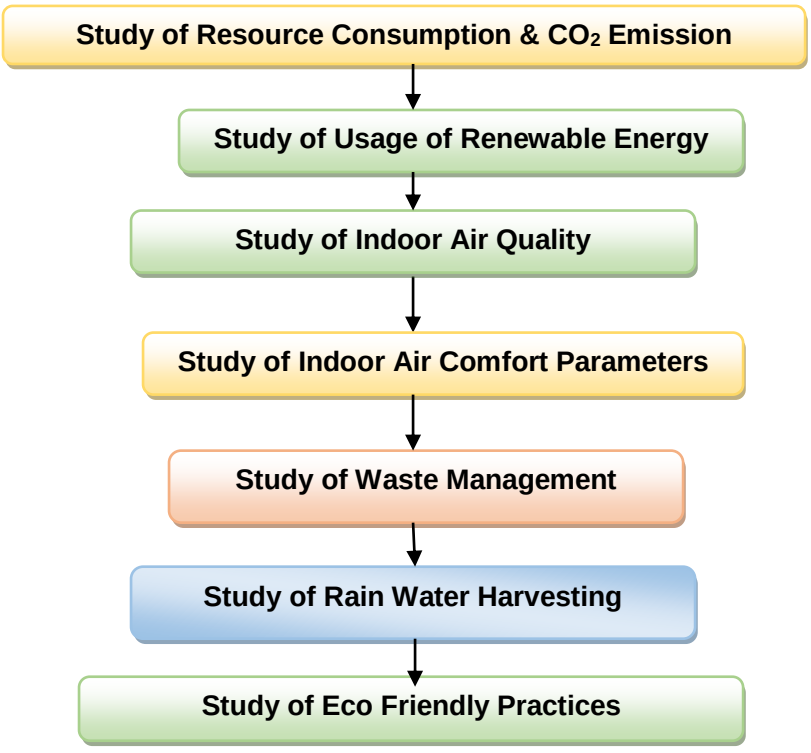
1.2. Environmental Audit: Definition:

An audit which aims at verification and validation to ensure that various environmental laws are compiled with and adequate care has been taken towards environmental protection and preservation

According to UNEP, 1990, "Environmental audit can be defined as a management tool comprising systematic, documented and periodic evaluation of how well environmental organization management and equipment are performing with an aim of helping to regularize the environment

1.3. Environmental Pollutant: means any solid, liquid and gaseous substance present in the concentration as may be, or tend to be, injurious to Environment.

1.4 Audit Procedural Steps:



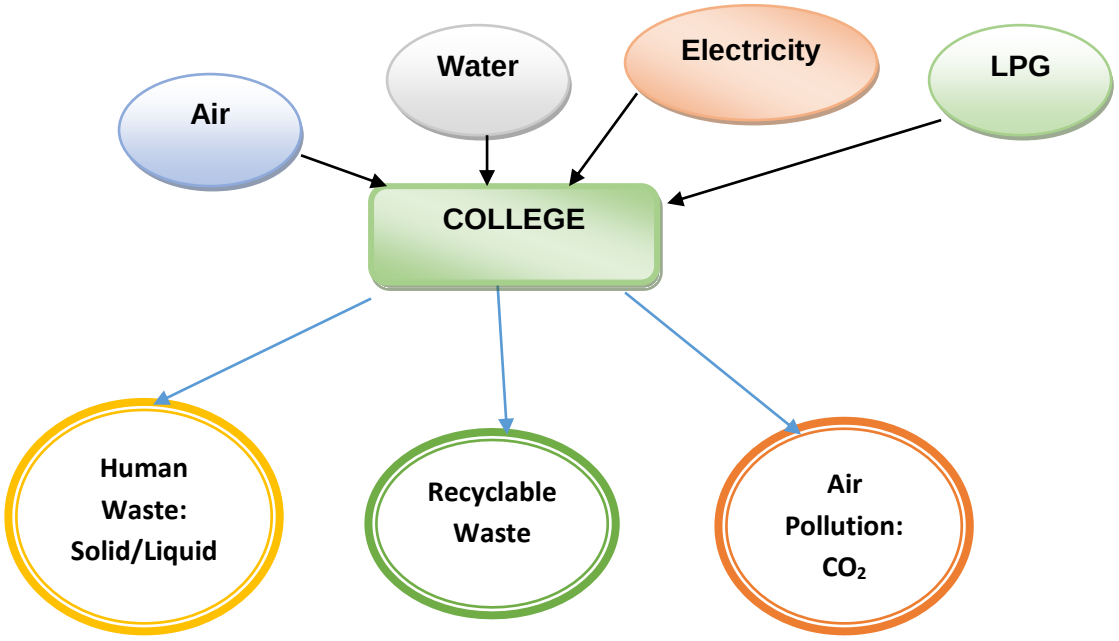
1.5 College Location Image:

CHAPTER-II
STUDY OF RESOURCE CONSUMPTION & CO_2 EMISSION

The College consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy & LPG

We try to draw a schematic diagram for the College System & Environment as under.
Chart No 1: Representation of College as System & Study of Resources & Waste



Now we compute the Generation of CO_2 on account of consumption of Electrical Energy. The basis of Calculation for CO_2 emissions due to Electrical Energy is as under.

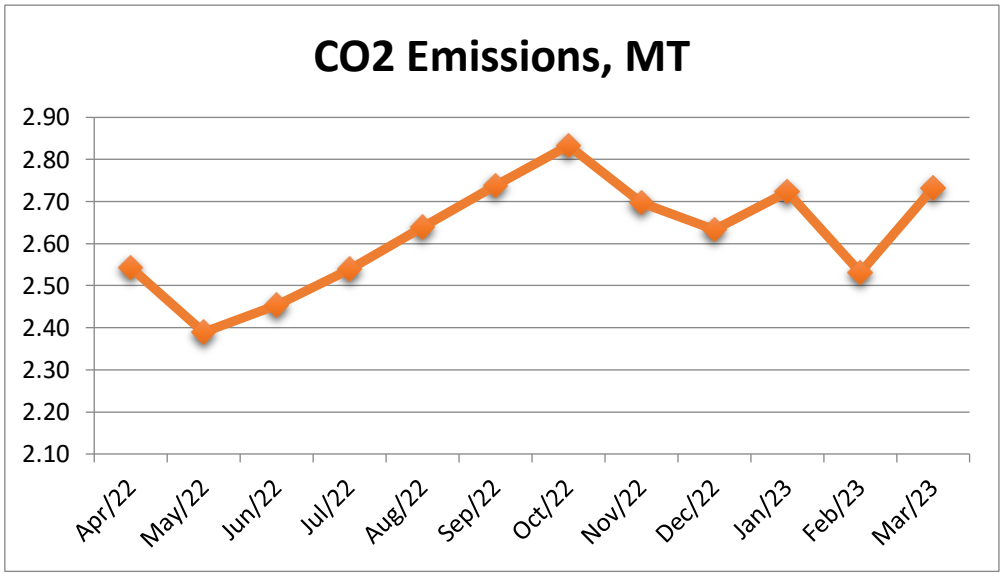
- **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere
- **1 Kg** of **LPG** releases **2.68 Kg of CO_2** into atmosphere.

Table No 1: Study of Purchase of Energy & CO_2 Emissions: 22-23:

No	Month	Energy Purchased, kWh	LPG Consumed, Kg	CO_2 Emissions, MT
1	Apr-22	2796	10	2.54
2	May-22	2628	9	2.39
3	Jun-22	2696	10	2.45
4	Jul-22	2794	9	2.54
5	Aug-22	2905	9	2.64
6	Sep-22	3015	9	2.74
7	Oct-22	3118	10	2.83
8	Nov-22	2967	10	2.70

9	Dec-22	2896	10	2.63
10	Jan-23	2998	9	2.72
11	Feb-23	2785	9	2.53
12	Mar-23	3006	10	2.73
13	Total	34604	114	31.45
14	Maximum	3118	10	2.83
15	Minimum	2628	9	2.39
16	Average	2883.67	9.5	2.62

Chart No 2: Month wise CO_2 Emissions:



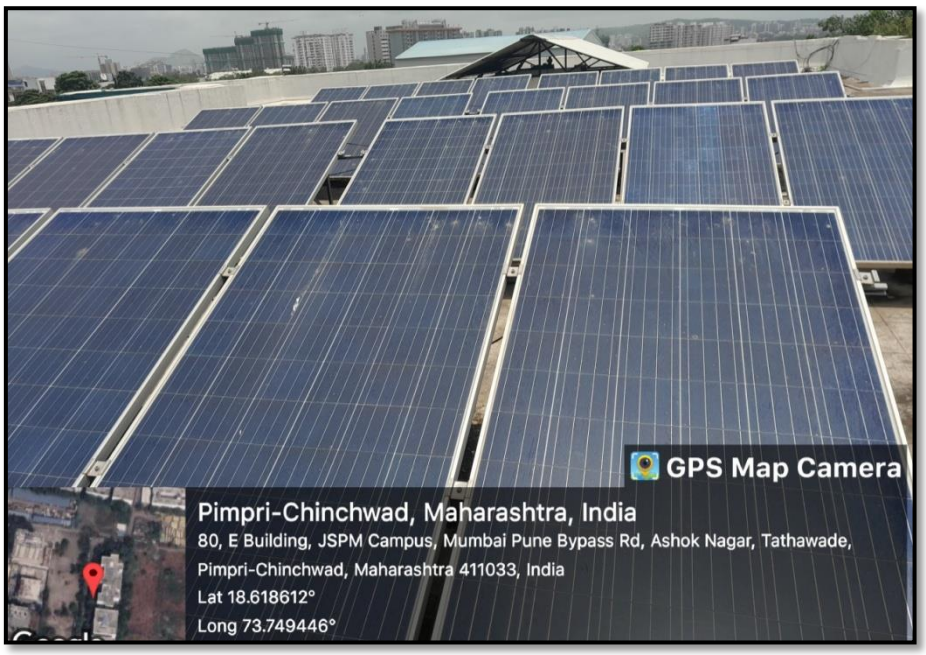
CHAPTER III
STUDY OF USAGE OF RENEWABLE ENERGY

The College has installed Roof Top Solar PV Plant of Capacity **10 kWp**
In the following Table, we present the reduction in CO_2 emissions due to Solar Energy:

Table No 2: Computation of Reduction in CO_2 Emissions:

No	Particulars	Value	Unit
1	Installed Capacity of Roof Top Solar PV Plant Capacity	10	kWp
2	Energy Generated in per kWp	4	4 kWh/kWp
3	Annual Solar Energy generation Days	300	Nos
4	Energy Generated in the Year: 22-23	**12000**	kWh
5	1 kWh of Electrical Energy saves	**0.9**	Kg/kWh
6	**Qty of CO_2 Saved by Solar PV Plant =(4)*(5) /1000**	**10.8**	**MT of CO_2**

Photograph of Roof Top Solar PV Plant:



CHAPTER IV
STUDY OF INDOOR AIR QUALITY

4.1 Importance of Air Quality:

Air: The common name given to the atmospheric gases used in breathing and photosynthesis.

By volume, Dry Air contains 78.09% Nitrogen, 20.95% Oxygen, 0.93% Argon, 0.039% carbon dioxide, and small amounts of other gases.

On average, a person inhales about **14,000 liters** of air every day. Therefore, poor air quality may affect the quality of life now and for future generations by affecting the health, the environment, the economy and the city's livability.

Air quality is a measure of the suitability of air for breathing by people, plants and animals.

4.2 Air Quality Index:

An **Air Quality Index (AQI)** is a number used by government agencies to measure the **air pollution** levels and communicate it to the population. As the AQI increases, it means that a large percentage of the population will experience severe adverse health effects.

We present herewith following important Parameters.

1. AQI- Air Quality Index
2. PM-2.5- Particulate Matter of Size 2.5 micron
3. PM-10- Particulate Matter of Size 10 micron

Table No 3: Indoor Air Quality Parameters:

No	Location	AQI	PM-2.5	PM-10
1	Library	64	39	44
2	Office	61	35	39
3	Classroom	63	37	45
4	faculty Room	60	34	39
5	Pharmaceutics Lab	63	38	49
6	Girls Common Room	65	40	44
7	Preparation room	62	36	44
8	Pharmacology Lab	60	36	39
	Maximum	**65**	**40**	**45**
	Minimum	**60**	**35**	**39**

CHAPTER V
STUDY OF INDOOR COMFORT CONDITION PARAMETERS

In this Chapter, we present the various Indoor Comfort Parameters measured during the Audit. The Parameters include:

1. Temperature
2. Humidity
3. Lux Level
4. Noise Level.

Table No 4: Study of Indoor Comfort Condition Parameters:

No	Location	Temperature, ^{0}C	Humidity, %	Lux Level	Noise Level, dB
1	Library	28.2	82	120	42
2	Office	28.1	81	114	44.5
3	Classroom	28.2	82	105	42.6
4	faculty Room	28.1	82	122	43
5	Pharmaceutics Lab	28.1	81	123	45
6	Girls Common Room	28	80	119	39
7	Preparation room	28	80	116	41.2
8	Pharmacology Lab	28.2	81	98	43.8
	Maximum	**28.2**	**82**	**123**	**45**
	Minimum	**28**	**80**	**98**	**39**

CHAPTER VI
STUDY OF WASTE MANAGEMENT

6.1 Segregation of Waste at Source:

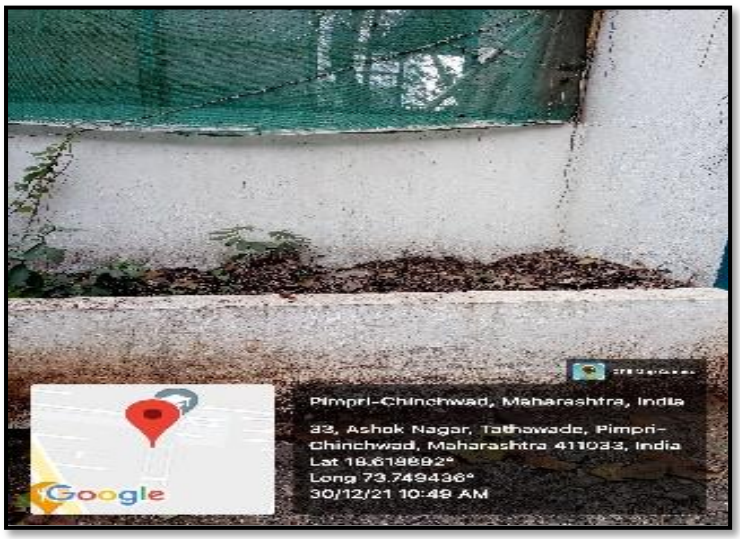
The recyclable waste, like paper, plastic waste is segregated at source and is handed over to Authorized Agency for further action.

Photograph of Waste Collection Bin:

6.2 Organic Waste Management:

The Organic Waste like leafy waste is composted in a Vermi composting Pit.

Photograph of Vermi Composting Pit:



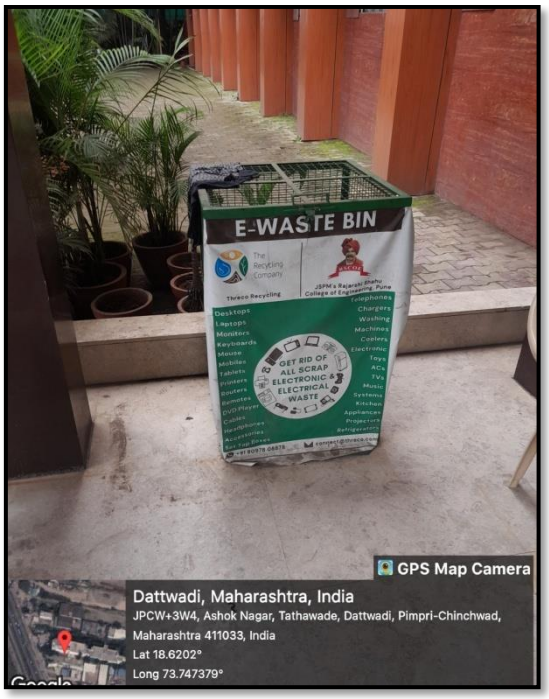
6.3 Chemical Storage & Fumes Management:

The Chemicals are stored out of reach of students in a Fuming Chamber.

Photograph of Fuming Chamber:

6.4 E Waste Management:

It is recommended to dispose of the E Waste through Authorized Agency



CHAPTER-VII
STUDY OF RAIN WATER HARVESTING

The College has installed Pipes from the terrace and the Rain water falling on the terrace is stored in an underground Tank and is further used for domestic purpose after treatment.

Photograph of Rain Water Carrying Pipe:

CHAPTER-VIII
STUDY OF ECO FRIENDLY INITIATIVES

8.1 Internal Tree Plantation:

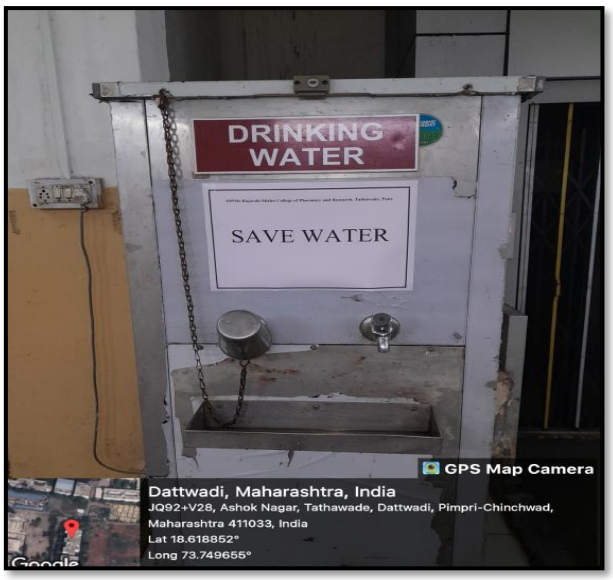
The College has Tree Plantation in the campus.

Photograph of Tree plantation:

8.2 Creation of Awareness about Water Conservation:

The College has displayed posters emphasizing on importance of Water Conservation.

Photograph of Poster on Water Conservation:



ANNEXURE-I:
VARIOUS AIR QUALITY, NOISE & COMFORT STANDARDS:

1. Category Wise Air Quality Index Values & Concentration of PM 2.5 & PM10:

No	Category	AQI Value	Concentration Range, PM 2.5	Concentration Range, PM 10
1	Good	0 to 50	0 to 30	0 to 50
2	Satisfactory	51 to 100	31 to 60	51 to 100
3	Moderately Polluted	101 to 200	61 to 90	101 to 250
4	Poor	201 to 300	91 to 120	251 to 350
5	Very Poor	301 to 400	121 to 250	351 to 430
6	Severe	401 to 500	250 +	430 +

2. Recommended Noise Level Standards:

No	Location	Noise Level dB
1	Auditoriums	20-25
2	Outdoor Playground	55
3	Occupied Class Room	40-45
4	Un occupied Class Room	35
5	Apartment, Homes	35-40
6	Offices	45-50
7	Libraries	35-40
8	Restaurants	50-55

3. Thermal Comfort Conditions: For Non-conditioned Buildings:

No	Parameter	Value
1	Temperature	Less Than 33^0C
2	Humidity	Less Than 70%

ENERGY AUDIT REPORT

of

Jayawant Shikshan Prasarak Mandal's,

RAJARSHI SHAHU COLLEGE OF PHARMACY & RESEARCH,

Tathawade, Pune 411 033

Year: 2022-23

Prepared by:

ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society
Near Muktangan English School, Parvati, Pune 411009
Phone: 09890444795 Email: engress123@gmail.com

ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society, Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: engress123@gmail.com
MEDA Registration No: ECN/2022-23/CR-43/1709
ISO: 9001-2015 Certified (Cert No: 23EQKC13),
ISO: 14001-2015 Certified (Cert No: 23EEKW20)

ENERGY AUDIT CERTIFICATE

Certificate No: ES/RSCOPR/22-23/01 **Date: 11/6/2023**

This is to certify that we have conducted Energy Audit at Jayawant Shikshan Prasarak Mandal's, Rajarshi Shahu College of Pharmacy & Research, Tathawade, Pune 411 033, in the Year 2022-23.

The College has adopted following Energy Efficient Initiatives:

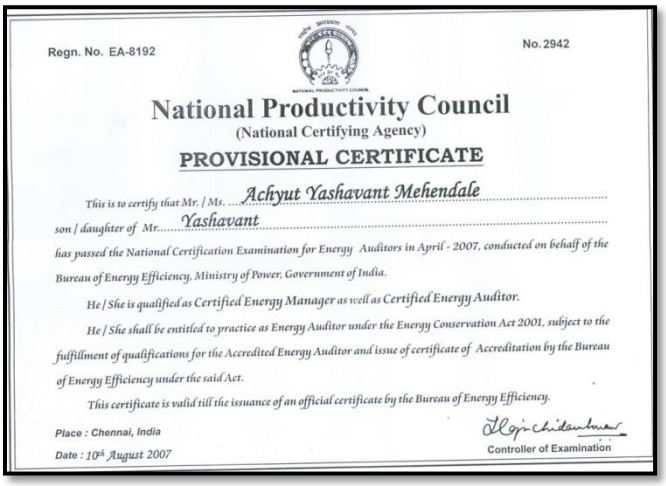
- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Maximum usage of Day Lighting
- Installation of 10 kWp Roof Top Solar PV Plant

We appreciate the support of Management, involvement of faculty members and students in the process of making the Campus Energy Efficient.

For Engress Services,

A Y Mehendale,
B E-Mechanical, M Tech- Energy
BEE Certified Energy Auditor, EA-8192

REGISTRATION CERTIFICATES



Regn. No. EA-8192 No. 2942

National Productivity Council
(National Certifying Agency)

PROVISIONAL CERTIFICATE

This is to certify that Mr. / Ms. Achyut Yashavant Mehendale son / daughter of Mr. Yashavant has passed the National Certification Examination for Energy Auditors in April - 2007, conducted on behalf of the Bureau of Energy Efficiency, Ministry of Power, Government of India.

He / She is qualified as Certified Energy Manager as well as Certified Energy Auditor.

He / She shall be entitled to practice as Energy Auditor under the Energy Conservation Act 2001, subject to the fulfillment of qualifications for the Accredited Energy Auditor and issue of certificate of Accreditation by the Bureau of Energy Efficiency under the said Act.

This certificate is valid till the issuance of an official certificate by the Bureau of Energy Efficiency.

Place : Chennai, India
Date : 10th August 2007

Controller of Examination

AUDITOR CERTIFICATE

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency
(Government of Maharashtra Institution)
Aundh Road, Opposite Spicer College Road, Near Commissionerate of Animal Husbandary, Aundh, Pune, Maharashtra 411067
Ph No: 020-35000450
Email: eee@mahaurja.com, Web: www.mahaurja.com

ECN/2022-23/CR-43/1709 10th May, 2022

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

We hereby certify that, the firm having following particulars is registered with ***MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)*** under given category as "Energy Planner & Energy Auditor" in Maharashtra for Energy Conservation Programme of MEDA.

Name and Address of the firm : M/s Engress Services
Yashshree, 26, Nirmal Bag Society,
Near Muktangan English School,
Parvati, Pune – 411 009.

Registration Category : *Empanelled Consultant for Energy Conservation Programme for Class 'A'*

Registration Number : ***MEDA/ECN/2022-23/Class A/EA-32.***

- Energy Conservation Programme intends to identify areas where wasteful use of energy occurs and to evaluate the scope for Energy Conservation and take concrete steps to achieve the evaluated energy savings.
- MEDA reserves the right to visit at any time without giving prior information to verify quarterly activities performed by the firm and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **09th May, 2024** from the date of registration, to carry out energy audits under the Energy Conservation Programme
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

General Manager (EC)

MEDA Registration Certificate

Certificate of Registration

This is to Certify that Quality Management System of

ENGRESS SERVICES

26, YASHASHREE, BLOCK 1, LOKMANYA NAGAR, NIRMAL BAUG SOC, PARVATI, PUNE- 411009, MAHARASHTRA, INDIA

has been assessed and found to conform to the requirements of
ISO 9001:2015
for the following scope :

CONSULTANCY SERVICES FOR ENERGY AUDIT, GREEN AUDIT & ENVIRONMENTAL AUDIT IN EDUCATIONAL INSTITUTIONS & SUBMISSION OF AUDIT CERTIFICATE AND REPORT.

Certificate No : 23EQKC13
Initial Registration Date : 27/03/2023 Issuance Date : 27/03/2023
Date of Expiry : 26/03/2026
1st Surve. Due : 27/02/2024 2nd Surve. Due : 27/02/2025

Director

Magnitude Management Services Pvt. Ltd.
B-55, Lower Ground Floor, Sector 02, Noida-201301, U.P, India
e-mail: info@mmscertification.com, website: www.mmscertification.com

ISO: 9001-2015 Certificate

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CONSULTANCY SERVICES FOR ENERGY AUDIT, GREEN AUDIT & ENVIRONMENTAL AUDIT IN EDUCATIONAL INSTITUTIONS & SUBMISSION OF AUDIT CERTIFICATE AND REPORT.

Certificate No : 23EEKW20
Initial Registration Date : 29/03/2023 Issuance Date : 29/03/2023
Date of Expiry : 28/03/2026
1st Surve. Due : 29/02/2024 2nd Surve. Due : 28/02/2025

Director

Magnitude Management Services Pvt. Ltd.
B-55, Lower Ground Floor, Sector 02, Noida-201301, U.P, India
e-mail: info@mmscertification.com, website: www.mmscertification.com

ISO: 14001-2015 Certificate

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ACKNOWLEDGEMENT

We Engress Services, Pune, express our sincere gratitude to the management of Jayawant Shikshan Prasarak Mandal's Rajarshi Shahu College of Pharmacy & Research, Tathawade, Pune, for awarding us the assignment of Energy Audit of their Campus for the Year: 22-23.

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

EXECUTIVE SUMMARY

1. Jayawant Shikshan Prasarak Mandal's Rajarshi Shahu College of Pharmacy & Research, Tathawade, Pune consumes Energy in the form of **Electrical Energy & LPG;** used for various Electrical Equipment, office & other facilities.

2. Present Connected Load & Energy Consumption:

No	Particulars	Value	Unit
1	Total Connected Load	**67**	kW
2	Annual Energy Purchased	**34604**	kWh
3	Annual Energy Purchased	**114**	Kg

3. Energy Performance Index:

No	Particulars	Value	Unit
1	Total Annual Energy Purchased	34604	kWh
2	Annual Energy Generated	12000	kWh
3	Annual Energy Consumed=1+2	46604	kWh
4	Total Built up area of College	4981	m^2
5	Energy Performance Index **=(3) / (4)**	**9.36**	kWh/m^2

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

No	Particulars	Value	Unit
1	Lighting Power Density	**3.2**	W/m^2
2	% of Usage of LED Lighting to Total Lighting Load	**32.20**	%

5. Renewable Energy & Energy Efficiency Projects:

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

6. Assumptions:

1. Energy Consumed is computed based on Load Utilization Factor
2. **1 kWh** of Electrical Energy releases **0.9 Kg** of **CO_2** into atmosphere
3. **1 Kg** of LPG releases **2.68 Kg** of **CO_2** into atmosphere
4. Energy generated by Roof Top Solar PV Plant: **4 kWh/kWp per Day**
5. 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 CO_2 Emissions: www.tatapower.com
- For Solar PV Energy generation: www.solarrooftop.gov.in

ABBREVIATIONS

LED	:	Light Emitting Diode
MSEDCL	:	Maharashtra State Electricity Distribution Company Limited
BEE	:	Bureau of Energy Efficiency
ECBC	:	Energy Conservation Building Code
MEDA	:	Maharashtra Energy Development Agency
PV	:	Photo Voltaic
Kg	:	Kilo Gram
kWh	:	kilo-Watt Hour
CO_2	:	Carbon Di Oxide
MT	:	Metric Ton

CHAPTER-I
INTRODUCTION

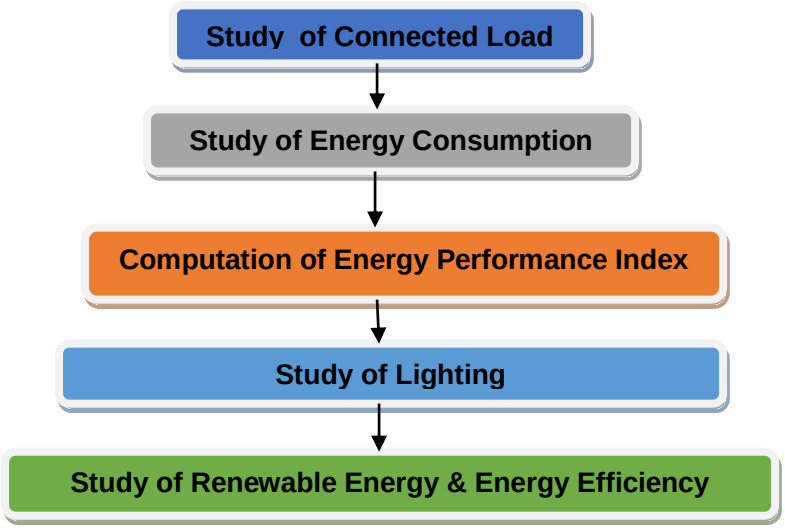
1.1 Introduction:

An Energy Audit is conducted at Jayawant Shikshan Prasarak Mandal's, Rajarshi Shahu College of Pharmacy & Research, Tathawade, Pune.

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 Audit Procedural Steps:



1.3 College Location Image:

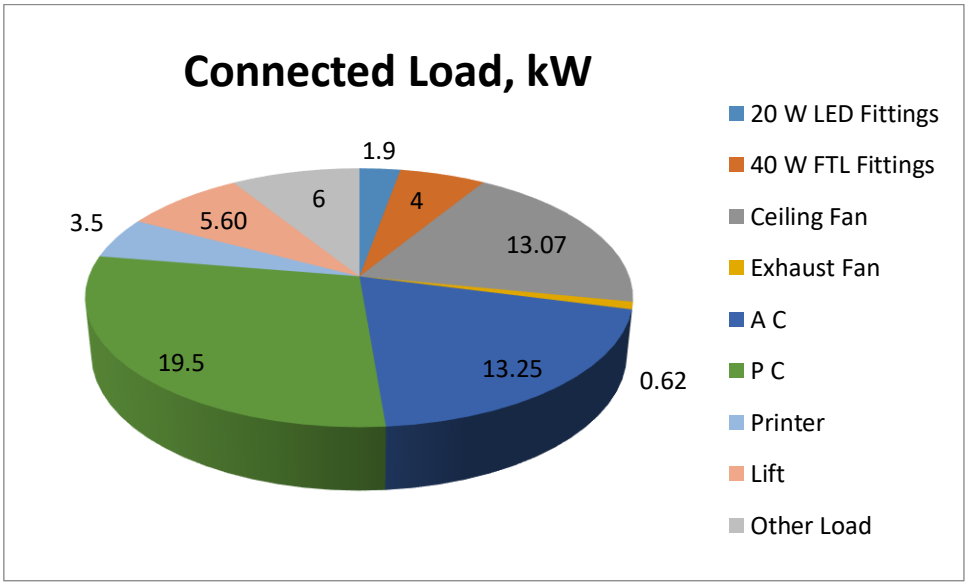
CHAPTER-II
STUDY OF CONNECTED LOAD

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

Table No 1: Study of Equipment wise Connected Load:

No	Equipment	Qty	Load/Unit, W	Load, kW
1	20 W LED Fittings	95	20	1.9
2	40 W FTL Fittings	100	40	4
3	Ceiling Fan	201	65	13.07
4	Exhaust Fan	12	52	0.62
5	A C	10	1325	13.25
6	P C	130	150	19.5
7	Printer	20	175	3.5
8	Lift	1	5595	5.60
9	Other Load	30	200	6
10	**Total**			**67**

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 & LPG Purchase Analysis- 2022-23:

No	Month	Energy Purchased, kWh	LPG Consumed, Kg	CO_2 Emissions, MT
1	Apr-22	2796	10	2.54
2	May-22	2628	9	2.39
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15	Minimum	2628	9	2.39
16	Average	2883.67	9.5	2.62

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

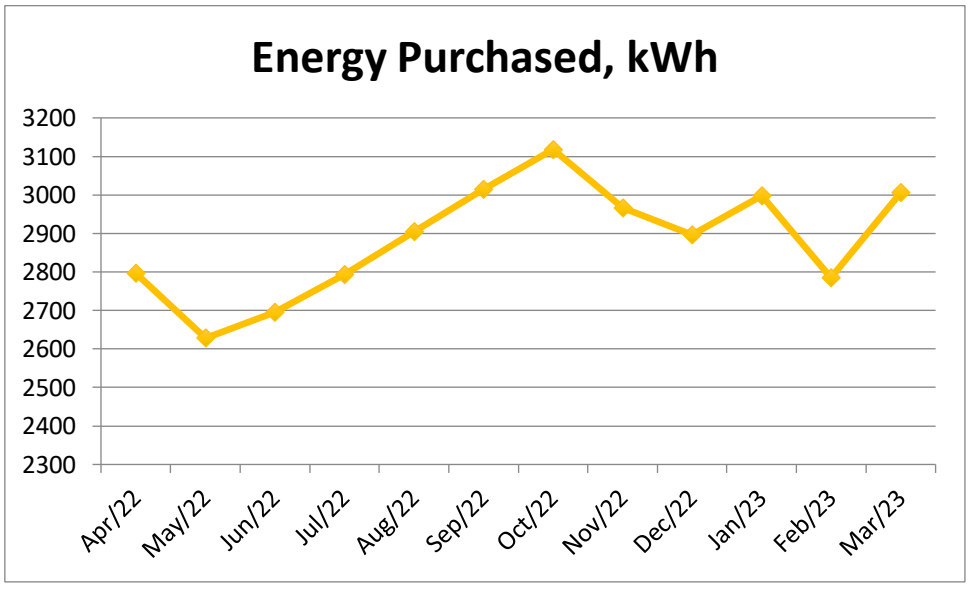
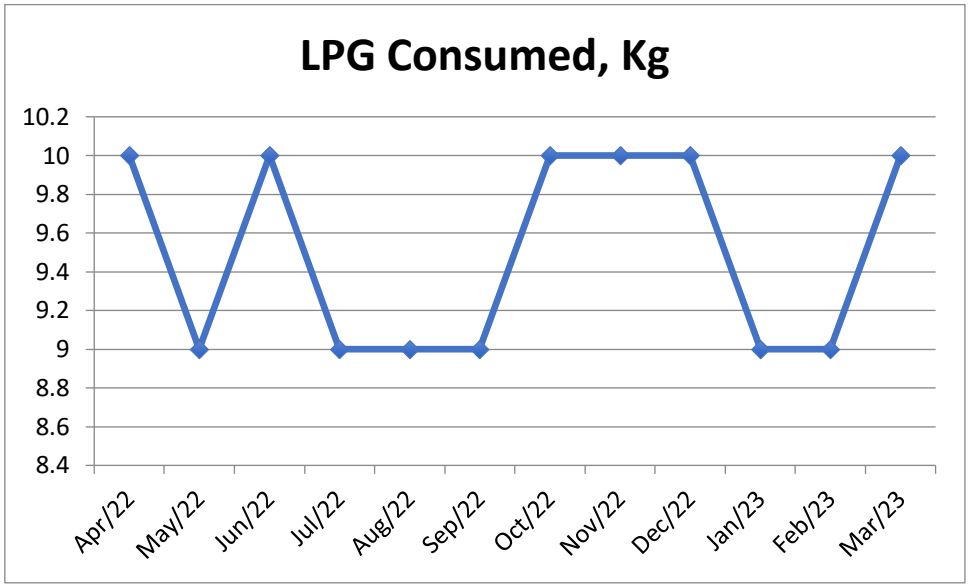


Chart No3: Variation in Monthly LPG Purchased, kWh:



CHAPTER-IV
STUDY OF ENERGY PERFORMANCE INDEX

Energy Performance Index: Energy Performance Index of a Building is its Annual Energy Consumption in Kilo Watt Hours per square meter of the Building

It is determined by:

$$\textbf{EPI} = \frac{\textbf{(Annual Energy Consumption in kWh)}}{\textbf{(Total Built-up area in m}^2\textbf{)}}$$

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	34604	kWh
2	Energy Generated by Solar PV Plant	12000	kWh
3	Total Energy Consumed= 1+2	46604	kWh
4	Total Built up area of College	4981	m^2
5	Energy Performance Index **=(3) / (4)**	**9.36**	kWh/m^2

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: Class Room:

No	Particulars	Value	Unit
1	Qty of 40 W Fittings in Class Room:	6	Nos
2	Load of 40 W Fitting	40	W/unit
3	Total Load of 6 Nos, 40 W Fittings	**240**	W
4	Built up area of Class Room: GF-07	**75**	m^2
5	**Lighting Power Density = (3)/(4)**	**3.2**	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 Tube Lights	100	Nos
2	Demand of 40 W FTL Tube Light	40	W/Unit
3	Total Electrical Load of 40 W FTL Fittings	**4**	kW
4	No of 20 W LED Tube Lights	95	Nos
5	Demand of 20 W LED Tube Light	20	W/Unit
6	Total Electrical Load of 20 W LED Fittings	**1.9**	kW
7	Total LED Lighting Load= 6	**1.9**	kW
8	Total Lighting Load=3+6	**5.9**	kW
9	**% of LEDs to Total Lighting Load = 7*100/8**	**32.20**	%

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 10 kWp

Photograph of Roof Top Solar PV Plant:

6.2 Energy Efficiency Measures adopted:

- The College has Energy Efficient LED Fittings.

Photograph of LED Lighting: