Jai Mahakali Shikshan Sanstha's

Shri Shankarprasad Agnihotri College of Engineering

Approved by AICTE, New Delhi (06/07/MS Engg. 2005 Dated 18/06/2007)
DTE Mumbai Recognised by Govt of Maharashtra Affiliated to R.T.M. Nagpur University, Nagpur

Pt. Shri. Shankarprasad Agnihotri
President

Dr. C. B. Kothare (M.E. Ph.D)
Principal

Ref.

Date : 2.11.23

7.1.3: Quality audits on environment and energy regularly undertaken by the Institution.

TABLE OF CONTENT

PRINCIPAL
Shri Shankarprasad Agnihotri College of Engineering, WARDHA

Agnihotri College Campus, Bapuji Wadi, Sindi (Meghe), Wardha-442 001 (M.S.)
(07152) 250007. Fax: 07152-250159 Website: www.sspace.ac.in

Shri Shankarprasad Agnihotri College of Engineering, Wardha

AUDIT REPORT

2018-2019

ENVIRONMENTAL & CIVIL ENGINEERING SOLUTIONS

Editorial

In the Era of global warming and climate change every citizen has to reduce their own carbon foot prints to tackle with the adverse impacts of climate change. A green audit of any academic institution revels ways in which we can reduce energy consumption, water use and reduction in emission of carbon dioxide in the environment. It is a process to look into and ask ourselves whether we are also contributing to the degradation of the environment and if so, in what manner and how we can minimize this contribution and bring down to zero and preserve our environment for future generation.

Shri Shankarprasad Agnihotri College of Engineering, Wardha administration has already taken a step towards the green approach and conducted green audit of campus in the year 2018-2019. As an outcome of this institute has taken green steps to reduce its carbon foot prints by several means in campus viz. sustainable fittings, tree plantation and green computing in the administration and examination. The responsibility of carrying out the scientific green audit was given to Environmental and Civil Engineering Solutions. The organization has followed the rules and regulation of Ministry of Environment and Forest, Govt. of India and Central Pollution Control Board, New Delhi.

During the preparation of the Audit Report Hon. Principal, Dean Academics and IQAC encouraged us with their full support and the audit team wants to mention a warm vote of thanks towards them.

N
(
E **Civil Engineering Solutions**

ACKNOWLEDGEMENT

We express our gratitude for calling upon us for this audit, mainly the Principal and all other staff members, who were ever helpful and supported us with all the inputs needed for this audit. We thank all the teaching, non-teaching and students for helping us in conducting this audit.
Green Audit Team

Mr. Nikhil N. Kamble
PhD (Sustainability), M. Tech. (Env. Eng.)

Mr. Smithesh L. Bhatt
B. E. (Civil. Eng.)

Mrs. Seema N. Kamble
Director, ECS, B. E. (Electrical)

Introduction:

The modernization and industrialization are the two important outputs of twentieth century which have made human life more luxurious and comfortable. Simultaneously, they are responsible for voracious use of natural resources, exploitation of forests and wildlife, producing massive solid waste, polluting the scarce and sacred water resources and finally making our mother Earth ugly and inhospitable. Today, people are getting more familiar to the global issues like global warming, greenhouse effect, ozone depletion and climate change etc. Now, it is considered as a final call by mother Earth to walk on the path of sustainable development. The time has come to wake up, unite and combat together for sustainable environment.

Green Audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings. Green audit can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E- waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

Need of audit:

Green auditing is the process of identifying and determining whether institutions practices are eco-friendly and sustainable. Traditionally, we are good and efficient users of natural resources. But over the period of time excess use of resources like energy, water, chemicals are become habitual for everyone especially, in common areas. Now, it is necessary to check whether our processes are consuming more than required resources? Whether we are handling waste carefully? Green audit regulates all such practices and gives an efficient way of natural resource utilization. In the era of climate change and resource depletion it is necessary to verify the processes and convert it in to green and clean one. Green audit provides an approach for it. It also increases overall consciousness among the people working in institution towards an environment.

Goals of audit:

Institute has conducted a audit with specific goals as:

Identification and documentation of green practices followed by college.
Identify strength and weakness in green practices.
Conduct a survey to know the ground reality about green practices.
Analyse and suggest solution for problems identified from survey.
Assess facility of different types of waste management.
Increase environmental awareness throughout campus.
Identify and assess environmental risk.

Objectives of Audit:

To examine the current practices which can impact on environment such as of resource utilization, waste management etc.
To identify and analyse significant environmental issues.
Setup goal, vision and mission for Green practices in campus.
Establish and implement Environmental Management in various departments.
Continuous assessment for betterment in performance in green practices and its evaluation..

Benefits of Green Audit to an Educational Institute:

There are many advantages of green audit to an Educational Institute:

It would help to protect the environment in and around the campus.
Recognize the cost saving methods through waste minimization and energy conservation.
Find out the prevailing and forthcoming complications
Empower the organization to frame a better environmental performance.

Overview of Institute:

Shri Shankarprasad Agnihotri College of Engineering, Wardha was established in the year of 1985. Institute has huge area, infrastructure and been serving the mankind in the field engineering and technology.

Jai Mahakali Shikshan Sanstha (JMSS), established in 1985,has emerged as one of the largest groups of educational institutions in Vidarbha region. As a result of benevolence, dedication and untiring efforts of the chairman JMSS, honourable Pt. Shri Shankar Prasad Agnihotri, the group has a stupendous growth of more than twenty institutions. It includes schools for tribal and ruler children with free lodging & boarding facility and education from pre-primary to doctoral research in various disciplines.
Shri Shankarprasad Agnihotri College of Engineering, Wardha was established under Agnihorti Group of Institution. It was established in 1985 by Pandit Shri. Shankar Prasadji Agnihotri as a result of dedication and motivation of late Smt. Ranibai Agnihotri who was inspired by the father of the nation Mahatma Gandhi and Vinoba Bhave. It's now grown up with more than 20 educational units of various kinds, right from pre-primary schools to post graduate institution. Vision: To develop globally competent, efficient learner and community oriented model of Engineering education. Mission: To create value added, competent and

research oriented trained Engineering professionals for sustainable development of the society.

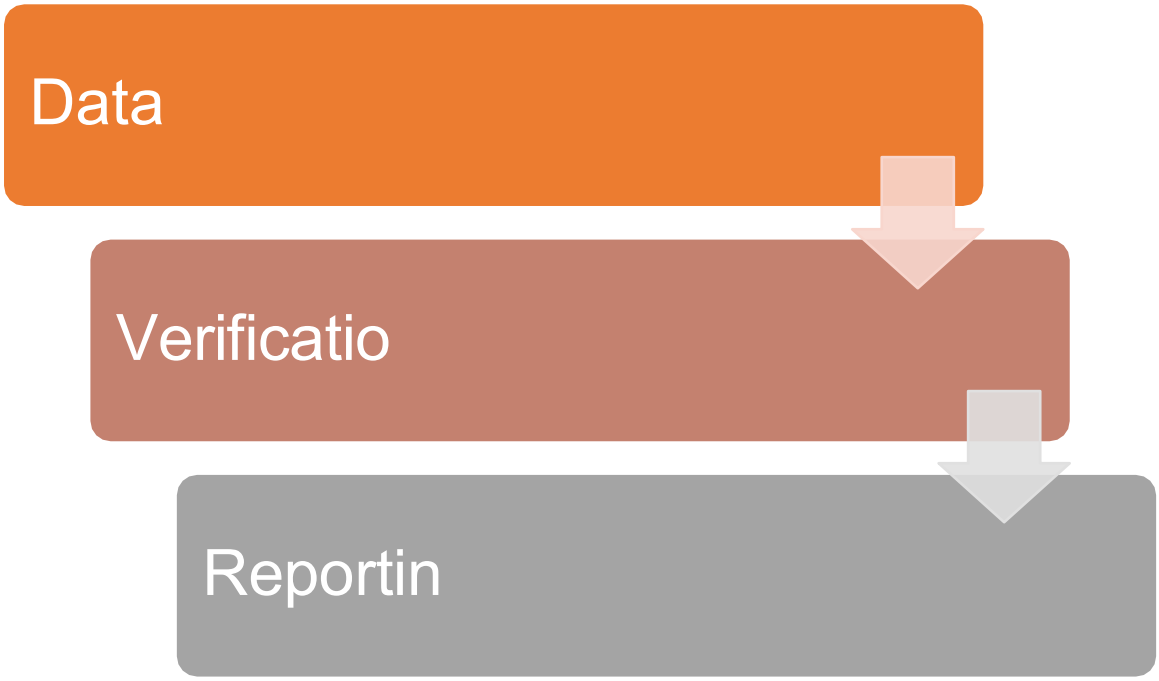
Vision of the institute:

To develop globally competent, efficient learner and community oriented model of engineering education.

Mission of the institute:

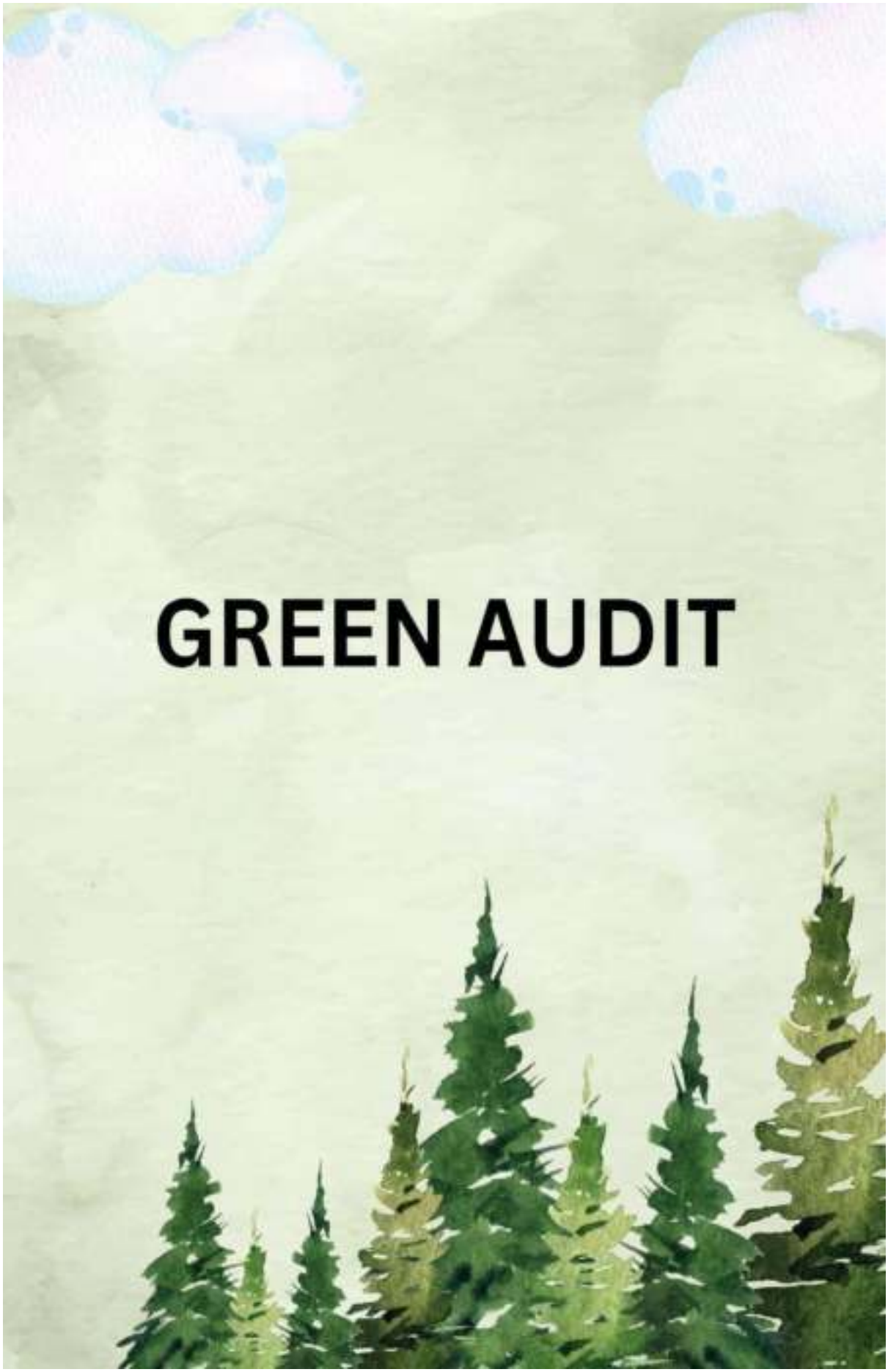
To create value added competent and research oriented trained engineering professionals for sustainable development of the society.

Methodology:



Audits to be carried out:

Green and carbon footprint audit
Energy audit
Environmental audit
Water audit
Wastewater audit


GREEN AUDIT

Green and Carbon footprint audit:

Green Audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings.

Green audit can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E-waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

Carbon is the basis of life on mother Earth. It is incorporated into the plants through photosynthesis, consumed by animal species through the food, present in the form of carbon dioxide (CO_2) the atmosphere, locked into the rocks as limestone and compressed into the different fossil fuels such as coal and oil. As CO_2 level in the atmosphere continue to increase, most climate designs or project that the oceans of the world and trees will keep soaking up more than half CO_2 .

The plants on land and in the sea, taken up carbon by over many years increased the percentage discharged during decay, and this increased carbon became locked away as fossil fuels beneath the surface of the planet. The starting of the 21st century brought growing concern about global warming, climate change, food security, poverty and population growth. In the 21st century more carbon has been released into the atmosphere than that has been absorbed. CO_2 is a principle component causing global warming. Atmospheric carbon dioxide levels have increased to 40 % from preindustrial levels to more than 390 parts per million CO_2. On this background it is a need of time to cover the research areas interrelated with climate change.

Green Cover at SSPACE:

SSPACE has got a huge green cover and has almost 50 species of vegetation inside the campus. The institute has huge campus and most of this is covered by green area. Institute has huge plantations along with variation in species Greenery is maintained well by the institute. .

Figure 1 SSPACE, Campus

SSPACE has taken huge efforts to develop its green cover. In the vicinity of the institute there is huge vegetation along the road side and around the campus. The below table shows different species of tress available in the campus and vicinity.

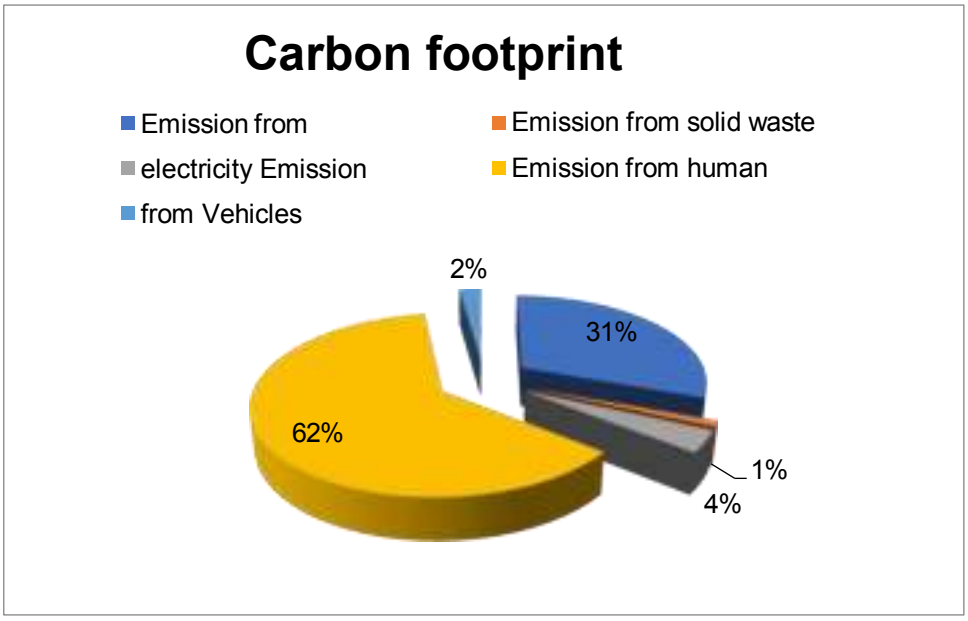
Species	**Count**	**Species**	**Count**
Neem	16	Thuja	35
Chapha	15	Shiv Babul	1
Pipal	2	Maringo	9
Karanji	17	Umba	1
Badam	1	Mogra	19

Mostly there are trees of Chapha, Neem and Mogra etc. Due to this the institute has high carbon sequesterial values. Considering the vicinity some dry plants were observed to approximately about 2. Plants absorb sunlight, 50% is absorbed and 30% reflected so this helps to create a cooler and more pleasant climate through a 3°C temperature reduction in the vicinity. This has also leaded to increase in biodiversity as more than 12 species of birds were observed. Some off the common birds were viz. Sparrow, wild parrots, little stint, black kite etc.

Carbon Footprint Audit:

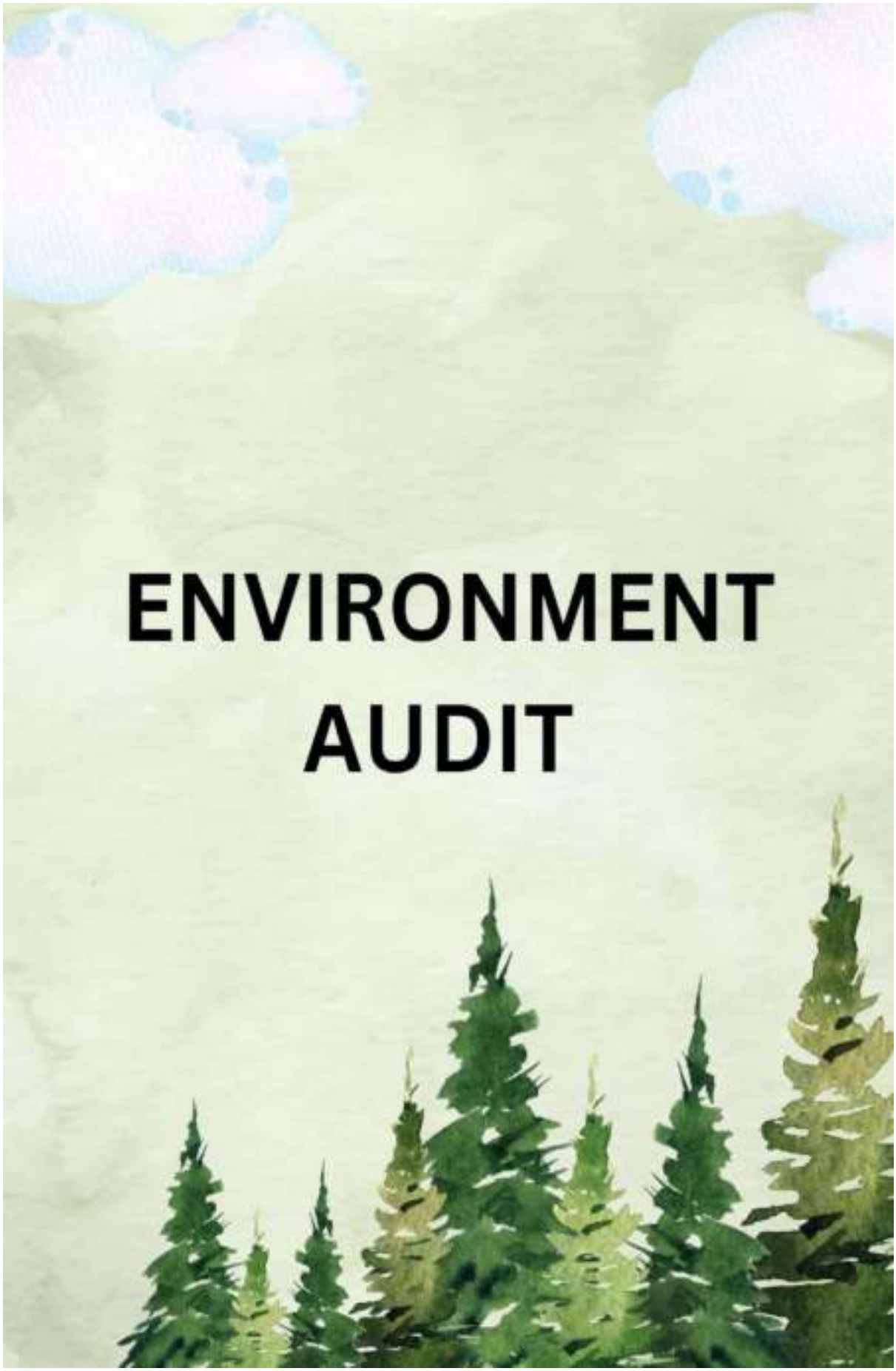
SSPACE has estimated its carbon footprint by factor methodology. Various factors were used to estimate the carbon emissions from Consumption of electricity, generation of solid waste, use of vehicles in campus, carbon emissions due to human breathing and emissions from buildings. At last they have also calculated Carbon sequesterial value i.e. carbon that is absorbed by the plants.

Sr. No.	Section	Emission
1	Emission from electricity	27411 kg CO_2 eq./year.
2	Emission from solid waste	951.2 kg CO_2 eq. per year.
3	Emission from Vehicles	3491 kg CO_2 eq. per year.
4	Emission from human breathing	55.60 tons of CO_2 eq. per year.
5	Emission from buildings	2020 kg CO_2 eq. per year.
6	Carbon sequesterial	558 kg CO_2 eq. per year.



Hence as per the calculation the carbon emission for electricity is 27411 kg CO_2 eq./year. Secondly considering emissions from human breathing, the institute has total 556 students and staff. The staff's works for about averagely 6 hours a day in the institute and the students are present for 5 hours averagely daily. Vehicles emit significant amount of gases in environment and SSPACE has various parking sections in the campus. It was found that averagely 110 vehicles entered the institute daily and travel about 450 m of distance from the gate. Cars also enter the institute and as per observation 5 cars are observed daily. Hence the overall the institute emits 3491 Kg CO_2 eq. per year.

Solid waste is very important as it emits significant amount of carbon through it. SSPACE has a good solid waste management system. Hence the institute develops about 1100 kg of waste daily in both the form of wet and dry. Hence the emission is about 951.20 kg CO_2 eq. per year. Buildings play an important role in carbon contribution. During the construction operation and use phase they emit significant amount of carbon. Hence considering total built-up area the carbon emissions could be evaluated. After the estimation the total built-up area observed was approximately about 10099.95 sq. m and the carbon emission were 2019.99 kg CO_2 eq. per year. Carbon sequesterial in important as it is the carbon absorbed by the trees. SSPACE campus has 144 fully grown trees in the campus; hence the sequesterial value is about 558 kg CO_2 eq. per year.


ENVIRONMENT
AUDIT

Environmental Audit:

An environmental audit is a type of evaluation intended to identify environmental compliance and management system implementation gaps, along with related corrective actions. ISO 14001 is a voluntary international standard for environmental management systems ("EMS"). ISO 14001:2004 provides the requirements for an EMS and ISO 14004 gives general EMS guidelines. An EMS meeting the requirements of ISO 14001:2004 is a management tool enabling an organization of any size or type to:

Identify and control the environmental impact of its activities, products or services;
Improve its environmental performance continually, and
Implement a systematic approach to setting environmental objectives and targets, to achieving these and to demonstrating that they have been achieved.

The audit examines the potential hazards or risks posed by the institutes. Areas examined may include environmental policies and procedures, energy use practices, recycling, waste, conservation, and pollution. Then, the institute can use the results to determine what changes need to be made for compliance. In a broad sense, environmental auditing aims to help protect the environment and minimize the risks of business activities to the environment and human safety and health.

Water Audit and wastewater audit:

Water auditing is a method of quantifying water flows and quality in systems, with a view to reducing water usage and often saving money on otherwise unnecessary water use. Water audit is an effective management tool for minimizing losses, optimizing various uses and thus enabling considerable conservation of water. Water audits trace water use from its point of entry into the facility/system to its discharge into the sewer/river/canal etc. Wastewater audit deals with effective management of wastewater in the system. It deals with proper generation, management, treatment, transfer and disposal of wastewater.
SSPACE has carried out its water and wastewater audit and has suggested many more ways for water conservation, reuse and recycle. The detail water and waste water report is mentioned below.

Water Audit report

Water audit for the "SSPACE" was carried out. The purpose of the water audit is to provide a thorough understanding of the water uses by identifying and measuring all water using fixtures, appliances, and practices in order to recommend potential water saving efficiencies.

PRIMARY DATA

Sr. No.	Title	Information
1	**Name of Institute**	Shri Shankarprasad Agnihotri College of Engineering, Wardha
2	**Address**	Wardha 442001
3	**Name of company under which water audit is carried out**	Environmental and Civil Engineering Solutions, Sangli
4	**Number of floors**	G + 3 (Variable)
5	**Category of building**	Educational Institute
6	**Nearest ESR location**	Campus
7	**Water supply hours**	NA
8	**Water meter present**	No

POPULATION DETAILS

Title	Information
Fixed population (Working staff and Students)	Gents: 283
	Ladies: 273
Variable population (Visiting persons)	Gents: 10
	Ladies: 8

SOURCE INFORMATION

Title	Information
Sources of water	Open well
Connection details	1” PVC pipe inlet and 1” outlet distribution pipe

STORAGE DETAILS

Title	Information
Overhead tank type	RCC tank
Location	On terrace
Number of tanks	2 X 10,000 lit RCC | 1 X 21,000 lit RCC 1 X 22,000 lit RCC | 1 X 40,000 lit RCC
Motor connection details	5 Hp for Building 1 3 Hp for Building 2
Pumping period	4 hours daily
Underground sump	Yes
Capacity of underground sump	40,000 Lit RCC

WATER USAGE

Toilet	Number of users	Water consumption
Gents toilet	283 users	283 X 15 lit = 4860
Washbasin	556 users	556 X 0.75 lit = 473
Ladies toilet	273 users	273 X 18 lit = 5526
Toilet cleaning	700 liters	700 liters
Floor cleaning	1200 liters	1200 liters
Gardening	2500 liters	2500 liters
Laboratories	2000 liters	2000 liters
Total		**15,976 lit**

SCHEDULE OF TOILETS AND WASHROOMS:

Number of Students and staff toilets in each floor for Building 1 and 2

Sr. No.	Toilet	Boys	Girls	Staff
1	**Ground floor**	2	0	5
2	**First floor**	1	2	0
3	**Second floor**	2	1	0
4	**Third floor**	1	2	0

WATER USED FOR DRINKING

There are coolers cum water purifiers present in the institute. Sample assessment for 3 months was done and average values are presented below for each section.

Potable water assessment:

Open well assessment

Sr. No.	Test	Results	Limit
1	pH	**7.8**	6.5-8.5
2	TDS	**1331**	-
3	E.C	**2158**	-
4	Hardness	**181**	200
5	Chlorides	**126**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

RO Building 1

Sr. No.	Test	Results	Limit
1	pH	**6.9-7.2**	6.5-8.5
2	TDS	**118**	-
3	E.C	**106**	-
4	Hardness	**114**	200
5	Chlorides	**115**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

RO Building 2

Sr. No.	Test	Results	Limit
1	pH	**6.8-7.7**	6.5-8.5
2	TDS	**114**	-
3	E.C	**125**	-
4	Hardness	**139**	200
5	Chlorides	**111**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

Testing specifications:

Test	ISO Code
pH	ISO 3025:11 (1993)
TDS	ISO 3025: 16 (1984)
E.C	ISO 3025: 14 (1984)
Total Hardness	ISO 1055: 12 (2012)
Chloride	ISO 3025: 40 (1991)
MPN	ISO 9308: 2 (2012)

Water Consumption in Hostel sections

Institute has hostels present for both Boys and girls. Following table shows the water cosnumption

Sr. No.	Section	Count	Demand	Water usage
1	**Boys Hostel**	116	135 LPCD	15,660
2	**Girls Hostel**	62	135 LPCD	8,370

Waste water audit

SSPACE campus generates huge amount of wastewater. The source for wastewater in the campus is hostels, institute, mess and the washrooms and urinals inside the campus. To estimate the amount of wastewater generated all the water that is used in the washrooms and hostels is considered as wastewater.

Sr. No.	Section	Wastewater generated in litres
1	Water usage generated in campus	**15,976**
2	Water usage in hostel section	**24,030**
Waste water generated		**30,004**

Waste water treatment plant at SSPACE:

Currently SSPACE lets all it waste water into sewers. Currently there is no any waste treatment facility. Sampling of waste water was done for 3 months for the parameters of COD, BOD, TKN and pH. Following table shows the characterization of wastewater.

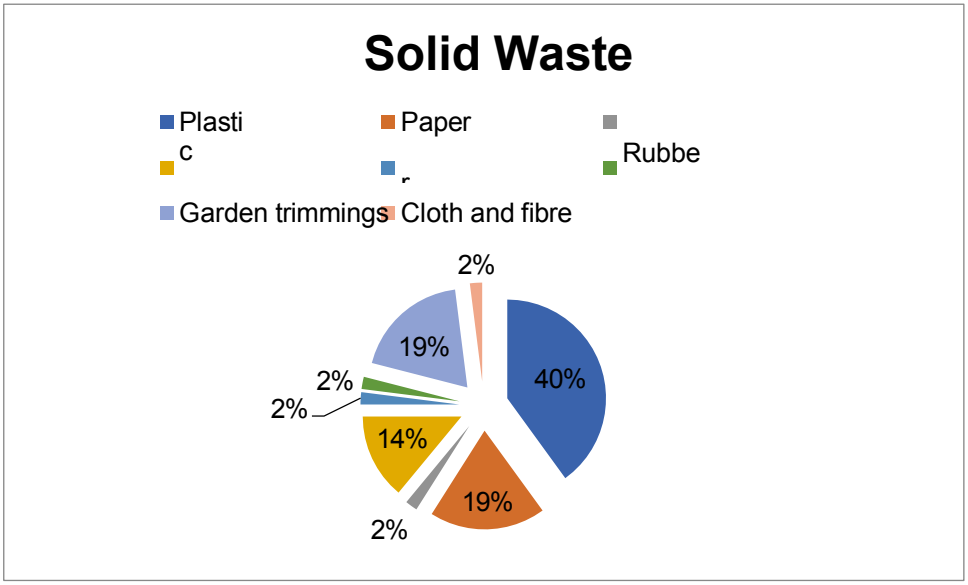
Sr. No.	Parameter	Reading
1	pH	7.71
2	COD	2158
3	BOD	137
4	TKN	26

Solid waste Audit

A waste audit is a physical analysis of waste composition to provide a detailed understanding of problems, identify potential opportunities, and give you a detailed analysis of your waste composition. A waste audit will help you clearly identify your waste generation to establish baseline or benchmark data, Characterize and quantify waste stream, Verify waste pathways, identify waste diversion opportunities and identify source reduction opportunities.

Solid waste is the unwanted or useless solid material generated from the human activities in residential, industrial or commercial area. Solid waste management reduce or eliminates the adverse impact on the environment and human health. Solid waste audit for SSPACE was carried out. The entire premise was analysed for solid waste generation and waste characterization. Overall waste was observed and characterization was done. The below table shows the components of solid waste at SSPACE campus. Quartering method was used and 1 Kg of waste was selected.

Sr. No.	Type of waste	Composition %
1	Plastic	40
2	Paper	19
3	Rubber	2
4	Food	14
5	Glass	2
6	Metals	2
7	Garden trimmings	19
8	Cloth and fibre	2



After analysing all the bins it was observed that plastic had highest contribution viz. 40% followed by the paper waste i.e. 19%. Mostly common observed plastic items were plastic wrappers of chips, soft drinks bottles and chocolate wrappers. The paper waste included paper wrappers, notebook pages, pamphlets and some pieces of cardboard. The third highest waste included garden trimmings. It included small grass, minute branches etc. The least contribution was of cloth, fibre, glass and metals.

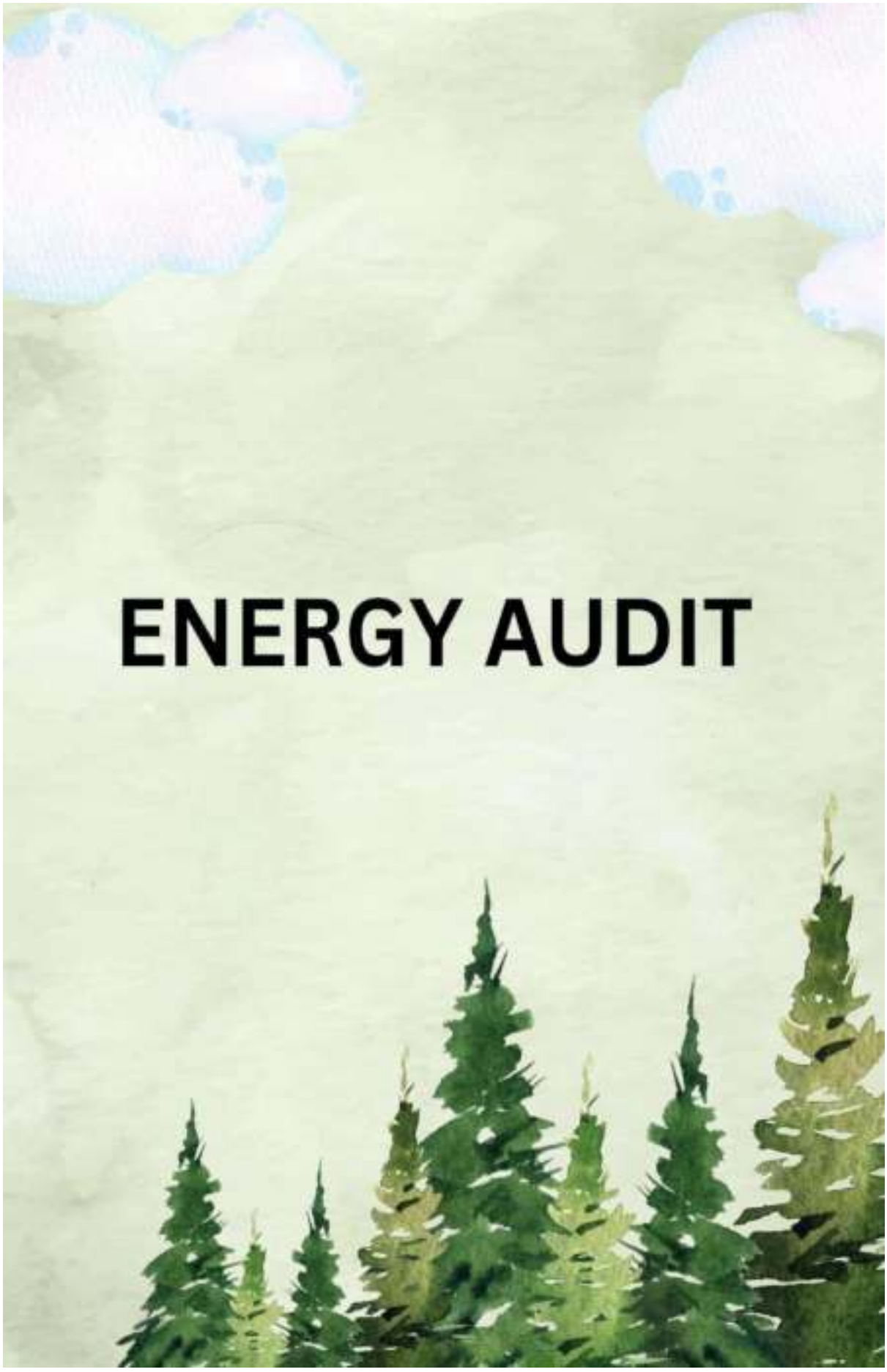
Observations and Conclusion:

There are separate bins for wet waste and dry waste. Hence, source segregation takes place.

Institute has taken steps towards paper recycling. The paper waste collected from the bins is send to vendors.

Assessment of soil was done to determine the quality of soil:

Sr. No.	Test	Results
1	pH	**6.1**
2	NPK	**2:3:1**
3	Acidity	**141 mg/lit**
4	Hardness	**137 mg/lit**


ENERGY AUDIT

Energy Audit

An energy audit is an inspection survey and an analysis of energy flows for energy conservation in a building. It may include a process or system to reduce the amount of energy input into the system without negatively affecting the output. In commercial and industrial real estate, an energy audit is the first step in identifying opportunities to reduce energy expense and carbon footprint.

A nation is tiring to advance in quantity and quality to the spread of education among the common India and development of their intelligence. In India the entire field of education and other fields of intelligent activities had been monopolized by a handful of men before independence. But today we are marching towards the desirable status of a developed nation with fast strides. But the development should be a sustained one. For achieving such an interminable development energy management is essential. As far as concerning electricity crisis, we are facing lack of electricity during office work. So, institutional management is taking design regarding production of electricity and saving electricity for Eco social aspect. Energy requirement of India is growing and incomplete domestic fossil fuel treasury. The country has motivated strategy to enlarge its renewable energy resources and policy to establish the nuclear power plants. India increases the involvement of nuclear power to largely electrical energy development facility from 4.2% to 9%. India's industrial demand accounted for 35% of electrical power requirement, domestic household use accounted for 28%, agriculture 21%, commercial 9%, and public lighting and other miscellaneous applications accounted for the rest. Energy conservation means reduction in energy consumption without making any sacrifice of quantity or quality. A successful energy management program begins with energy conservation; it will lead to adequate rating of equipment's, using high efficiency equipment and change of habits which causes enormous wastages of energy. By observing all these study lack of electricity and huge electricity demands. It is necessary to plan to be self-sufficient in electricity requirement.

Connection details:

Institute receives electricity from MSEB i.e. Maharashtra State Electricity Distribution Co. Ltd. Following are the details about connection.

Type of connection: HT (High tensioned)
Tariff: 146 HT-VII B
Contract demand: 200 KVA

Feeder voltage: 11 KW
Type: 3 Phase

Tariff Structure:

As per Distribution Company, HT and LT consumers have an option to take Time of Day (TOD) tariff instead of the normal tariff. Under TOD tariff electricity consumption and maximum demand in respect of HT consumers for different periods of the day i.e. normal period, peak load period and off-peak load period could be recorded by installing TOD meter. The maximum demand and consumption recorded in different periods could be billed on the following rates of the tariff applicable.

TOD Tariffs	Rate % (Rs./Unit)
0000 Hrs- 0600 Hrs & 2200 Hrs- 2400 Hrs	-1.500
0600 Hrs- 0900 Hrs & 1200 Hrs- 1800 Hrs	0.000
0900 Hrs- 1200 Hrs	0.800
1800 Hrs- 2200 Hrs	1.100

Power Factor:

Power Factor (PF) is an indicator of efficient utilization of power. In an AC (Alternating Current) electrical power system, PF is defined as the ratio of real power flowing to the load, to the apparent power in the circuit and is a dimensionless number.

Bill analysis:

Bill analysis for SSPACE had been done for academic year 2020-2021.

Sr. No.	Month	Consumption (Kw)	Bill Amount
1	**Apr-18**	47364	577033
2	**May-18**	35532	440494
3	**Jun-18**	21378	282542
4	**Jul-18**	32006	393062
5	**Aug-18**	36182	447274
6	**Sep-18**	39158	571096
7	**Oct-18**	44570	65009
8	**Nov-18**	28966	419913
9	**Dec-18**	22938	352014
10	**Jan-19**	26190	406965
11	**Feb-19**	27450	407417
12	**Mar-19**	39408	572000

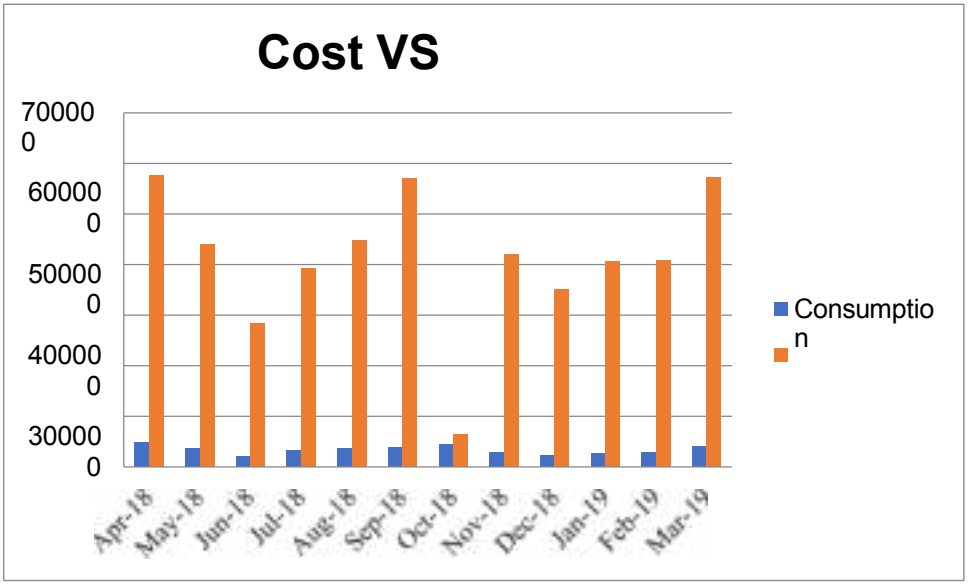
Cost Analaysis:

After analysisng the bill the average cost expenditure of the institute on energy is about 411234.6 Rs

Consumption analysis:

After analysisng the bill the average energy consumption of the institute is about 33428.5 Units

Cost VS Consumption:



ILER analysis:

Lighting is provided in industries, commercial buildings, indoor and outdoor for providing comfortable working environment. The primary objective is to provide the required lighting effect for the lowest installed load i.e. highest lighting at lowest power consumption. The purpose of performance test is to calculate the installed efficacy in terms of lux/watt/m² (existing or design) for general lighting installation. The calculated value can be compared with the norms for specific types of interior installations for assessing improvement options.

Range	Condition
0.5 or less	Urgent activity required (UAR)
0.51 - 0.70	Review Suggested (RS)
0.70- above	Good

ILER analysis for various sections in SSPACE were carried out. Firstly using LUX meter illumination was measured and then numerical analysis was carried out. ILER gives idea about lighting conditions and measured regarding improving them.

Main Building analysis

Sr. No.	Section	LUX reading	ILER	Condition
1	Library	158	0.71	Good
2	Study room	144	0.72	Good
3	Classroom B1	164	0.74	Good
4	Office	128	0.72	Good

Reasons for Good ILER:

Proper placement of windows and doors so that natural light is available well.
Good ventilation system.

Details of light fittings:

Below table shows the main fitting details in the institute building.

Energy	Count
LED	222
Fans	218
PC	280
Printer	7

SUSTAINABLE PRACTICES

SSPACE follows sustainable practices in the section of water, energy and waste management.

LED Tubes

Institute has almost 240 LED tubes present in various sections viz. classrooms, office and laboratories. The main advantages of having LED tubes are:

Open well water system

RO Water system

.

Septic tanks

Fire Extinguisher

SSPACE have installed fire extinguishers at every necessary section in the premises. These help easily as they are portable fire extinguishers and can be quickly brought to the scene of a fire.

Roof top solar panel system

Rain water harvesting:

Schedule of Lab equipments Physics lab

EQUIPMENTS		Count
1	Transistor in CB Configuration	1
2	Half and Full wave Bridge rectifier with and without filters	1
3	Zener Diode as a shunt voltage regulator	1
4	LDR Characteristics	1
5	Energy Band Gap of semiconductor material using reverse biased PN junction	1
6	To study characteristics of semiconducting diode	1
7	Characteristics of LED Kit	1
8	Resistivity by four probe method	1
9	Study of Hall Effect	1
10	e/m by Thomson method	1
11	Determination of wavelength of spectral line using diffraction grating spectrometer, sodium light system	1
12	Interference of light in the thin film (Newton's Ring Dia)	1
13	Study of Photocell and determination of Planks Constant	1
14	Combine unit / kit for divergence of LASER beam and grating element of a diffraction grating using Laser Beam	1
15	CRO	1
16	Function Generator	1
17	Spirit Level	3
18	Diffraction Grating	2
19	Spectrometer Prism ED 135x25	1
20	Zener Diode characteristics kit	1

21	Ammeter D.C, 0-50 mA	2
22	Ammeter D.C, 0-30 mA	2
23	Ammeter D.C, 0-10 mA	2
24	Voltmeter D.C.0-10 V	2
25	Voltmeter D.C.0-30 V	2
26	Voltmeter D.C.0-50 V	2
27	Prism simple	1
28	Soldering Iron 25W	1
29	Soldering wire	1
30	Soldering Paste	1
31	Screw driver set 812	1
32	Screw driver set 824	1
33	Screw driver set 936	1
34	Multimeter Analog Toyatone	1
35	Sodium Vapour Lamp 35 W	1
36	Mercury Lamp with wooden box and Transformer	1
37	Transistor Characteristics in CE Mode Model : SA-111	2
38	Transistor Characteristics in CB Mode Model : SA-112	1
39	Plano convex Lens	4
40	Semiconductor Diode Characteristics Kit Model : SA-101	2
41	Banana pins 2mm	20
42	Digital Multimeter 3 ¾ Auto ranging DMM with capacitor frequency measurement Make : Meco model : 801	8
43	Magnifier lens with light	2
44	Transistor Characteristics in CB configuration ASICO Kit	2

45	Transistor Characteristics in CE configuration ASICO Kit	2
46	Zener Diode char. Kit ASICO	2
47	PN Junction Diode kit ASICO	2
48	Diffraction Grating	2
49	Half wave Full wave Refractor kit	2
50	Digital Multimeter (inter model)	2
51	Forbidden Energy Gap kit	2
52	CB, CE and CC configuration kit	2
53	Half wave Full wave Rectifier kit	2
54	20 MHz Dual Trace CRO with probe Model :ST-201 Scientech	3
55	Function Generator Model: ST-4060 Scientech	2
56	Spectrometer	1
57	Quartz Prism for double refraction	1
58	Optical Bench 1 meter	1
59	Studty of Hall Effect	1
60	Ditital Multimeter	2
61	Table Lamp	2
62	Zener Diode kit	1
63	PN Junctioin kit	1
64	Zener Diode kit	1
65	PN Junctioin kit	1
66	e/m by Thomson method Complete setup	1
67	e/m by Thomson method Complete setup	1
68	Resistivity of Semiconductor by Four Probe Method	1

69	Sodium Lamp Assembly	1
70	Travelling Microscope	1
71	Diffraction Grating	1
72	Reading Lens	3
73	Spirit Level	1
74	Eye piece	4

Chemistry Lab

EQUIPMENTS		**Count**
1	Pensky Marten Close cup Flash Point App M. No. 1013A	3
2	Red Wood Viscometer No. 1 M. No. 1022C	2
3	Red Wood Viscometer No. 2 M. No. 1024C	2
4	PH Meter with Electrode M. No. 112	1
5	Photo Electric Calorimeter M. No. 312	1
6	Digital PH Meter Make EI Model No. 111	9
7	Weighing M/c Balance Digital Cap. 300 gm Make ELDER	2
8	Ph Meter Digital EI M No. 111	2
9	Digital Conductivity Meter Make EI M No. 611	1
10	Digital Photo Calorimeter Make EI M No. 312	1
11	Red Wood Viscometer No. 1 Model No.1022 A	2
12	Red Wood Viscometer No. 2 Model No. 1024 A	2
13	Pensky Marte Close cup Flash Point Apparatus M. No.1017	2
14	Abel Close cup Flash Point App. Model No. 1003 A	2
15	Water Still Cap. 4 Lit S.S. Distillation Assembly	2
16	Hot Air Oven with Digital Indicator 18"x18" 18" Hicon	1

17	Muffle Furnace (Digital) 1100 C 4x4x9 (Hicon)	1
18	Stop Clock Esel	40
19	Spring Balance Cap. 5 kg	1
20	Spring Balance With Cap. 2kg Barum	1
21	Spring Balance Cap. 5 kg	1
22	Digital pH Meter (EI) M. No. 111	5
23	Digital Conductivity Meter (EI) M.No. 611	1
24	Digital Photoelectric Calorimeter (EI) , M.No. 312	1
25	Heating Mantle Cap 2 Lit	2
26	Redwood Viscometer No.1	5
27	Redwood Viscometer No.2	9
28	Abel Close cup Flash Point Appratus	1
29	Penskey Marten Close cup Flash Point Apparatus	8
30	Claveland Open cup Flash point Apparatus	1
31	Redwood Viscometer No.1	5
32	Claveland Open cup Flash point Apparatus	2
33	Penskey Marten close cup Flash Point Apparatus	2
34	Weighiong M/c Digital Balance 10g to 300g (Aiwa)	1
35	Stop Clock Easel	30
36	Mechanical Stirrer	2
37	Digital Gloss 45 Deg Angle Head (Model No. RSPT-20)	1
38	Heating Mantle Cap. 2 Lit	4
39	Mechanical Stirrer Mount All Purpose/ REMI :RMQ 122/R	4
40	Heating Mantle Cap 2 Lit	1

41	Heating Mental 2000ml	1
42	Heating Mantal 2000 ml	6
43	Abel Flash Point Appratus with regulator	2
44	Heating Mantle Cap 2 Lit	6
45	Weighing M/c Digital Balance Cap. 1Kg (K-Roy)	1

Electronics Devices and Circuit Lab

EQUIPMENTS		**Count**
1	Collpit Oscillator Trainer	1
2	Emitter Follower Trainer	1
3	Two stage RC Coupled Amplifier Trainer	1
4	DC Regulated power supply 0-25V	1
5	DC Regulated power supply 0-15V	1
6	Half wave & Full wave rectifier with filter	1
7	Characteristics of PN Junction Diode	1
8	Characteristics of Zener Diode	1
9	Voltage Doubler Trainer (Voltage Regulator zener diode)	1
10	Characteristics of BJT in CE Mode	1
11	Characteristics of FET	1
12	Voltage Doubler Trainer	1
13	CRO Systronics Model 6020	2

Mechanical Measurement Lab

EQUIPMENT		**Count**
1	Basic Strain Gauge Apparatus	1
2	Measurement of force and weight using Load Cell	1

3	LVDT Instrument	1
4	Speed Measurement by using Inductive Pick up	1
5	Temperature Control using Thermocouple	1
6	Rotameter Test Rig	1
7	Stroboscope	1

Concrete technology Lab

EQUIPMENTS		**Count**
	Cube mould 15 cm	
1	i) 7.5 kg to 8 kg weight	1
2	ii) 9.0 kg to 9.5 kg weight	1
3	iii) 11 kg to 11.5 kg weight	1
4	Slump Test Apparatus	1
5	Tamping Rod	1
6	Cube Mould 7.06 cm	3
7	Fine Sieve 20 cm dia 4.75 mm	1
8	Compaction Factor Apparatus	1
9	LE CHATELIER MOULD (Set of Six)	1
	Enamel Tray	
10	i) 10”x12”	1
11	ii) 18”x12”	1
12	iii) 18”x24”	1
13	Gauging Trowel	2
14	Proving Ring 10 KN	1
15	Proving Ring 25 KN	1

16	Vicat Needle Apparatus	1
17	Beam Mould 150x150x700 mm	3
18	Spring Balance Dial Type 15 cm dia Cap. 50 Kg	2
19	Flow Table Hand Operated	1
20	VEE BEE Consistometer	1
21	Sieve Shaker Gyratory 20 cm	1
22	Hot Air Oven 24”x24”x24” S.S. 3 Tray	1
23	Compression Testing Machine 1000KN (100 Tonne)	1
24	Tiles Abrasion Testing Machine	1
25	Ultrasonic Pulse Velocity Tester	1

Heat Transfer lab

EQUIPMENTS		**Count**
1	Heat Transfer in Force Convection	1
2	Heat Transfer in Natural Convection	1
3	Dropwise & Filmwise condensation App.	1
4	Thermal Conductivity of Insulating Powder	1
5	Parallel Flow/Counter Flow Heat Exchanger	1
6	Stefen Boltzman Apparatus	1
7	Thermal Conductivity of Metal Bar	1

TOM lab

EQUIPMENTS		**Count**
1	Best Indian JPTI Make CAM Analysis Apparatus	1
2	Best Indian JPTI Make Whirling of Shaft App.	1

3	Best Indian JPTI Make Motorised Gyroscope	1
4	Best Indian JPTI Make Universal Vibration App.	1
5	Best Indian JPTI Make Governor Apparatus	1
6	Static and dynamic Balancing App.	1
7	Torsion Testing Machine	1

Digital Circuit lab

EQUIPMENTS		**Count**
1	Basic Logic Gates Trainer	1
2	Demorgan's Theorem Trainer	1
3	R-S Flip flop Trainer	1
4	Demultiplexer trainer kit	1
5	Modulo N Counter	1
6	Half/Full Adder	1
7	Half/Full Subtractor	1
8	TTL Clock Generator	1
9	CRO Systronic 6020	1
10	Trainer Kit for Universal gates by using NOR and NAND Gates Model : SB-312	2
11	Demorgan's Theorem Trainer Model : SB-311	2
12	Half/Full Adder SF : 305	2
13	Half/Full Subtractor SF : 306	2
14	Basic Logic Gates Trainer Kit AET-21 By Aquila	2
15	8:1 Multiplexer Trainer Kit AET 31M By Aquila	2
16	De-Multiplexer Trainer Kit AET 31D BY Aquila	2

17	Flip-Flop Trainer kit AET-60 By Aquila	2
18	Trainer kit of Synchronous counter by Aquilla Model AET 32A	2
19	Trainer kit of Asynchronous counter by Aquilla Model AET 32	2

TV lab

EQUIPMENT		**Counts**
1	Colour TV Trainer (51cm) by Anshuman Model: XPO-COL TV	3
2	Black & White TV Trainer with 14" CRT By Mars Edpal Model: ME 1200	1
3	Antenna Trainer with 10 Antennas (50 to 860 MHz)	1
4	Colour Patttern Genertor By Signet Model: Signet 1053 Mltichannel with colour VHF-UHF Ch.2 to Ch.12 VHF, 1 KHz FM Demodulation Attenuator 20 dB	2
5	Colour Pattern Generator by Saral (Markoni)	2
6	VCR Trainer Depmstratpr by Mars Edpal Model : ME 1215	1

Microprocessor lab

EQUIPMENTS		**Count**
1	8085 Microprocessor Kit with 16*2 LCD Display Model XPO Kit	5
2	8086 Microprocessor Kit with 16*2 LCD Display Model XPO Kit	5
3	SMPS For Microprocessor 8085 Kit	10
4	101 Keyboard	10
5	RS 232 Serial Link /cable & PC up/down Loading Software & Cross assembler on CD	10

6	8085 Microprocessor Kit with 16*2 LCD Display Model XPO Kit	5
7	8086 Microprocessor Kit with 16*2 LCD Display Model XPO Kit	5
8	SMPS For Microprocessor 8085 Kit	10
9	101 Keyboard	10
10	RS 232 Serial Link /cable & PC up/down Loading Software & Cross assembler on CD	10
11	8051 Microcontroller Kit	1

RAC lab

EQUIPMENT		**Count**
1	Computerised Variable Compression Ratio Petrol Engine	1
2	Air Conditioner Trainer Duct Type	1
3	Digital Anemometer	1
4	5 Gas Analyser	1
5	24 Column Matrix Printer	1
6	Rolling Charts	38

Production technology lab

EQUIPMENT		**Count**
1	Floating Carriage Diameter Measuring Machine Model EDM-75	1
2	Sodium Vapour Monochromatic light unit	1
3	Specimen Set: include 4 Test surface of dia 50 mm, Optical flat 01 No. Steel flat 01 No.	1
4	Optical flat 25 mm	1
5	Optical flat 30 mm	1

6	Optical flat 50 mm	1
7	Dial Indicator Range 1mm L.C. 0.001mm	1
8	Straight Edge size 300x50x8	1
9	Straight Edge Size450x50x8	1
10	Tool Maker Microscope Model TM -50	1
11	Venire Height Gauge 12 inch	1
12	Sine Bar 100 mm	2
13	Slip Gauge set	1
14	Dial Gauge Stand	1
15	Digital Micrometre For Floating Carriage	1

Metallurgy lab

EQUIPMENT		**Count**
1	Impact Testing Machine for Izod & Chirpy Test	1
2	Rockwell Hardness Testing M/c	1
3	Metal Sample Box	1
4	Inclined monocular metallurgical microscope Model n56	1
5	Binocular metallurgical microscope model 57	1
6	Metallurgical Image Analyser	1
7	specimen	1 set

Fluid power lab

EQUIPMENT		**Count**
1	Centrifugal Pump Test Rig	1
2	Reynolds Apparatus	1

3	Verification of Bernoulli's Theorem	1
4	Equipment List	1
5	Rota meter Test Rig	1
6	Flow Measured by Venturimeter & Orifice meter	1

Structural analysis lab

EQUIPMENT		**Count**
1	Behaviour of Column and Truss App.	1
2	Hinged Arches	1
3	Verification of Maxwell Reciprocal Theorem	1
4	Deflection of Truss App.	1

Transportation lab

EQUIPMENT		**Count**
1	Penskey Morten Flash Point App.	1
2	Flakiness Gauge	1
3	Length Gauge	1
4	Standard Penetrometer	1
5	Ring & Ball App.	1
6	Coarse Sieve 45 cm Dia GI	14
7	Ductility Testing Machine Model EIE 040	1
8	Specific Gravity and Water Absor. Test App.	1
9	Aggregate Crushing Value App. 15 CM	1
10	C.B.R. Testing Machine	1
11	Aggregate Impact Testing Machine	1
12	Electronic Balance 10 KG /1GM	1

13	Los Angeles Abrasion Testing Machine	1

Fluid mechanics lab

EQUIPMENT		Count
1	Bernoullis Theorem App.	1
2	Impact of Jet App.	1
3	Orifice and Mouthpiece App.	1
4	Reynolds App.	1
5	Metacentric Height App	1
6	Notch Apparatus	1
7	Pitot Tube apparatus	1

Survey lab

EQUIPMENT		Count
1	Levelling Staff 4 mtr (compact)	3
2	Transit Vernier Theodolite	1
3	Measuring chain 30 Mtr 150 Link	3
4	Measuring chain 20 Mtr 100 Link	3
5	Ranging Rod 3 Mtr	5
6	Prismatic Compass	1
7	Surveyers Compass	1
8	Dumpy Level with Stand	3
9	Plane Table	2
10	Measuring Tape Steel 30 Mtr	3
11	Trough Compass	2

Soil lab

EQUIPMENT		Count
1	Liquid Limit Device, Hand operated	1
2	Test Sieves 20 cm dia brass frame size 425 micron	1
3	Plastic limit kit	1
4	Shrinkage Limit Apparatus	1
5	Pycnometer Brass Cone, Metal Ring & Rubber seal	1
6	Particle size determination IS Test sieve 20 cm dia brass frame without any joint 4.75 mm to 150 micron	1
7	Sieve 75 micron	1
8	Lid and Receiver for above	1
9	Permeability Apparatus	1
10	Overhead tank for above made of GI sheet	1
11	Apparatus for soil determination Core cutter with Dolly & Rammer	1
12	Sand Pouring Cylinder Large	1
13	Stop Watch (Mechanical)	5
14	Glass Thermometer 0-200 Degree	1
15	Glass Thermometer 0-50 Degree	1
16	Glass Thermometer 0-110 Degree	1
17	Moisture Cane 50x50MM	4
18	Measuring Cylinder (Glass) 100 ML	2
19	Measuring Cylinder (Glass) 250 ML	2
20	Measuring Cylinder (Glass) 500 ML	2
21	Measuring Cylinder (Glass) 1000 ML	2
22	Measuring Cylinder (Plastic) 50 ML	2

23	Measuring Cylinder (Plastic) 100 ML	2
24	Measuring Cylinder (Plastic) 250 ML	2
25	Measuring Cylinder (Plastic) 500 ML	2
26	Measuring Cylinder (Plastic) 1000 ML	2
27	Evaporating Dish 150 mm dia Porcelain	2
28	Evaporating Dish 100 mm dia Porcelain	2
29	Specific Gravity Bottle 25 ml	1
30	Specific Gravity Bottle 50 ml	1
31	Specific Gravity Bottle 100 ml	1
32	G.I. Tray 18”x24”x2” with Handles	1
33	Moisture Cane 75x50MM	4
34	Glass Rod 20 cm Long x 6 mm dia	2
35	Electronic Balance 500 gm./10mg	1
36	Electronic Balance 50 kg/1g	1
37	Proctor Needle Hydraulic Type	1

Environmental engineering lab

EQUIPMENTS		**Count**
1	Hot Air Oven 14”x14”x14” S.S.	1
2	Ph. Meter PM-100 Digital	1
3	Turbidity Meter	1
4	Sound Level Meter	1
5	Flocculate	1

Engineering geology lab

EQUIPMENTS		Count
1	Specimen Rocks	14
2	Specimen Minerals	18
3	Mirror Stereoscope	1
4	Transparent Geographical Globe	1
5	Bruntan Compass	1
6	Charts	9
7	Models	25

Details of PC, CPU, Keyboard and Mouse in Programming labs

Lab Name	EQUIPMENTS		Count
PROGRAMMING LAB 2	1	MONITOR	24
		CPU	24
		KEYBOARD	24
		MOUSE	24
PROGRAMMING LAB 2	2	MONITOR	60
		CPU	60
		KEYBOARD	60
		MOUSE	60
PROGRAMMING LAB 3	3	MONITOR	60
		CPU	60
		KEYBOARD	60
		MOUSE	60
DBMS LAB	4	MONITOR	24
		CPU	24
		KEYBOARD	24
		MOUSE	24
OPERATING SYSTEM LAB	5	MONITOR	24
		CPU	24
		KEYBOARD	24
		MOUSE	24
COMPUTER NETWORK LAB	6	MONITOR	16
		CPU	16
		KEYBOARD	16
		MOUSE	16


ENVIRONMENTAL & CIVIL
ENGINEERING SOLUTIONS
CERTIFICATE
This certificate is presented to
Shri Shankarprasad Agnihotri
College of Engineering, Wardha
FOR CARRYING OUT GREEN ENERGY ENVIRONMENT AUDIT
FOR ACADEMIC YEAR 2018-2019
SEEMA N. KAMBLE
DIRECTOR
NIKHIL N. KAMBLE
HEAD

SHRI SHANKARPRASAD AGNIHOTRI COLLEGE OF ENGINEERING, WARDHA

AUDIT REPORT

2019-2020

ENVIRONMENTAL & CIVIL
ENGINEERING SOLUTIONS

Editorial

In the Era of global warming and climate change every citizen has to reduce their own carbon foot prints to tackle with the adverse impacts of climate change. A green audit of any academic institution revels ways in which we can reduce energy consumption, water use and reduction in emission of carbon dioxide in the environment. It is a process to look into and ask ourselves whether we are also contributing to the degradation of the environment and if so, in what manner and how we can minimize this contribution and bring down to zero and preserve our environment for future generation.

Shri Shankarprasad Agnihotri College of Engineering, Wardha administration has already taken a step towards the green approach and conducted green audit of campus in the year 2019-2020. As an outcome of this institute has taken green steps to reduce its carbon foot prints by several means in campus viz. sustainable fittings, tree plantation and green computing in the administration and examination. The responsibility of carrying out the scientific green audit was given to Environmental and Civil Engineering Solutions. The organization has followed the rules and regulation of Ministry of Environment and Forest, Govt. of India and Central Pollution Control Board, New Delhi.

During the preparation of the Audit Report Hon. Principal, Dean Academics and IQAC encouraged us with their full support and the audit team wants to mention a warm vote of thanks towards them.

N
(
E **Civil Engineering Solutions**

ACKNOWLEDGEMENT

We express our gratitude for calling upon us for this audit, mainly the Principal and all other staff members, who were ever helpful and supported us with all the inputs needed for this audit. We thank all the teaching, non-teaching and students for helping us in conducting this audit.
Green Audit Team

Mr. Nikhil N. Kamble
PhD (Sustainability), M. Tech. (Env. Eng.)
Mr. Smithesh L. Bhatt
B. E. (Civil. Eng.)

Miss. Maithilee N. Kamble M.B.A, B. Tech. (Mech. Eng.) **Mrs. Seema N. Kamble** Director, ECS, B. E. (Electrical)

Introduction:

The modernization and industrialization are the two important outputs of twentieth century which have made human life more luxurious and comfortable. Simultaneously, they are responsible for voracious use of natural resources, exploitation of forests and wildlife, producing massive solid waste, polluting the scarce and sacred water resources and finally making our mother Earth ugly and inhospitable. Today, people are getting more familiar to the global issues like global warming, greenhouse effect, ozone depletion and climate change etc. Now, it is considered as a final call by mother Earth to walk on the path of sustainable development. The time has come to wake up, unite and combat together for sustainable environment.

Green Audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings. Green audit can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E- waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

Need of audit:

Green auditing is the process of identifying and determining whether institutions practices are eco-friendly and sustainable. Traditionally, we are good and efficient users of natural resources. But over the period of time excess use of resources like energy, water, chemicals are become habitual for everyone especially, in common areas. Now, it is necessary to check whether our processes are consuming more than required resources? Whether we are handling waste carefully? Green audit regulates all such practices and gives an efficient way of natural resource utilization. In the era of climate change and resource depletion it is necessary to verify the processes and convert it in to green and clean one. Green audit provides an approach for it. It also increases overall consciousness among the people working in institution towards an environment.

Goals of audit:

Institute has conducted a audit with specific goals as:

Identification and documentation of green practices followed by college.
Identify strength and weakness in green practices.
Conduct a survey to know the ground reality about green practices.
Analyse and suggest solution for problems identified from survey.
Assess facility of different types of waste management.
Increase environmental awareness throughout campus.
Identify and assess environmental risk.

Objectives of Audit:

To examine the current practices which can impact on environment such as of resource utilization, waste management etc.
To identify and analyse significant environmental issues.
Setup goal, vision and mission for Green practices in campus.
Establish and implement Environmental Management in various departments.
Continuous assessment for betterment in performance in green practices and its evaluation..

Benefits of Green Audit to an Educational Institute:

There are many advantages of green audit to an Educational Institute:

It would help to protect the environment in and around the campus.
Recognize the cost saving methods through waste minimization and energy conservation.
Find out the prevailing and forthcoming complications
Empower the organization to frame a better environmental performance.

Overview of Institute:

Shri Shankarprasad Agnihotri College of Engineering, Wardha was established in the year of 1985. Institute has huge area, infrastructure and been serving the mankind in the field engineering and technology.

Jai Mahakali Shikshan Sanstha (JMSS), established in 1985,has emerged as one of the largest groups of educational institutions in Vidarbha region. As a result of benevolence, dedication and untiring efforts of the chairman JMSS, honourable Pt. Shri Shankar Prasad Agnihotri, the group has a stupendous growth of more than twenty institutions. It includes schools for tribal and ruler children with free lodging & boarding facility and education from pre-primary to doctoral research in various disciplines.
Shri Shankarprasad Agnihotri College of Engineering, Wardha was established under Agnihorti Group of Institution. It was established in 1985 by Pandit Shri. Shankar Prasadji Agnihotri as a result of dedication and motivation of late Smt. Ranibai Agnihotri who was inspired by the father of the nation Mahatma Gandhi and Vinoba Bhave. It's now grown up with more than 20 educational units of various kinds, right from pre-primary schools to post graduate institution. Vision: To develop globally competent, efficient learner and community oriented model of Engineering education. Mission: To create value added, competent and

research oriented trained Engineering professionals for sustainable development of the society.

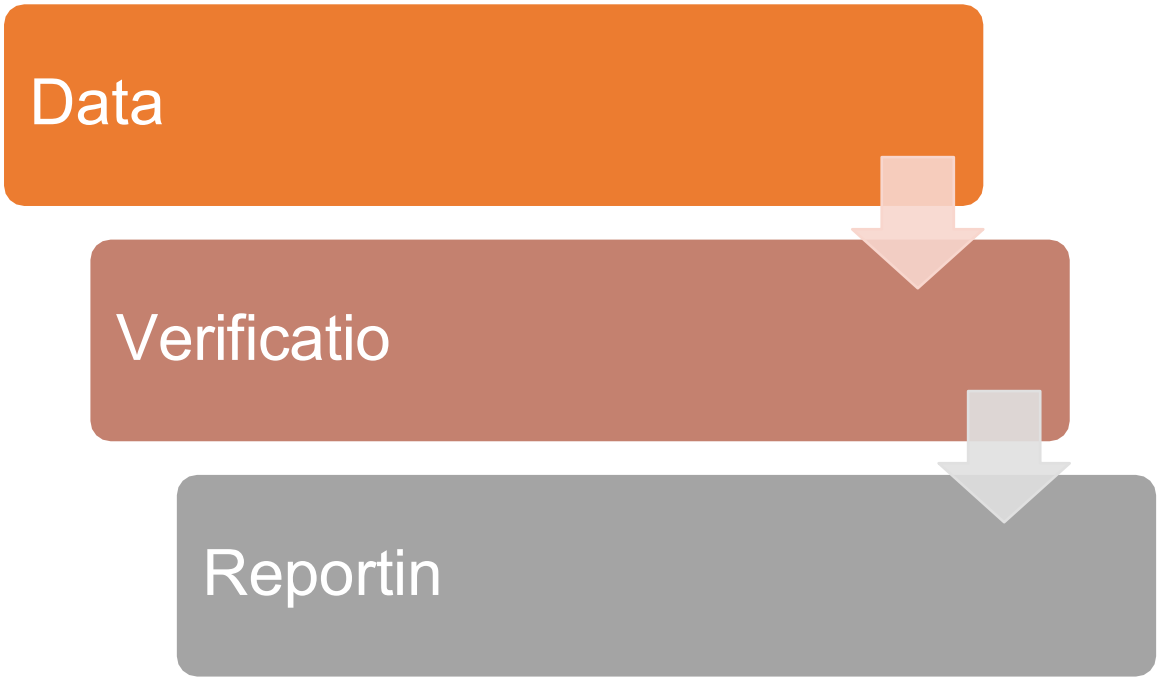
Vision of the institute:

To develop globally competent, efficient learner and community oriented model of engineering education.

Mission of the institute:

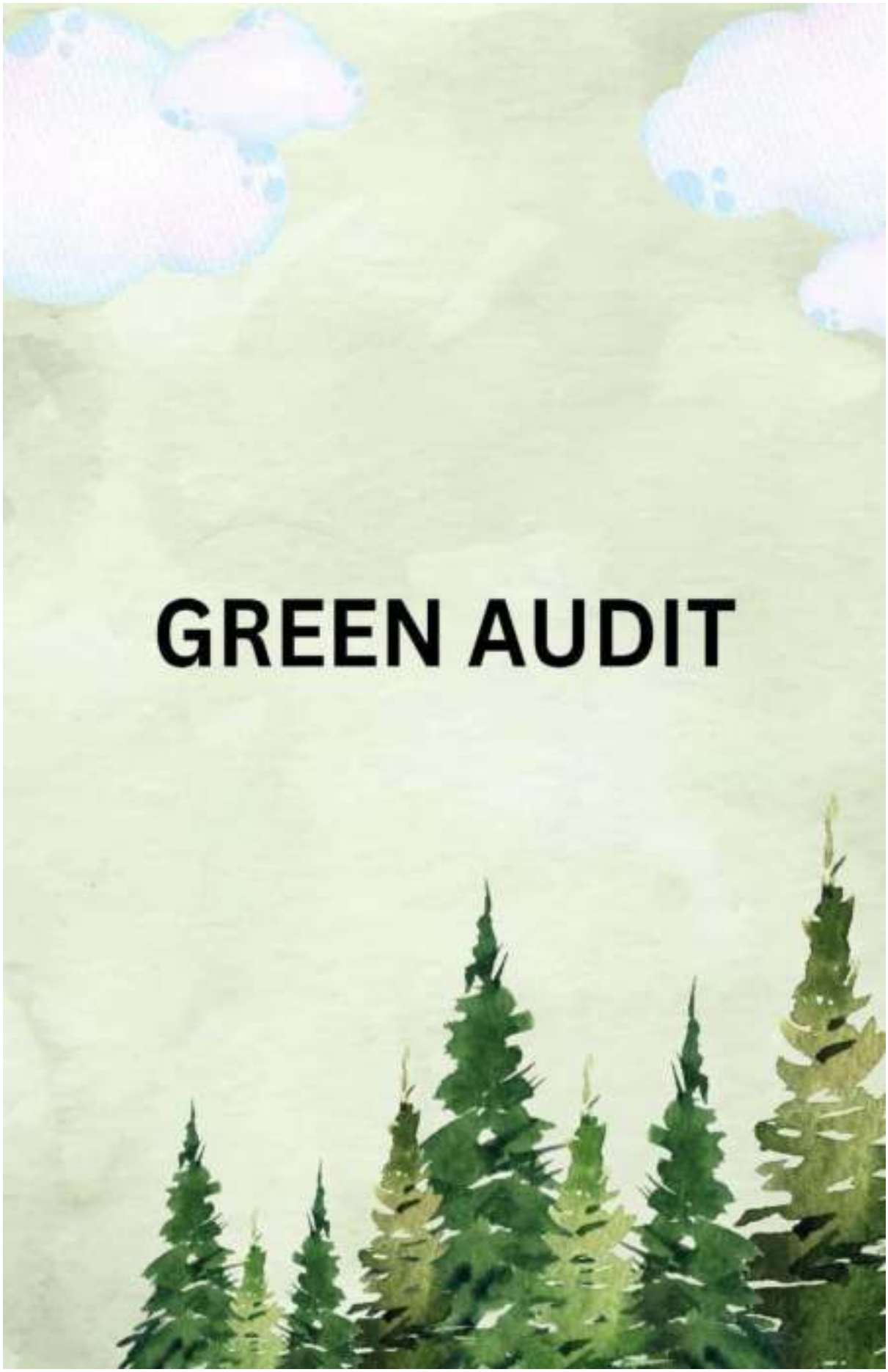
To create value added competent and research oriented trained engineering professionals for sustainable development of the society.

Methodology:



Audits to be carried out:

Green and carbon footprint audit
Energy audit
Environmental audit
Water audit
Wastewater audit


GREEN AUDIT

Green and Carbon footprint audit:

Green Audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings.

Green audit can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E-waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

Carbon is the basis of life on mother Earth. It is incorporated into the plants through photosynthesis, consumed by animal species through the food, present in the form of carbon dioxide (CO_2) the atmosphere, locked into the rocks as limestone and compressed into the different fossil fuels such as coal and oil. As CO_2 level in the atmosphere continue to increase, most climate designs or project that the oceans of the world and trees will keep soaking up more than half CO_2 .

The plants on land and in the sea, taken up carbon by over many years increased the percentage discharged during decay, and this increased carbon became locked away as fossil fuels beneath the surface of the planet. The starting of the 21st century brought growing concern about global warming, climate change, food security, poverty and population growth. In the 21st century more carbon has been released into the atmosphere than that has been absorbed. CO_2 is a principle component causing global warming. Atmospheric carbon dioxide levels have increased to 40 % from preindustrial levels to more than 390 parts per million CO_2. On this background it is a need of time to cover the research areas interrelated with climate change.

Green Cover at SSPACE:

SSPACE has got a huge green cover and has almost 50 species of vegetation inside the campus. The institute has huge campus and most of this is covered by green area. Institute has huge plantations along with variation in species Greenery is maintained well by the institute. .

Figure 1 SSPACE, Campus

SSPACE has taken huge efforts to develop its green cover. In the vicinity of the institute there is huge vegetation along the road side and around the campus. The below table shows different species of tress available in the campus and vicinity.

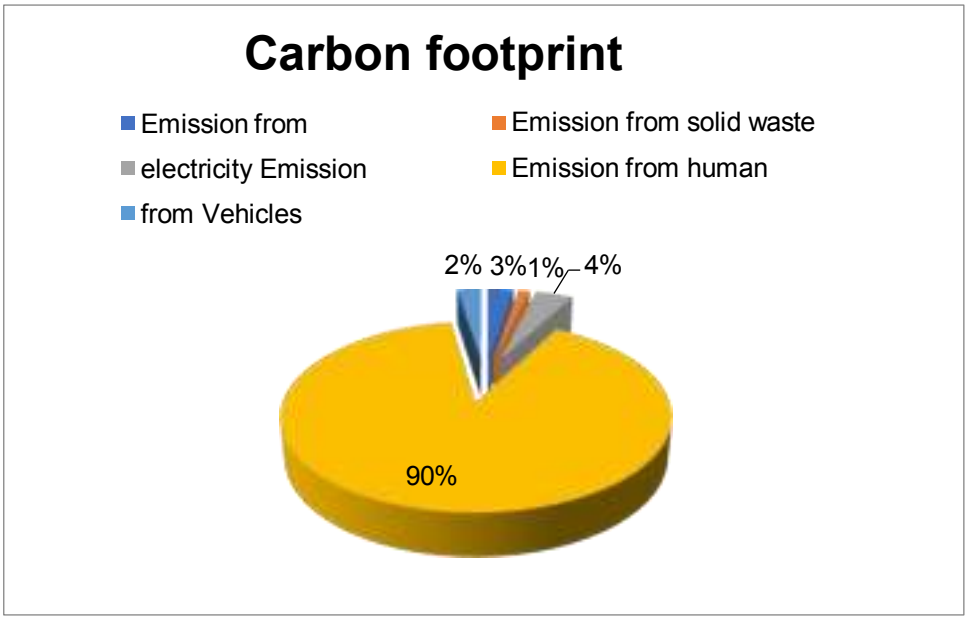
Species	**Count**	**Species**	**Count**
Neem	17	Thuja	37
Chapha	15	Shiv Babul	2
Pipal	3	Maringo	9
Karanji	17	Umba	2
Badam	1	Mogra	19

Mostly there are trees of Chapha, Neem and Mogra etc. Due to this the institute has high carbon sequesterial values. Considering the vicinity some dry plants were observed to approximately about 5. Plants absorb sunlight, 50% is absorbed and 30% reflected so this helps to create a cooler and more pleasant climate through a 3°C temperature reduction in the vicinity. This has also leaded to increase in biodiversity as more than 13 species of birds were observed. Some off the common birds were viz. Sparrow, wild parrots, little stint, black kite etc.

Carbon Footprint Audit:

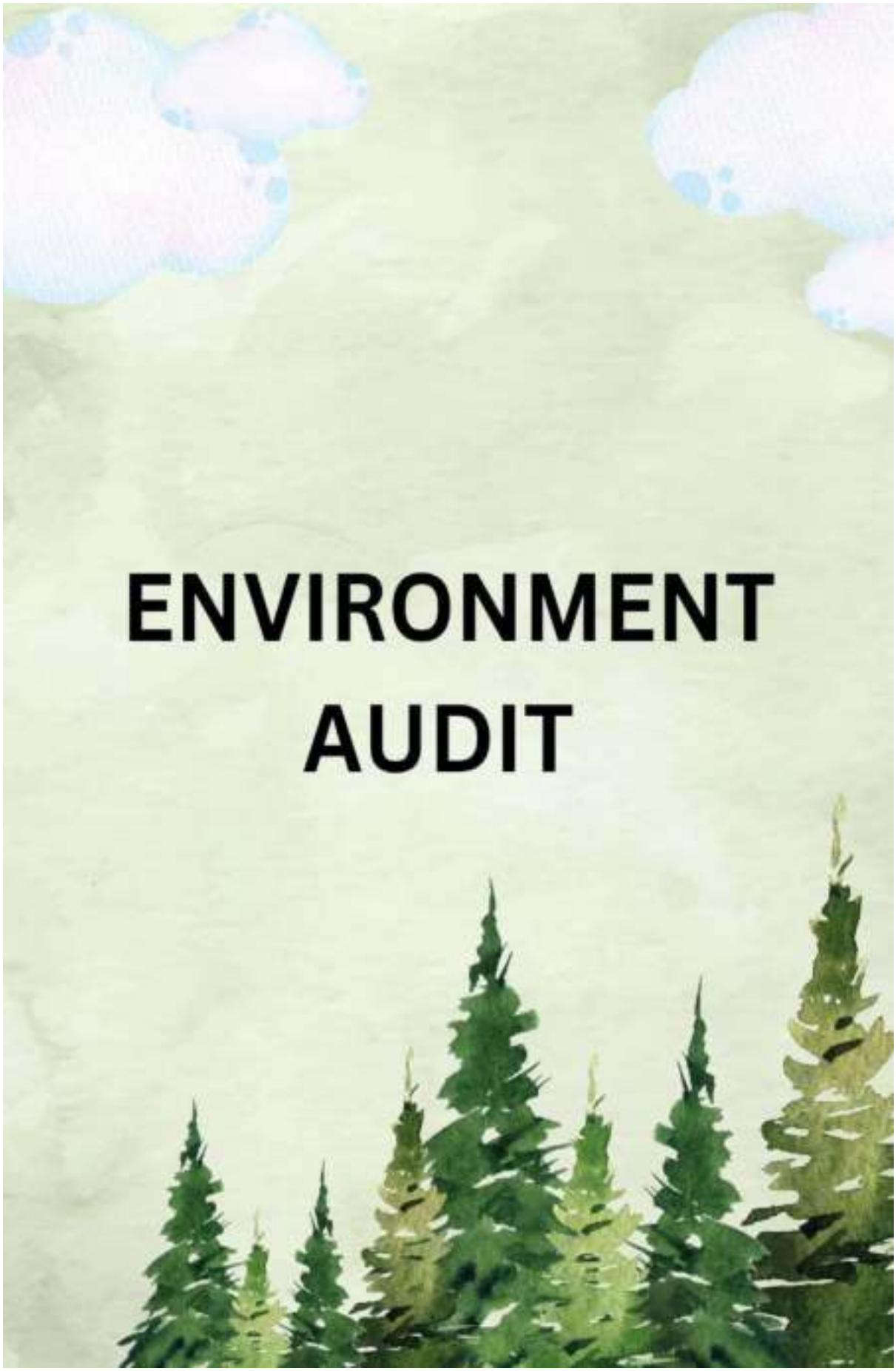
SSPACE has estimated its carbon footprint by factor methodology. Various factors were used to estimate the carbon emissions from Consumption of electricity, generation of solid waste, use of vehicles in campus, carbon emissions due to human breathing and emissions from buildings. At last they have also calculated Carbon sequesterial value i.e. carbon that is absorbed by the plants.

Sr. No.	Section	Emission
1	Emission from electricity	33558 kg CO_2 eq./year.
2	Emission from solid waste	994 kg CO_2 eq. per year.
3	Emission from Vehicles	3358 kg CO_2 eq. per year.
4	Emission from human breathing	63.10 tons of CO_2 eq. per year.
5	Emission from buildings	2020 kg CO_2 eq. per year.
6	Carbon sequesterial	711 kg CO_2 eq. per year.



Hence as per the calculation the carbon emission for electricity is 33557.68 kg CO_2 eq./year. Secondly considering emissions from human breathing, the institute has total 631 students and staff. The staff's works for about averagely 6 hours a day in the institute and the students are present for 5 hours averagely daily. Vehicles emit significant amount of gases in environment and SSPACE has various parking sections in the campus. It was found that averagely 105 vehicles entered the institute daily and travel about 450 m of distance from the gate. Cars also enter the institute and as per observation 5 cars are observed daily. Hence the overall the institute emits 2793 Kg CO_2 eq. per year.

Solid waste is very important as it emits significant amount of carbon through it. SSPACE has a good solid waste management system. Hence the institute develops about 1150 kg of waste daily in both the form of wet and dry. Hence the emission is about 994 kg CO_2 eq. per year. Buildings play an important role in carbon contribution. During the construction operation and use phase they emit significant amount of carbon. Hence considering total built-up area the carbon emissions could be evaluated. After the estimation the total built-up area observed was approximately about 10099.95 sq. m and the carbon emission were 2019.99 kg CO_2 eq. per year. Carbon sequesterial in important as it is the carbon absorbed by the trees. SSPACE campus has 191 fully grown trees in the campus; hence the sequesterial value is about 711 kg CO_2 eq. per year.


ENVIRONMENT
AUDIT

Environmental Audit:

An environmental audit is a type of evaluation intended to identify environmental compliance and management system implementation gaps, along with related corrective actions. ISO 14001 is a voluntary international standard for environmental management systems ("EMS"). ISO 14001:2004 provides the requirements for an EMS and ISO 14004 gives general EMS guidelines. An EMS meeting the requirements of ISO 14001:2004 is a management tool enabling an organization of any size or type to:

Identify and control the environmental impact of its activities, products or services;
Improve its environmental performance continually, and
Implement a systematic approach to setting environmental objectives and targets, to achieving these and to demonstrating that they have been achieved.

The audit examines the potential hazards or risks posed by the institutes. Areas examined may include environmental policies and procedures, energy use practices, recycling, waste, conservation, and pollution. Then, the institute can use the results to determine what changes need to be made for compliance. In a broad sense, environmental auditing aims to help protect the environment and minimize the risks of business activities to the environment and human safety and health.

Water Audit and wastewater audit:

Water auditing is a method of quantifying water flows and quality in systems, with a view to reducing water usage and often saving money on otherwise unnecessary water use. Water audit is an effective management tool for minimizing losses, optimizing various uses and thus enabling considerable conservation of water. Water audits trace water use from its point of entry into the facility/system to its discharge into the sewer/river/canal etc. Wastewater audit deals with effective management of wastewater in the system. It deals with proper generation, management, treatment, transfer and disposal of wastewater.
SSPACE has carried out its water and wastewater audit and has suggested many more ways for water conservation, reuse and recycle. The detail water and waste water report is mentioned below.

Water Audit report

Water audit for the "SSPACE" was carried out. The purpose of the water audit is to provide a thorough understanding of the water uses by identifying and measuring all water using fixtures, appliances, and practices in order to recommend potential water saving efficiencies.

PRIMARY DATA

Sr. No.	Title	Information
1	**Name of Institute**	Shri Shankarprasad Agnihotri College of Engineering, Wardha
2	**Address**	Wardha 442001
3	**Name of company under which water audit is carried out**	Environmental and Civil Engineering Solutions, Sangli
4	**Number of floors**	G + 3 (Variable)
5	**Category of building**	Educational Institute
6	**Nearest ESR location**	Campus
7	**Water supply hours**	NA
8	**Water meter present**	No

POPULATION DETAILS

Title	Information
Fixed population (Working staff and Students)	Gents: 324
	Ladies: 307
Variable population (Visiting persons)	Gents: 18
	Ladies: 11

SOURCE INFORMATION

Title	Information
Sources of water	Open well
Connection details	1” PVC pipe inlet and 1” outlet distribution pipe

STORAGE DETAILS

Title	Information
Overhead tank type	RCC tank
Location	On terrace
Number of tanks	2 X 10,000 lit RCC | 1 X 21,000 lit RCC 1 X 22,000 lit RCC | 1 X 40,000 lit RCC
Motor connection details	5 Hp for Building 1 3 Hp for Building 2
Pumping period	4 hours daily
Underground sump	Yes
Capacity of underground sump	40,000 Lit RCC

WATER USAGE

Toilet	Number of users	Water consumption
Gents toilet	324 users	324 X 15 lit = 4860
Washbasin	631 users	631 X 0.75 lit = 473
Ladies toilet	307 users	307 X 18 lit = 5526
Toilet cleaning	700 liters	700 liters
Floor cleaning	1500 liters	1500 liters
Gardening	3000 liters	3000 liters
Laboratories	2500 liters	2500 liters
Total		**18,559 lit**

SCHEDULE OF TOILETS AND WASHROOMS:

Number of Students and staff toilets in each floor for Building 1 and 2

Sr. No.	Toilet	Boys	Girls	Staff
1	**Ground floor**	2	0	5
2	**First floor**	1	2	0
3	**Second floor**	2	1	0
4	**Third floor**	1	2	0

WATER USED FOR DRINKING

There are coolers cum water purifiers present in the institute. Sample assessment for 3 months was done and average values are presented below for each section.

Potable water assessment:

Open well assessment

Sr. No.	Test	Results	Limit
1	pH	**7.8**	6.5-8.5
2	TDS	**1271**	-
3	E.C	**2699**	-
4	Hardness	**179**	200
5	Chlorides	**120**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

RO Building 1

Sr. No.	Test	Results	Limit
1	pH	**6.9-7.2**	6.5-8.5
2	TDS	**123**	-
3	E.C	**111**	-
4	Hardness	**117**	200
5	Chlorides	**102**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

RO Building 2

Sr. No.	Test	Results	Limit
1	pH	**6.8-7.7**	6.5-8.5
2	TDS	**129**	-
3	E.C	**114**	-
4	Hardness	**125**	200
5	Chlorides	**109**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

Testing specifications:

Test	ISO Code
pH	ISO 3025:11 (1993)
TDS	ISO 3025: 16 (1984)
E.C	ISO 3025: 14 (1984)
Total Hardness	ISO 1055: 12 (2012)
Chloride	ISO 3025: 40 (1991)
MPN	ISO 9308: 2 (2012)

Water Consumption in Hostel sections

Institute has hostels present for both Boys and girls. Following table shows the water cosnumption

Sr. No.	Section	Count	Demand	Water usage
1	**Boys Hostel**	118	135 LPCD	15,930
2	**Girls Hostel**	65	135 LPCD	8,775

Waste water audit

SSPACE campus generates huge amount of wastewater. The source for wastewater in the campus is hostels, institute, mess and the washrooms and urinals inside the campus. To estimate the amount of wastewater generated all the water that is used in the washrooms and hostels is considered as wastewater.

Sr. No.	Section	Wastewater generated in litres
1	Water usage generated in campus	**18,559**
2	Water usage in hostel section	**24,705**
Waste water generated		**32,448**

Waste water treatment plant at SSPACE:

Currently SSPACE lets all it waste water into sewers. Currently there is no any waste treatment facility. Sampling of waste water was done for 3 months for the parameters of COD, BOD, TKN and pH. Following table shows the characterization of wastewater.

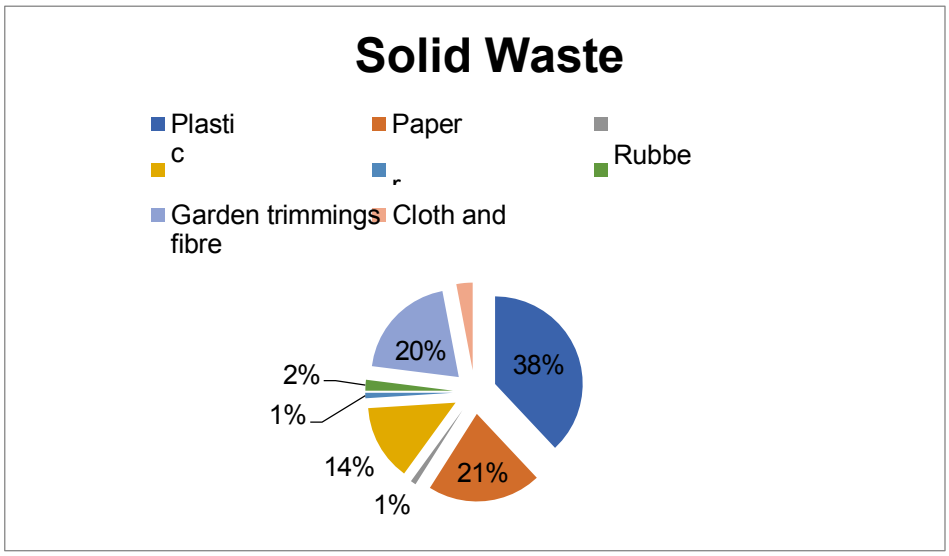
Sr. No.	Parameter	Reading
1	pH	7.89
2	COD	2015
3	BOD	144
4	TKN	21

Solid waste Audit

A waste audit is a physical analysis of waste composition to provide a detailed understanding of problems, identify potential opportunities, and give you a detailed analysis of your waste composition. A waste audit will help you clearly identify your waste generation to establish baseline or benchmark data, Characterize and quantify waste stream, Verify waste pathways, identify waste diversion opportunities and identify source reduction opportunities.

Solid waste is the unwanted or useless solid material generated from the human activities in residential, industrial or commercial area. Solid waste management reduce or eliminates the adverse impact on the environment and human health. Solid waste audit for SSPACE was carried out. The entire premise was analysed for solid waste generation and waste characterization. Overall waste was observed and characterization was done. The below table shows the components of solid waste at SSPACE campus. Quartering method was used and 1 Kg of waste was selected.

Sr. No.	Type of waste	Composition %
1	Plastic	38
2	Paper	21
3	Rubber	1
4	Food	14
5	Glass	1
6	Metals	2
7	Garden trimmings	20
8	Cloth and fibre	3



After analysing all the bins it was observed that plastic had highest contribution viz. 38% followed by the paper waste i.e. 21%. Mostly common observed plastic items were plastic wrappers of chips, soft drinks bottles and chocolate wrappers. The paper waste included paper wrappers, notebook pages, pamphlets and some pieces of cardboard. The third highest waste included garden trimmings. It included small grass, minute branches etc. The least contribution was of cloth, fibre, glass and metals.

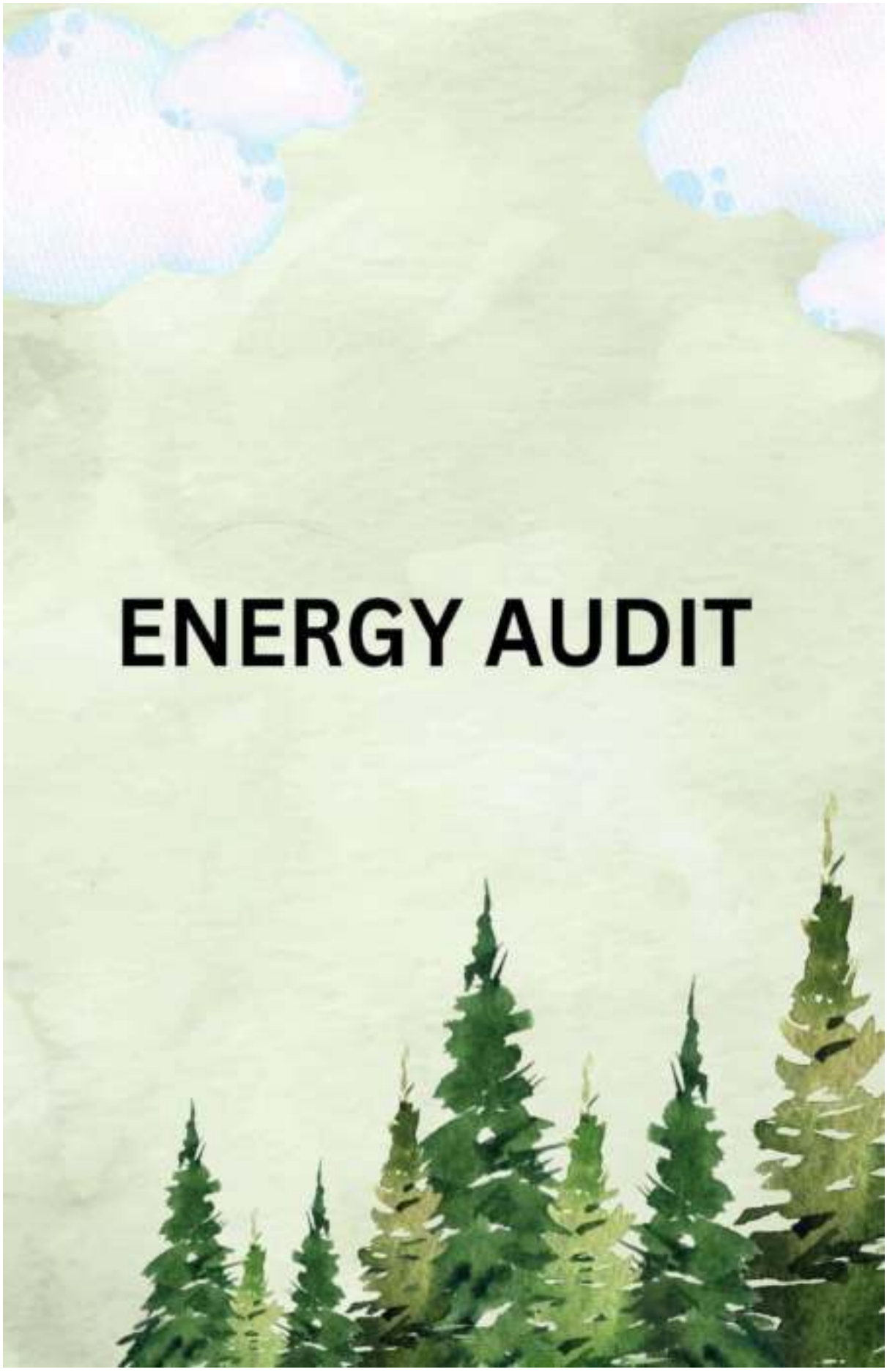
Observations and Conclusion:

There are separate bins for wet waste and dry waste. Hence, source segregation takes place.

Institute has taken steps towards paper recycling. The paper waste collected from the bins is send to vendors.

Assessment of soil was done to determine the quality of soil:

Sr. No.	Test	Results
1	pH	**6.1**
2	NPK	**2:3:1**
3	Acidity	**139 mg/lit**
4	Hardness	**159 mg/lit**


ENERGY AUDIT

Energy Audit

An energy audit is an inspection survey and an analysis of energy flows for energy conservation in a building. It may include a process or system to reduce the amount of energy input into the system without negatively affecting the output. In commercial and industrial real estate, an energy audit is the first step in identifying opportunities to reduce energy expense and carbon footprint.

A nation is tiring to advance in quantity and quality to the spread of education among the common India and development of their intelligence. In India the entire field of education and other fields of intelligent activities had been monopolized by a handful of men before independence. But today we are marching towards the desirable status of a developed nation with fast strides. But the development should be a sustained one. For achieving such an interminable development energy management is essential. As far as concerning electricity crisis, we are facing lack of electricity during office work. So, institutional management is taking design regarding production of electricity and saving electricity for Eco social aspect. Energy requirement of India is growing and incomplete domestic fossil fuel treasury. The country has motivated strategy to enlarge its renewable energy resources and policy to establish the nuclear power plants. India increases the involvement of nuclear power to largely electrical energy development facility from 4.2% to 9%. India's industrial demand accounted for 35% of electrical power requirement, domestic household use accounted for 28%, agriculture 21%, commercial 9%, and public lighting and other miscellaneous applications accounted for the rest. Energy conservation means reduction in energy consumption without making any sacrifice of quantity or quality. A successful energy management program begins with energy conservation; it will lead to adequate rating of equipment's, using high efficiency equipment and change of habits which causes enormous wastages of energy. By observing all these study lack of electricity and huge electricity demands. It is necessary to plan to be self-sufficient in electricity requirement.

Connection details:

Institute receives electricity from MSEB i.e. Maharashtra State Electricity Distribution Co. Ltd. Following are the details about connection.

Type of connection: HT (High tensioned)
Tariff: 146 HT-VII B
Contract demand: 200 KVA

Feeder voltage: 11 KW
Type: 3 Phase

Tariff Structure:

As per Distribution Company, HT and LT consumers have an option to take Time of Day (TOD) tariff instead of the normal tariff. Under TOD tariff electricity consumption and maximum demand in respect of HT consumers for different periods of the day i.e. normal period, peak load period and off-peak load period could be recorded by installing TOD meter. The maximum demand and consumption recorded in different periods could be billed on the following rates of the tariff applicable.

TOD Tariffs	Rate % (Rs./Unit)
0000 Hrs- 0600 Hrs & 2200 Hrs- 2400 Hrs	-1.500
0600 Hrs- 0900 Hrs & 1200 Hrs- 1800 Hrs	0.000
0900 Hrs- 1200 Hrs	0.800
1800 Hrs- 2200 Hrs	1.100

Power Factor:

Power Factor (PF) is an indicator of efficient utilization of power. In an AC (Alternating Current) electrical power system, PF is defined as the ratio of real power flowing to the load, to the apparent power in the circuit and is a dimensionless number.

Bill analysis:

Bill analysis for SSPACE had been done for academic year 2020-2021.

Sr. No.	Month	Consumption (Kw)	Bill Amount
1	**Apr-19**	42544	620936
2	**May-19**	31462	465941
3	**Jun-19**	21062	327643
4	**Jul-19**	31878	384803
5	**Aug-19**	38539	535414
6	**Sep-19**	43346	704418
7	**Oct-19**	45895	725899
8	**Nov-19**	43384	662358
9	**Dec-19**	58955	745899
10	**Jan-20**	42589	698951
11	**Feb-20**	42445	689570
12	**Mar-20**	48995	745877

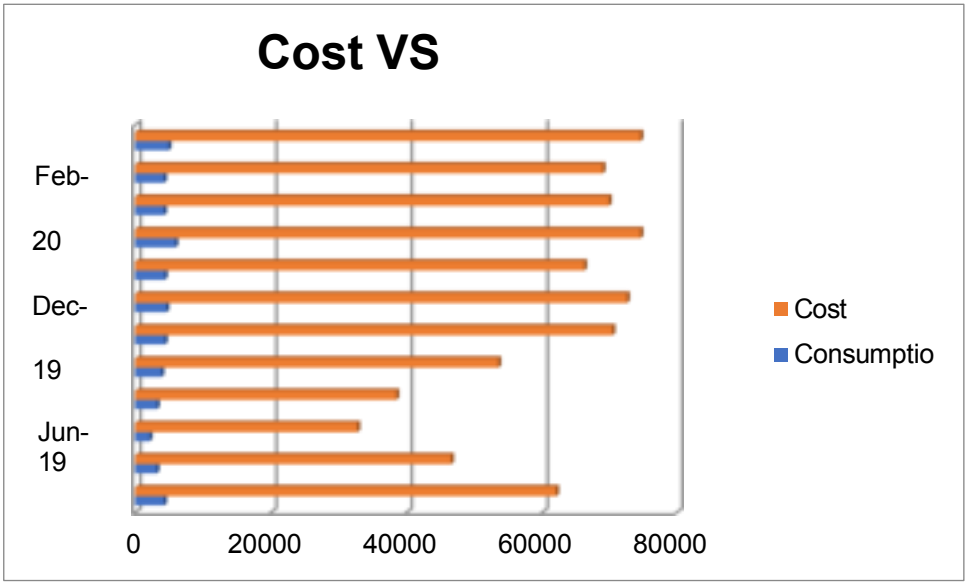
Cost Analaysis:

After analysisng the bill the average cost expenditure of the institute on energy is about 608975.8 Rs

Consumption analysis:

After analysisng the bill the average energy consumption of the institute is about 40924.5 Units

Cost VS Consumption:



ILER analysis:

Lighting is provided in industries, commercial buildings, indoor and outdoor for providing comfortable working environment. The primary objective is to provide the required lighting effect for the lowest installed load i.e. highest lighting at lowest power consumption. The purpose of performance test is to calculate the installed efficacy in terms of lux/watt/m² (existing or design) for general lighting installation. The calculated value can be compared with the norms for specific types of interior installations for assessing improvement options.

Range	Condition
0.5 or less	Urgent activity required (UAR)
0.51 - 0.70	Review Suggested (RS)
0.70- above	Good

ILER analysis for various sections in SSPACE were carried out. Firstly using LUX meter illumination was measured and then numerical analysis was carried out. ILER gives idea about lighting conditions and measured regarding improving them.

Main Building analysis

Sr. No.	Section	LUX reading	ILER	Condition
1	Library	168	0.72	Good
2	Study room	147	0.73	Good
3	Classroom B1	166	0.75	Good
4	Office	131	0.71	Good

Reasons for Good ILER:

Proper placement of windows and doors so that natural light is available well.
Good ventilation system.

Details of light fittings:

Below table shows the main fitting details in the institute building.

Energy	Count
LED	222
Fans	218
PC	280
Printer	7

SUSTAINABLE PRACTICES

SSPACE follows sustainable practices in the section of water, energy and waste management.

LED Tubes

Institute has almost 240 LED tubes present in various sections viz. classrooms, office and laboratories. The main advantages of having LED tubes are:

Open well water system

RO Water system

.

Septic tanks

Fire Extinguisher

SSPACE have installed fire extinguishers at every necessary section in the premises. These help easily as they are portable fire extinguishers and can be quickly brought to the scene of a fire.

Roof top solar panel system

Rain water harvesting:

Schedule of Lab equipments Physics lab

EQUIPMENTS		Count
1	Transistor in CB Configuration	1
2	Half and Full wave Bridge rectifier with and without filters	1
3	Zener Diode as a shunt voltage regulator	1
4	LDR Characteristics	1
5	Energy Band Gap of semiconductor material using reverse biased PN junction	1
6	To study characteristics of semiconducting diode	1
7	Characteristics of LED Kit	1
8	Resistivity by four probe method	1
9	Study of Hall Effect	1
10	e/m by Thomson method	1
11	Determination of wavelength of spectral line using diffraction grating spectrometer, sodium light system	1
12	Interference of light in the thin film (Newton's Ring Dia)	1
13	Study of Photocell and determination of Planks Constant	1
14	Combine unit / kit for divergence of LASER beam and grating element of a diffraction grating using Laser Beam	1
15	CRO	1
16	Function Generator	1
17	Spirit Level	3
18	Diffraction Grating	2
19	Spectrometer Prism ED 135x25	1
20	Zener Diode characteristics kit	1

21	Ammeter D.C, 0-50 mA	2
22	Ammeter D.C, 0-30 mA	2
23	Ammeter D.C, 0-10 mA	2
24	Voltmeter D.C.0-10 V	2
25	Voltmeter D.C.0-30 V	2
26	Voltmeter D.C.0-50 V	2
27	Prism simple	1
28	Soldering Iron 25W	1
29	Soldering wire	1
30	Soldering Paste	1
31	Screw driver set 812	1
32	Screw driver set 824	1
33	Screw driver set 936	1
34	Multimeter Analog Toyatone	1
35	Sodium Vapour Lamp 35 W	1
36	Mercury Lamp with wooden box and Transformer	1
37	Transistor Characteristics in CE Mode Model : SA-111	2
38	Transistor Characteristics in CB Mode Model : SA-112	1
39	Plano convex Lens	4
40	Semiconductor Diode Characteristics Kit Model : SA-101	2
41	Banana pins 2mm	20
42	Digital Multimeter 3 ¾ Auto ranging DMM with capacitor frequency measurement Make : Meco model : 801	8
43	Magnifier lens with light	2
44	Transistor Characteristics in CB configuration ASICO Kit	2

45	Transistor Characteristics in CE configuration ASICO Kit	2
46	Zener Diode char. Kit ASICO	2
47	PN Junction Diode kit ASICO	2
48	Diffraction Grating	2
49	Half wave Full wave Refractor kit	2
50	Digital Multimeter (inter model)	2
51	Forbidden Energy Gap kit	2
52	CB, CE and CC configuration kit	2
53	Half wave Full wave Rectifier kit	2
54	20 MHz Dual Trace CRO with probe Model :ST-201 Scientech	3
55	Function Generator Model: ST-4060 Scientech	2
56	Spectrometer	1
57	Quartz Prism for double refraction	1
58	Optical Bench 1 meter	1
59	Studty of Hall Effect	1
60	Ditital Multimeter	2
61	Table Lamp	2
62	Zener Diode kit	1
63	PN Junctioin kit	1
64	Zener Diode kit	1
65	PN Junctioin kit	1
66	e/m by Thomson method Complete setup	1
67	e/m by Thomson method Complete setup	1
68	Resistivity of Semiconductor by Four Probe Method	1

69	Sodium Lamp Assembly	1
70	Travelling Microscope	1
71	Diffraction Grating	1
72	Reading Lens	3
73	Spirit Level	1
74	Eye piece	4

Chemistry Lab

EQUIPMENTS		**Count**
1	Pensky Marten Close cup Flash Point App M. No. 1013A	3
2	Red Wood Viscometer No. 1 M. No. 1022C	2
3	Red Wood Viscometer No. 2 M. No. 1024C	2
4	PH Meter with Electrode M. No. 112	1
5	Photo Electric Calorimeter M. No. 312	1
6	Digital PH Meter Make EI Model No. 111	9
7	Weighing M/c Balance Digital Cap. 300 gm Make ELDER	2
8	Ph Meter Digital EI M No. 111	2
9	Digital Conductivity Meter Make EI M No. 611	1
10	Digital Photo Calorimeter Make EI M No. 312	1
11	Red Wood Viscometer No. 1 Model No.1022 A	2
12	Red Wood Viscometer No. 2 Model No. 1024 A	2
13	Pensky Marte Close cup Flash Point Apparatus M. No.1017	2
14	Abel Close cup Flash Point App. Model No. 1003 A	2
15	Water Still Cap. 4 Lit S.S. Distillation Assembly	2
16	Hot Air Oven with Digital Indicator 18"x18" 18" Hicon	1

17	Muffle Furnace (Digital) 1100 C 4x4x9 (Hicon)	1
18	Stop Clock Esel	40
19	Spring Balance Cap. 5 kg	1
20	Spring Balance With Cap. 2kg Barum	1
21	Spring Balance Cap. 5 kg	1
22	Digital pH Meter (EI) M. No. 111	5
23	Digital Conductivity Meter (EI) M.No. 611	1
24	Digital Photoelectric Calorimeter (EI) , M.No. 312	1
25	Heating Mantle Cap 2 Lit	2
26	Redwood Viscometer No.1	5
27	Redwood Viscometer No.2	9
28	Abel Close cup Flash Point Appratus	1
29	Penskey Marten Close cup Flash Point Apparatus	8
30	Claveland Open cup Flash point Apparatus	1
31	Redwood Viscometer No.1	5
32	Claveland Open cup Flash point Apparatus	2
33	Penskey Marten close cup Flash Point Apparatus	2
34	Weighiong M/c Digital Balance 10g to 300g (Aiwa)	1
35	Stop Clock Easel	30
36	Mechanical Stirrer	2
37	Digital Gloss 45 Deg Angle Head (Model No. RSPT-20)	1
38	Heating Mantle Cap. 2 Lit	4
39	Mechanical Stirrer Mount All Purpose/ REMI :RMQ 122/R	4
40	Heating Mantle Cap 2 Lit	1

41	Heating Mental 2000ml	1
42	Heating Mantal 2000 ml	6
43	Abel Flash Point Appratus with regulator	2
44	Heating Mantle Cap 2 Lit	6
45	Weighing M/c Digital Balance Cap. 1Kg (K-Roy)	1

Electronics Devices and Circuit Lab

EQUIPMENTS		**Count**
1	Collpit Oscillator Trainer	1
2	Emitter Follower Trainer	1
3	Two stage RC Coupled Amplifier Trainer	1
4	DC Regulated power supply 0-25V	1
5	DC Regulated power supply 0-15V	1
6	Half wave & Full wave rectifier with filter	1
7	Characteristics of PN Junction Diode	1
8	Characteristics of Zener Diode	1
9	Voltage Doubler Trainer (Voltage Regulator zener diode)	1
10	Characteristics of BJT in CE Mode	1
11	Characteristics of FET	1
12	Voltage Doubler Trainer	1
13	CRO Systronics Model 6020	2

Mechanical Measurement Lab

EQUIPMENT		**Count**
1	Basic Strain Gauge Apparatus	1
2	Measurement of force and weight using Load Cell	1

3	LVDT Instrument	1
4	Speed Measurement by using Inductive Pick up	1
5	Temperature Control using Thermocouple	1
6	Rotameter Test Rig	1
7	Stroboscope	1

Concrete technology Lab

EQUIPMENTS		**Count**
	Cube mould 15 cm	
1	i) 7.5 kg to 8 kg weight	1
2	ii) 9.0 kg to 9.5 kg weight	1
3	iii) 11 kg to 11.5 kg weight	1
4	Slump Test Apparatus	1
5	Tamping Rod	1
6	Cube Mould 7.06 cm	3
7	Fine Sieve 20 cm dia 4.75 mm	1
8	Compaction Factor Apparatus	1
9	LE CHATELIER MOULD (Set of Six)	1
	Enamel Tray	
10	i) 10”x12”	1
11	ii) 18”x12”	1
12	iii) 18”x24”	1
13	Gauging Trowel	2
14	Proving Ring 10 KN	1
15	Proving Ring 25 KN	1

16	Vicat Needle Apparatus	1
17	Beam Mould 150x150x700 mm	3
18	Spring Balance Dial Type 15 cm dia Cap. 50 Kg	2
19	Flow Table Hand Operated	1
20	VEE BEE Consistometer	1
21	Sieve Shaker Gyratory 20 cm	1
22	Hot Air Oven 24”x24”x24” S.S. 3 Tray	1
23	Compression Testing Machine 1000KN (100 Tonne)	1
24	Tiles Abrasion Testing Machine	1
25	Ultrasonic Pulse Velocity Tester	1

Heat Transfer lab

EQUIPMENTS		**Count**
1	Heat Transfer in Force Convection	1
2	Heat Transfer in Natural Convection	1
3	Dropwise & Filmwise condensation App.	1
4	Thermal Conductivity of Insulating Powder	1
5	Parallel Flow/Counter Flow Heat Exchanger	1
6	Stefen Boltzman Apparatus	1
7	Thermal Conductivity of Metal Bar	1

TOM lab

EQUIPMENTS		**Count**
1	Best Indian JPTI Make CAM Analysis Apparatus	1
2	Best Indian JPTI Make Whirling of Shaft App.	1

3	Best Indian JPTI Make Motorised Gyroscope	1
4	Best Indian JPTI Make Universal Vibration App.	1
5	Best Indian JPTI Make Governor Apparatus	1
6	Static and dynamic Balancing App.	1
7	Torsion Testing Machine	1

Digital Circuit lab

EQUIPMENTS		**Count**
1	Basic Logic Gates Trainer	1
2	Demorgan's Theorem Trainer	1
3	R-S Flip flop Trainer	1
4	Demultiplexer trainer kit	1
5	Modulo N Counter	1
6	Half/Full Adder	1
7	Half/Full Subtractor	1
8	TTL Clock Generator	1
9	CRO Systronic 6020	1
10	Trainer Kit for Universal gates by using NOR and NAND Gates Model : SB-312	2
11	Demorgan's Theorem Trainer Model : SB-311	2
12	Half/Full Adder SF : 305	2
13	Half/Full Subtractor SF : 306	2
14	Basic Logic Gates Trainer Kit AET-21 By Aquila	2
15	8:1 Multiplexer Trainer Kit AET 31M By Aquila	2
16	De-Multiplexer Trainer Kit AET 31D BY Aquila	2

17	Flip-Flop Trainer kit AET-60 By Aquila	2
18	Trainer kit of Synchronous counter by Aquilla Model AET 32A	2
19	Trainer kit of Asynchronous counter by Aquilla Model AET 32	2

TV lab

EQUIPMENT		**Counts**
1	Colour TV Trainer (51cm) by Anshuman Model: XPO-COL TV	3
2	Black & White TV Trainer with 14" CRT By Mars Edpal Model: ME 1200	1
3	Antenna Trainer with 10 Antennas (50 to 860 MHz)	1
4	Colour Patttern Genertor By Signet Model: Signet 1053 Mltichannel with colour VHF-UHF Ch.2 to Ch.12 VHF, 1 KHz FM Demodulation Attenuator 20 dB	2
5	Colour Pattern Generator by Saral (Markoni)	2
6	VCR Trainer Depmstratpr by Mars Edpal Model : ME 1215	1

Microprocessor lab

EQUIPMENTS		**Count**
1	8085 Microprocessor Kit with 16*2 LCD Display Model XPO Kit	5
2	8086 Microprocessor Kit with 16*2 LCD Display Model XPO Kit	5
3	SMPS For Microprocessor 8085 Kit	10
4	101 Keyboard	10
5	RS 232 Serial Link /cable & PC up/down Loading Software & Cross assembler on CD	10

6	8085 Microprocessor Kit with 16*2 LCD Display Model XPO Kit	5
7	8086 Microprocessor Kit with 16*2 LCD Display Model XPO Kit	5
8	SMPS For Microprocessor 8085 Kit	10
9	101 Keyboard	10
10	RS 232 Serial Link /cable & PC up/down Loading Software & Cross assembler on CD	10
11	8051 Microcontroller Kit	1

RAC lab

EQUIPMENT		**Count**
1	Computerised Variable Compression Ratio Petrol Engine	1
2	Air Conditioner Trainer Duct Type	1
3	Digital Anemometer	1
4	5 Gas Analyser	1
5	24 Column Matrix Printer	1
6	Rolling Charts	38

Production technology lab

EQUIPMENT		**Count**
1	Floating Carriage Diameter Measuring Machine Model EDM-75	1
2	Sodium Vapour Monochromatic light unit	1
3	Specimen Set: include 4 Test surface of dia 50 mm, Optical flat 01 No. Steel flat 01 No.	1
4	Optical flat 25 mm	1
5	Optical flat 30 mm	1

6	Optical flat 50 mm	1
7	Dial Indicator Range 1mm L.C. 0.001mm	1
8	Straight Edge size 300x50x8	1
9	Straight Edge Size450x50x8	1
10	Tool Maker Microscope Model TM -50	1
11	Venire Height Gauge 12 inch	1
12	Sine Bar 100 mm	2
13	Slip Gauge set	1
14	Dial Gauge Stand	1
15	Digital Micrometre For Floating Carriage	1

Metallurgy lab

EQUIPMENT		**Count**
1	Impact Testing Machine for Izod & Chirpy Test	1
2	Rockwell Hardness Testing M/c	1
3	Metal Sample Box	1
4	Inclined monocular metallurgical microscope Model n56	1
5	Binocular metallurgical microscope model 57	1
6	Metallurgical Image Analyser	1
7	specimen	1 set

Fluid power lab

EQUIPMENT		**Count**
1	Centrifugal Pump Test Rig	1
2	Reynolds Apparatus	1

3	Verification of Bernoulli's Theorem	1
4	Equipment List	1
5	Rota meter Test Rig	1
6	Flow Measured by Venturimeter & Orifice meter	1

Structural analysis lab

EQUIPMENT		**Count**
1	Behaviour of Column and Truss App.	1
2	Hinged Arches	1
3	Verification of Maxwell Reciprocal Theorem	1
4	Deflection of Truss App.	1

Transportation lab

EQUIPMENT		**Count**
1	Penskey Morten Flash Point App.	1
2	Flakiness Gauge	1
3	Length Gauge	1
4	Standard Penetrometer	1
5	Ring & Ball App.	1
6	Coarse Sieve 45 cm Dia GI	14
7	Ductility Testing Machine Model EIE 040	1
8	Specific Gravity and Water Absor. Test App.	1
9	Aggregate Crushing Value App. 15 CM	1
10	C.B.R. Testing Machine	1
11	Aggregate Impact Testing Machine	1
12	Electronic Balance 10 KG /1GM	1

13	Los Angeles Abrasion Testing Machine	1

Fluid mechanics lab

EQUIPMENT		Count
1	Bernoullis Theorem App.	1
2	Impact of Jet App.	1
3	Orifice and Mouthpiece App.	1
4	Reynolds App.	1
5	Metacentric Height App	1
6	Notch Apparatus	1
7	Pitot Tube apparatus	1

Survey lab

EQUIPMENT		Count
1	Levelling Staff 4 mtr (compact)	3
2	Transit Vernier Theodolite	1
3	Measuring chain 30 Mtr 150 Link	3
4	Measuring chain 20 Mtr 100 Link	3
5	Ranging Rod 3 Mtr	5
6	Prismatic Compass	1
7	Surveyers Compass	1
8	Dumpy Level with Stand	3
9	Plane Table	2
10	Measuring Tape Steel 30 Mtr	3
11	Trough Compass	2

Soil lab

EQUIPMENT		Count
1	Liquid Limit Device, Hand operated	1
2	Test Sieves 20 cm dia brass frame size 425 micron	1
3	Plastic limit kit	1
4	Shrinkage Limit Apparatus	1
5	Pycnometer Brass Cone, Metal Ring & Rubber seal	1
6	Particle size determination IS Test sieve 20 cm dia brass frame without any joint 4.75 mm to 150 micron	1
7	Sieve 75 micron	1
8	Lid and Receiver for above	1
9	Permeability Apparatus	1
10	Overhead tank for above made of GI sheet	1
11	Apparatus for soil determination Core cutter with Dolly & Rammer	1
12	Sand Pouring Cylinder Large	1
13	Stop Watch (Mechanical)	5
14	Glass Thermometer 0-200 Degree	1
15	Glass Thermometer 0-50 Degree	1
16	Glass Thermometer 0-110 Degree	1
17	Moisture Cane 50x50MM	4
18	Measuring Cylinder (Glass) 100 ML	2
19	Measuring Cylinder (Glass) 250 ML	2
20	Measuring Cylinder (Glass) 500 ML	2
21	Measuring Cylinder (Glass) 1000 ML	2
22	Measuring Cylinder (Plastic) 50 ML	2

23	Measuring Cylinder (Plastic) 100 ML	2
24	Measuring Cylinder (Plastic) 250 ML	2
25	Measuring Cylinder (Plastic) 500 ML	2
26	Measuring Cylinder (Plastic) 1000 ML	2
27	Evaporating Dish 150 mm dia Porcelain	2
28	Evaporating Dish 100 mm dia Porcelain	2
29	Specific Gravity Bottle 25 ml	1
30	Specific Gravity Bottle 50 ml	1
31	Specific Gravity Bottle 100 ml	1
32	G.I. Tray 18”x24”x2” with Handles	1
33	Moisture Cane 75x50MM	4
34	Glass Rod 20 cm Long x 6 mm dia	2
35	Electronic Balance 500 gm./10mg	1
36	Electronic Balance 50 kg/1g	1
37	Proctor Needle Hydraulic Type	1

Environmental engineering lab

EQUIPMENTS		**Count**
1	Hot Air Oven 14”x14”x14” S.S.	1
2	Ph. Meter PM-100 Digital	1
3	Turbidity Meter	1
4	Sound Level Meter	1
5	Flocculate	1

Engineering geology lab

EQUIPMENTS		Count
1	Specimen Rocks	14
2	Specimen Minerals	18
3	Mirror Stereoscope	1
4	Transparent Geographical Globe	1
5	Bruntan Compass	1
6	Charts	9
7	Models	25

Details of PC, CPU, Keyboard and Mouse in Programming labs

Lab Name	EQUIPMENTS		Count
PROGRAMMING LAB 2	1	MONITOR	24
		CPU	24
		KEYBOARD	24
		MOUSE	24
PROGRAMMING LAB 2	2	MONITOR	60
		CPU	60
		KEYBOARD	60
		MOUSE	60
PROGRAMMING LAB 3	3	MONITOR	60
		CPU	60
		KEYBOARD	60
		MOUSE	60
DBMS LAB	4	MONITOR	24
		CPU	24
		KEYBOARD	24
		MOUSE	24
OPERATING SYSTEM LAB	5	MONITOR	24
		CPU	24
		KEYBOARD	24
		MOUSE	24
COMPUTER NETWORK LAB	6	MONITOR	16
		CPU	16
		KEYBOARD	16
		MOUSE	16

ENVIRONMENTAL & CIVIL
ENGINEERING SOLUTIONS
(ISO 9001: 2015, IEC 17025: 2017)

AUDIT CERTIFICATE

This Certificate is Presented to:

SHRI SHANKARPRASAD AGNIHOTRI COLLEGE OF ENGINEERING, WARDHA

-FOR CARRYING OUT GREEN, ENERGY &
ENVIRONMENT AUDIT FOR ACADEMIC YEAR
2019-2020

SEEMA N. KAMBLE
DIRECTOR

NIKHIL N. KAMBLE
HEAD

Shri Shankarprasad Agnihotri College of Engineering, Wardha

AUDIT REPORT 2020-21

ENVIRONMENTAL & CIVIL ENGINEERING SOLUTIONS
ISO 9001: 2015, IEC 17025: 2017

Editorial

In the Era of global warming and climate change every citizen has to reduce their own carbon foot prints to tackle with the adverse impacts of climate change. A green audit of any academic institution revels ways in which we can reduce energy consumption, water use and reduction in emission of carbon dioxide in the environment. It is a process to look into and ask ourselves whether we are also contributing to the degradation of the environment and if so, in what manner and how we can minimize this contribution and bring down to zero and preserve our environment for future generation.

Shri Shankarprasad Agnihotri College of Engineering, Wardha administration has already taken a step towards the green approach and conducted green audit of campus in the year 2020-2021. As an outcome of this institute has taken green steps to reduce its carbon foot prints by several means in campus viz. sustainable fittings, tree plantation and green computing in the administration and examination. The responsibility of carrying out the scientific green audit was given to Environmental and Civil Engineering Solutions. The organization has followed the rules and regulation of Ministry of Environment and Forest, Govt. of India and Central Pollution Control Board, New Delhi.

A questionnaire was prepared based on the guidelines and format of CPCB, New Delhi to conduct green audit. The information related to consumption of resources like water, electricity and handling of solid and hazardous waste was collected in the formats from main building support services and departments. The data collected was grouped and was tabulated in Excel sheets and analysed. The graphs of the analysed data were prepared for getting quick idea of the status. Interpretation of the overall outcomes was made which incorporates primary and secondary data, references and interrelations within. Final report preparation was carried out using this interpretation to prepare environment management plan of institute for next two years.

During the preparation of the Audit Report Hon. Principal, Dean Academics and IQAC encouraged us with their full support and the audit team wants to mention a warm vote of thanks towards them.

Nik
(C.E
Env **vil Engineering Solutions**

ACKNOWLEDGEMENT

We express our gratitude for calling upon us for this audit, mainly the Principal and all other staff members, who were ever helpful and supported us with all the inputs needed for this audit. We thank all the teaching, non-teaching and students for helping us in conducting this audit.
Green Audit Team

Mr. Nikhil N. Kamble
PhD (Sustainability), M. Tech. (Env. Eng.)
Mr. Smithesh L. Bhatt
B. E. (Civil. Eng.)

Miss. Maithilee N. Kamble M.B.A, B. Tech. (Mech. Eng.) **Mrs. Seema N. Kamble** Director, ECS, B. E. (Electrical)

Introduction:

The modernization and industrialization are the two important outputs of twentieth century which have made human life more luxurious and comfortable. Simultaneously, they are responsible for voracious use of natural resources, exploitation of forests and wildlife, producing massive solid waste, polluting the scarce and sacred water resources and finally making our mother Earth ugly and inhospitable. Today, people are getting more familiar to the global issues like global warming, greenhouse effect, ozone depletion and climate change etc. Now, it is considered as a final call by mother Earth to walk on the path of sustainable development. The time has come to wake up, unite and combat together for sustainable environment.

Considering the present environmental problems of pollution and excess use of natural resources, Hon. Prime Minister, Shri. Narendra Modiji has declared the Mission of Swachch Bharat Abhiyan. Also, University Grants Commission has mentioned “Green Campus, Clean Campus” mission mandatory for all higher educational institutes. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent. Green Audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings. Green audit can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E- waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

Need of audit:

Green auditing is the process of identifying and determining whether institutions practices are eco-friendly and sustainable. Traditionally, we are good and efficient users of natural resources. But over the period of time excess use of resources like energy, water, chemicals are become habitual for everyone especially, in common areas. Now, it is necessary to check

whether our processes are consuming more than required resources? Whether we are handling waste carefully? Green audit regulates all such practices and gives an efficient way of natural resource utilization. In the era of climate change and resource depletion it is necessary to verify the processes and convert it in to green and clean one. Green audit provides an approach for it. It also increases overall consciousness among the people working in institution towards an environment.

Goals of audit:

Institute has conducted a audit with specific goals as:

Identification and documentation of green practices followed by college.
Identify strength and weakness in green practices.
Conduct a survey to know the ground reality about green practices.
Analyse and suggest solution for problems identified from survey.
Assess facility of different types of waste management.
Increase environmental awareness throughout campus.
Identify and assess environmental risk.

Objectives of Audit:

To examine the current practices which can impact on environment such as of resource utilization, waste management etc.
To identify and analyse significant environmental issues.
Setup goal, vision and mission for Green practices in campus.
Establish and implement Environmental Management in various departments.
Continuous assessment for betterment in performance in green practices and its evaluation.

NAAC criteria VII Environmental Consciousness:

Institutes are playing a key role in development of human resources worldwide. Higher education institutes campus run various activities with aim to percolate the knowledge along with practical dimension among the society. Likewise different technological problems higher education institutes also try to give solution for issues related to environment. Different types of evolutionary methods are used to assess the problem concerning environment. It includes Environmental Impact Assessment (EIA), Social Impact Assessment (SIA), Carbon Footprint Mapping, Green audit etc

National Assessment and Accreditation Council (NAAC) which is a self-governing organization that declares the institutions as Grade according to the scores assigned at the time of accreditation of the institution. Green Audit has become mandatory procedure for educational institutes under Criterion of NAAC. The intention of green audit is to upgrade the environmental condition inside and around the institution. It is performed by considering environmental parameters like water and wastewater accounting, energy conservation, waste management, air, noise monitoring etc. for making the institution more eco-friendly. Students are the major strength of any academic institution. Practicing green actions in any educational institution will inculcate the good habit of caring natural resources in students. Many environmental activities like plantation and nurturing saplings and trees, Cleanliness drives, Bird watching camps, No vehicle day, Rain water harvesting, etc. will make the students good citizen of the country. Through Green Audit, higher educational institutions can ensure that they contribute towards the reduction of Global warming through Carbon Footprint reduction measures.

Benefits of Green Audit to an Educational Institute:

There are many advantages of green audit to an Educational Institute:

- It would help to protect the environment in and around the campus.
- Recognize the cost saving methods through waste minimization and energy conservation.
- Find out the prevailing and forthcoming complications
- Empower the organization to frame a better environmental performance.
- It portrays good image of institution through its clean and green campus.

Overview of Institute:

Shri Shankarprasad Agnihotri College of Engineering, Wardha was established in the year of 1985. Institute has huge area, infrastructure and been serving the mankind in the field engineering and technology.

Jai Mahakali Shikshan Sanstha (JMSS), established in 1985,has emerged as one of the largest groups of educational institutions in Vidarbha region. As a result of benevolence, dedication and untiring efforts of the chairman JMSS, honourable Pt. Shri Shankar Prasad Agnihotri, the group has a stupendous growth of more than twenty institutions. It includes schools for tribal and ruler children with free lodging & boarding facility and education from pre-primary to doctoral research in various disciplines.
Shri Shankarprasad Agnihotri College of Engineering, Wardha was established under Agnihorti Group of Institution. It was established in 1985 by Pandit Shri. Shankar Prasadji Agnihotri as a result of dedication and motivation of late Smt. Ranibai Agnihotri who was inspired by the father of the nation Mahatma Gandhi and Vinoba Bhave. It's now grown up with more than 20 educational units of various kinds, right from pre-primary schools to post graduate institution. Vision: To develop globally competent, efficient learner and community oriented model of Engineering education. Mission: To create value added, competent and

research oriented trained Engineering professionals for sustainable development of the society.

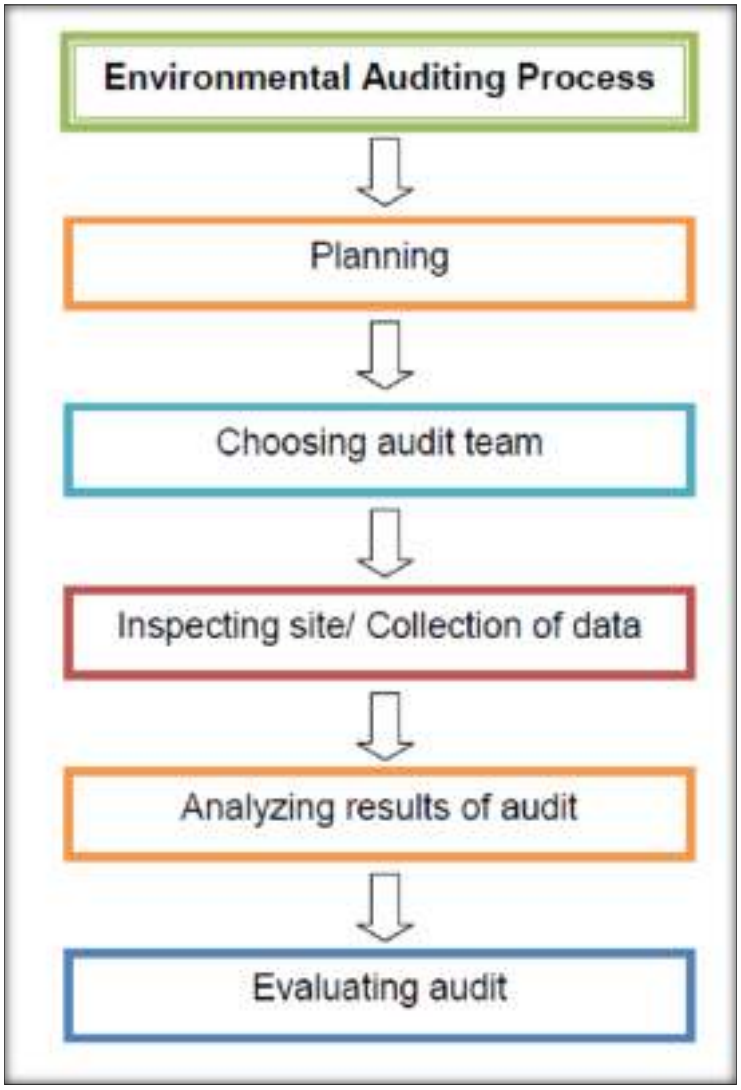
Vision of the institute:

To develop globally competent, efficient learner and community oriented model of engineering education.

Mission of the institute:

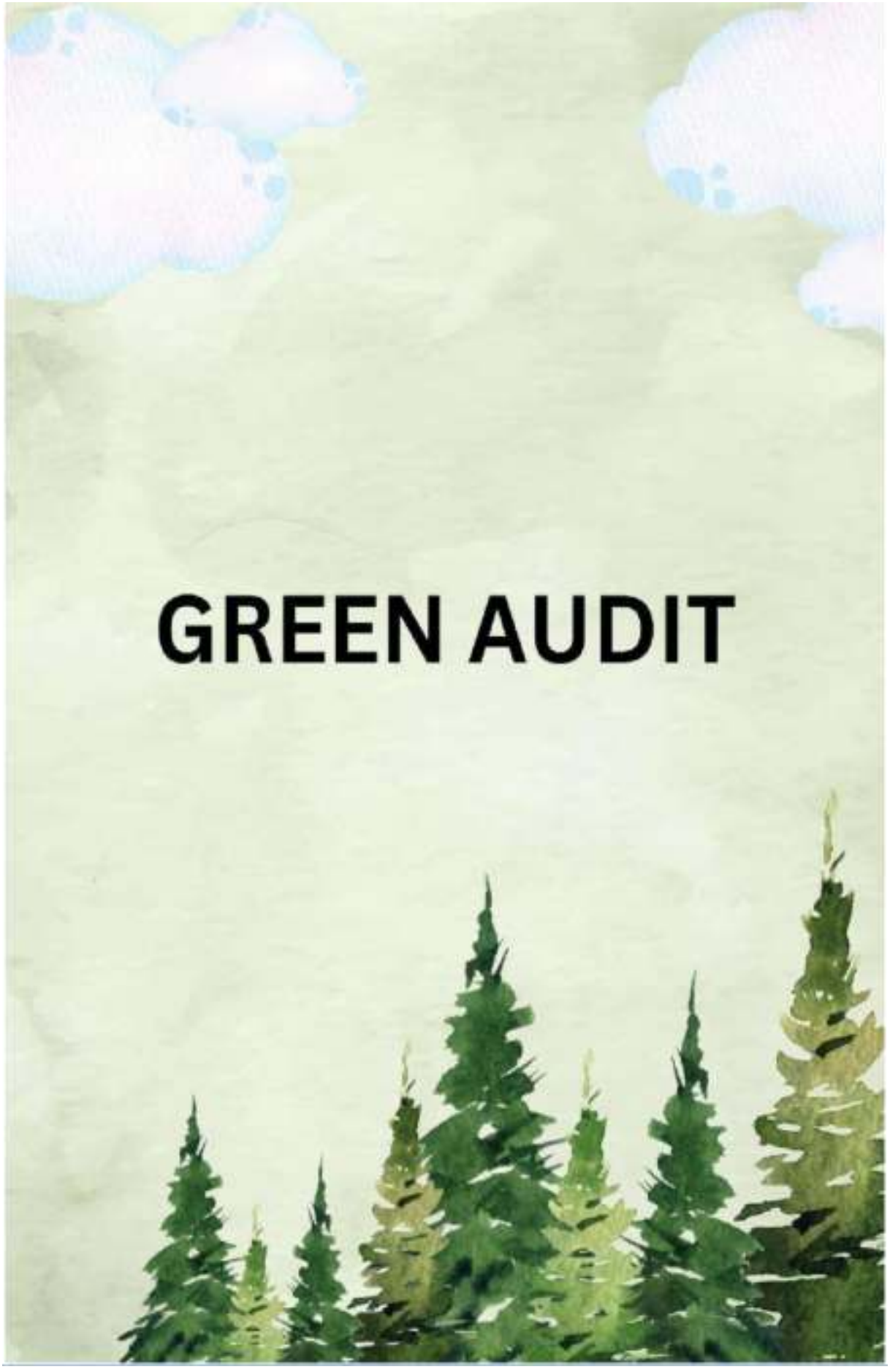
To create value added competent and research oriented trained engineering professionals for sustainable development of the society.

Methodology:



Audits to be carried out:

Green and carbon footprint audit
Energy audit
Environmental audit
Water audit
Wastewater audit


GREEN AUDIT

Green and Carbon footprint audit:

Green Audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings. Green audit can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E- waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

Carbon is the basis of life on mother Earth. It is incorporated into the plants through photosynthesis, consumed by animal species through the food, present in the form of carbon dioxide (CO_2) the atmosphere, locked into the rocks as limestone and compressed into the different fossil fuels such as coal and oil. As CO_2 level in the atmosphere continue to increase, most climate designs or project that the oceans of the world and trees will keep soaking up more than half CO_2 . The plants on land and in the sea, taken up carbon by over many years increased the percentage discharged during decay, and this increased carbon became locked away as fossil fuels beneath the surface of the planet. The starting of the 21st century brought growing concern about global warming, climate change, food security, poverty and population growth. In the 21st century more carbon has been released into the atmosphere than that has been absorbed. CO_2 is a principle component causing global warming. Atmospheric carbon dioxide levels have increased to 40 % from preindustrial levels to more than 390 parts per million CO_2. On this background it is a need of time to cover the research areas interrelated with climate change.

Green Cover at SSPACE:

SSPACE has got a huge green cover and has almost 50 species of vegetation inside the campus. The institute has huge campus and most of this is covered by green area. Institute has huge plantations along with variation in species Greenery is maintained well by the institute. .

Figure 1 SSPACE, Campus

SSPACE has taken huge efforts to develop its green cover. In the vicinity of the institute there is huge vegetation along the road side and around the campus. The below table shows different species of tress available in the campus and vicinity.

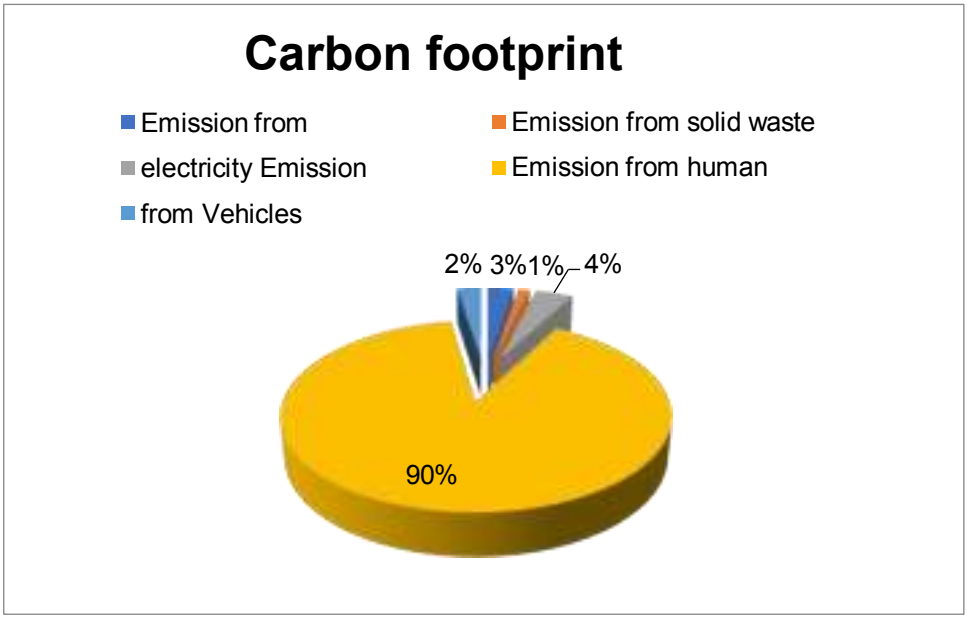
Species	Count	Species	Count
Neem	17	Thuja	37
Chapha	15	Aam	1
Pipal	3	Shiv Babul	2
Vad	1	Maringo	9
Karanji	17	Umba	2
Badam	1	Mogra	19

Mostly there are trees of Chapha, Thuja and Mogra etc. Due to this the institute has high carbon sequesterial values. Considering the vicinity some dry plants were observed to approximately about 3. Plants absorb sunlight, 50% is absorbed and 30% reflected so this helps to create a cooler and more pleasant climate through a 3°C temperature reduction in the vicinity. This has also leaded to increase in biodiversity as more than 13 species of birds were observed. Some off the common birds were viz. Sparrow, wild parrots, little stint, black kite etc.

Carbon Footprint Audit:

SSPACE has estimated its carbon footprint by factor methodology. Various factors were used to estimate the carbon emissions from Consumption of electricity, generation of solid waste, use of vehicles in campus, carbon emissions due to human breathing and emissions from buildings. At last they have also calculated Carbon sequesterial value i.e. carbon that is absorbed by the plants.

Sr. No.	Section	Emission
1	Emission from electricity	2691 kg CO_2 eq./year.
2	Emission from solid waste	951 kg CO_2 eq. per year.
3	Emission from Vehicles	31721 kg CO_2 eq. per year.
4	Emission from human breathing	73.6 tons of CO_2 eq. per year.
5	Emission from buildings	2020 kg CO_2 eq. per year.
6	Carbon sequesterial	590 kg CO_2 eq. per year.



Hence as per the calculation the carbon emission for electricity is 2691 kg CO_2 eq./year. Secondly considering emissions from human breathing, the institute has total 736 students and staff. The staff's works for about averagely 6 hours a day in the institute and the students are present for 5 hours averagely daily. Vehicles emit significant amount of gases in environment and SSPACE has various parking sections in the campus. It was found that averagely 100 vehicles entered the institute daily and travel about 450 m of distance from the gate. Cars also enter the institute and as per observation 5 cars are observed daily. Hence the overall the institute emits 3172 Kg CO_2 eq. per year.

Solid waste is very important as it emits significant amount of carbon through it. SSPACE has a good solid waste management system. Hence the institute develops about 1100 kg of waste daily in both the form of wet and dry. Hence the emission is about 951 kg CO_2 eq. per year. Buildings play an important role in carbon contribution. During the construction operation and use phase they emit significant amount of carbon. Hence considering total built-up area the carbon emissions could be evaluated. After the estimation the total built-up area observed was approximately about 10099.95 sq. m and the carbon emission were 2019.99 kg CO_2 eq. per year. Carbon sequesterial in important as it is the carbon absorbed by the trees. SSPACE campus has 187 fully grown trees in the campus; hence the sequesterial value is about 590kg CO_2 eq. per year.

Conclusion:

- Highest carbon emission was observed from human breathing i.e. 73.6 tons of CO_2 eq. per Year. There is no any significant mean to reduce this number as it is not controllable.
- The next is solid waste. The emission from solid waste comprises of 951 kg CO_2 eq. per year. This can be significantly reduced by following simple means. Waste segregation is properly observed by the institute and they should follow the cut out plastic plans. There should be complete ban in using the plastic inside the campus. There should be minimization of food waste as it contributes highest in carbon emissions.
- Considering emission from electricity they can be significantly reduced by decrease in electricity use. This can be done by installing LED lights and using energy efficient equipment's such as machines with high star ratings which save more. Institute can recognize renewable energy sources and have a setup in the institute. This can lead in significant saving of electricity and reduction in carbon emissions.
- Vehicles have the least emissions in SSPACE and it is due to the easy approached parking so that vehicles do not roam in the vicinity. All the vehicles travel hardly 550 m in the campus and this has led to lower emissions. Still institute can follows "NO Vehicle Day" on every 2nd Saturday of each month.
- Institute reduces about 0.590 tons of CO_2 per year by the means of plants. This could be increased by increasing in plantations. SSPACE can plant more trees next to

chemistry section, surrounding to play ground, front of applied science department etc.

SUSTAINABLE PRACTICES

SSPACE follows sustainable practices in the section of water, energy and waste management.

LED Tubes

Institute has almost 240 LED tubes present in various sections viz. classrooms, office and laboratories. The main advantages of having LED tubes are:

Long Lifespan: Compared to the lifespan of your average incandescent bulb, the lifespan of a LED light is far superior. The average incandescent bulb lasts about a thousand hours. The lifespan of an average LED light is 50,000 hours. Depending on how you use it, its life may be as long as 100,000 hours. This means that an LED light can last anywhere from six to 12 years before you need to replace it. That is 40 times longer than an incandescent bulb. As such, savings extend not only to replacement costs but also to the maintenance costs of your company's lighting bill.

Energy Efficiency: Another one of the leading LED lighting advantages is their energy-efficient operation. You can measure the energy efficiency of a lighting source in useful lumens, which describes the amount of lighting that the device emits for each unit of power, or watt, that the bulb uses. If you replaced all the lighting in your

office, school or other facility with LEDs, you could see as much as a 60% to 70% improvement in your overall energy savings. In some cases, the improvement could be as great as 90%, depending on what kind of lights you are replacing and what kind of LED lights you are using.

Improved Environmental Performance: It is becoming increasingly important for companies to become eco-friendly. Customers increasingly want environmentally friendly options and using an environmentally friendly light source can help companies reduce their energy use, as well as attract a socially conscious consumer base. The environmental benefits of LED lighting also extend to their manufacturing process. Many traditional lighting sources, like fluorescent lighting and mercury vapour lights, use mercury internally as part of their construction. Because of this, when they reach the end of their lifespans, they require special handling. You do not have to worry about any of these issues with LED lights.

Open well water system

Institute has Open well in its campus and it acts as the primary source of water. The main advantage of having the open well system is that the institute reduces the load on Municipal Corporation and the supply water is throughout the year from the well.

RO Water system

The problem with drinking tap water is that it contains harmful toxins and inorganic compounds such as lead, which in excess can cause high blood pressure and kidney problems. Because of the pollution in our environment and the deterioration of natural resources, we need a way to filter out these pollutants in our drinking water. The main reason for the RO water purification to be so much in demand is its ability to remove impurities from the water. It is able to clean around 97 percentages of bacteria, virus and other elements that can cause serious health problems. The likes of micro particles which are smaller than 10 microns can also be removed by an RO purifier.

Septic tanks

Septic tanks are secure systems for storing and subsequently disposing of faecal waste. A simple decantation and sedimentation process eliminates any solids in the wastewater, thus preventing them from contaminating the soil or freshwater sources. Institute has installed septic tanks and they offer effective pre-treatment before the water purification phase since they are inexpensive. They don't produce foul odour and prevents the appearance of pests, such as flies and mosquitoes.

Fire Extinguisher

SSPACE have installed fire extinguishers at every necessary section in the premises. These help easily as they are portable fire extinguishers and can be quickly brought to the scene of a fire.

Roof top solar panel system

Saving on bills: While regular electricity is powered through fuel across the country, it becomes an expensive ordeal, especially with rising fuel prices. Solar energy is readily available and can be harnessed as a substitute for fuel-based electricity, thus being a cheaper alternative in the long run.

Accessibility: India is a country that holds diverse communities from multiple walks of life, not all of whom have accessible sources of energy, other than petrol and diesel. Solar Energy has become an economically viable and safe option for them.

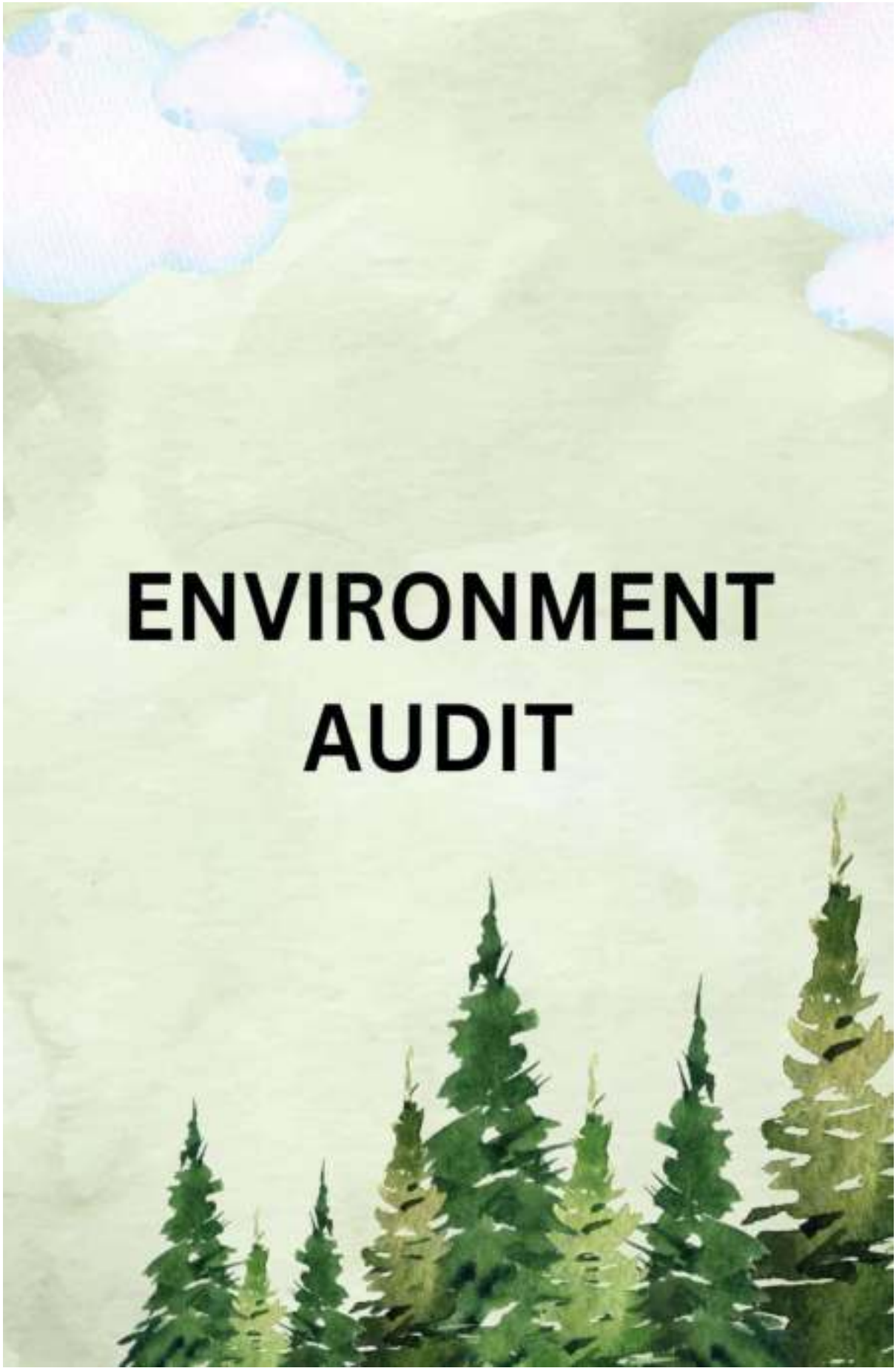
Low maintenance: Post the installation of a rooftop solar, the product itself requires negligible maintenance and, therefore, lower added costs. Rooftop Solar are known to have a long service life span.

Reduced carbon footprint: Right from installation to use, rooftop solar neither emit harmful greenhouse gases nor cause health hazards, resulting in a lowered carbon footprint.

Rain water harvesting:

Rainwater harvesting is the simple process or technology used to conserve rainwater by collecting, storing, conveying and purifying of rainwater that runs off from rooftops, parks, roads, open grounds, etc. for later use. Here, let us have a look at the diagram of rainwater harvesting system. It is beneficial for the institute as:

- Less cost.
- Helps in reducing the water bill.
- Decreases the demand for water.
- Reduces the need for imported water.
- Promotes both water and energy conservation.
- Improves the quality and quantity of groundwater.
- Does not require a filtration system for landscape irrigation.
- This technology is relatively simple, easy to install and operate.
- It reduces soil erosion, storm water runoff, flooding, and pollution of surface water with fertilizers, pesticides, metals and other sediments.
- It is an excellent source of water for landscape irrigation with no chemicals, dissolved salts and free from all minerals.


ENVIRONMENT
AUDIT

Environmental Audit:

An environmental audit is a type of evaluation intended to identify environmental compliance and management system implementation gaps, along with related corrective actions. ISO 14001 is a voluntary international standard for environmental management systems ("EMS"). ISO 14001:2004 provides the requirements for an EMS and ISO 14004 gives general EMS guidelines. An EMS meeting the requirements of ISO 14001:2004 is a management tool enabling an organization of any size or type to:

Identify and control the environmental impact of its activities, products or services;
Improve its environmental performance continually, and
Implement a systematic approach to setting environmental objectives and targets, to achieving these and to demonstrating that they have been achieved.

The audit examines the potential hazards or risks posed by the institutes. Areas examined may include environmental policies and procedures, energy use practices, recycling, waste, conservation, and pollution. Then, the institute can use the results to determine what changes need to be made for compliance. In a broad sense, environmental auditing aims to help protect the environment and minimize the risks of business activities to the environment and human safety and health.

Water Audit and wastewater audit:

Water auditing is a method of quantifying water flows and quality in systems, with a view to reducing water usage and often saving money on otherwise unnecessary water use. Water audit is an effective management tool for minimizing losses, optimizing various uses and thus enabling considerable conservation of water. Water audits trace water use from its point of entry into the facility/system to its discharge into the sewer/river/canal etc. Wastewater audit deals with effective management of wastewater in the system. It deals with proper generation, management, treatment, transfer and disposal of wastewater.
SSPACE has carried out its water and wastewater audit and has suggested many more ways for water conservation, reuse and recycle. The detail water and waste water report is mentioned below.

Water Audit report

Water audit for the “SSPACE” was carried out. The purpose of the water audit is to provide a thorough understanding of the water uses by identifying and measuring all water using fixtures, appliances, and practices in order to recommend potential water saving efficiencies.

PRIMARY DATA

Sr. No.	Title	Information
1	**Name of Institute**	Shri Shankarprasad Agnihotri College of Engineering, Wardha
2	**Address**	Wardha 442001
3	**Name of company under which water audit is carried out**	Environmental and Civil Engineering Solutions, Sangli
4	**Number of floors**	G + 3 (Variable)
5	**Category of building**	Educational Institute
6	**Nearest ESR location**	Campus
7	**Water supply hours**	NA
8	**Water meter present**	No

POPULATION DETAILS

Title	Information
Fixed population (Working staff and Students)	Gents: 450
	Ladies: 286
Variable population (Visiting persons)	Gents: 14
	Ladies: 9

SOURCE INFORMATION

Title	Information
Sources of water	Open well
Connection details	1” PVC pipe inlet and 1” outlet distribution pipe

STORAGE DETAILS

Title	Information
Overhead tank type	RCC tank
Location	On terrace
Number of tanks	2 X 10,000 lit RCC | 1 X 21,000 lit RCC 1 X 22,000 lit RCC | 1 X 40,000 lit RCC
Motor connection details	5 Hp for Building 1 3 Hp for Building 2
Pumping period	4 hours daily
Underground sump	Yes
Capacity of underground sump	40,000 Lit RCC

WATER USAGE

Toilet	Number of users	Water consumption
Gents toilet	450 users	450 X 15 lit = 6750
Washbasin	736 users	736 X 0.75 lit = 552
Ladies toilet	286 users	286 X 18 lit = 5148
Toilet cleaning	800 liters	800 liters
Floor cleaning	1500 liters	1500 liters
Gardening	3000 liters	3000 liters
Laboratories	2500 liters	2500 liters
Total		**20,250 lit**

SCHEDULE OF TOILETS AND WASHROOMS:

Number of Students and staff toilets in each floor for Building 1 and 2

Sr. No.	Toilet	Boys	Girls	Staff
1	**Ground floor**	2	0	5
2	**First floor**	1	2	0
3	**Second floor**	2	1	0
4	**Third floor**	1	2	0

WATER USED FOR DRINKING

There are coolers cum water purifiers present in the institute. Sample assessment for 3 months was done and average values are presented below for each section.

Potable water assessment:

Open well assessment

Sr. No.	Test	Results	Limit
1	pH	**7.8**	6.5-8.5
2	TDS	**1271**	-
3	E.C	**2699**	-
4	Hardness	**179**	200
5	Chlorides	**120**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

RO No 1 Building 1

Sr. No.	Test	Results	Limit
1	pH	**6.9-7.2**	6.5-8.5
2	TDS	**111**	-
3	E.C	**102**	-
4	Hardness	**114**	200
5	Chlorides	**116**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

RO No 2 Building 1

Sr. No.	Test	Results	Limit
1	pH	**6.6-7.3**	6.5-8.5
2	TDS	**114**	-
3	E.C	**107**	-
4	Hardness	**106**	200
5	Chlorides	**114**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

RO No 1 Building 2

Sr. No.	Test	Results	Limit
1	pH	**6.7-7.0**	6.5-8.5
2	TDS	**118**	-
3	E.C	**114**	-
4	Hardness	**124**	200
5	Chlorides	**111**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

RO No 1 Building 2

Sr. No.	Test	Results	Limit
1	pH	**6.8-7.6**	6.5-8.5
2	TDS	**109**	-
3	E.C	**125**	-
4	Hardness	**144**	200
5	Chlorides	**125**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

Testing specifications:

Test	ISO Code
pH	ISO 3025:11 (1993)
TDS	ISO 3025: 16 (1984)
E.C	ISO 3025: 14 (1984)
Total Hardness	ISO 1055: 12 (2012)
Chloride	ISO 3025: 40 (1991)
MPN	ISO 9308: 2 (2012)

Water Consumption in Hostel sections

Institute has hostels present for both Boys and girls. Following table shows the water cosnumption

Sr. No.	Section	Count	Demand	Water usage
1	**Boys Hostel**	114	135 LPCD	15,390
2	**Girls Hostel**	61	135 LPCD	8,235

Waste water audit

SSPACE campus generates huge amount of wastewater. The source for wastewater in the campus is hostels, institute, mess and the washrooms and urinals inside the campus. To estimate the amount of wastewater generated all the water that is used in the washrooms and hostels is considered as wastewater.

Sr. No.	Section	Wastewater generated in litres
1	Water usage generated in campus	**20,250**
2	Water usage in hostel section	**23,625**
Waste water generated		**32,906**

Waste water treatment plant at SSPACE:

Currently SSPACE lets all it waste water into sewers. Currently there is no any waste treatment facility. Sampling of waste water was done for 3 months for the parameters of COD, BOD, TKN and pH. Following table shows the characterization of wastewater.

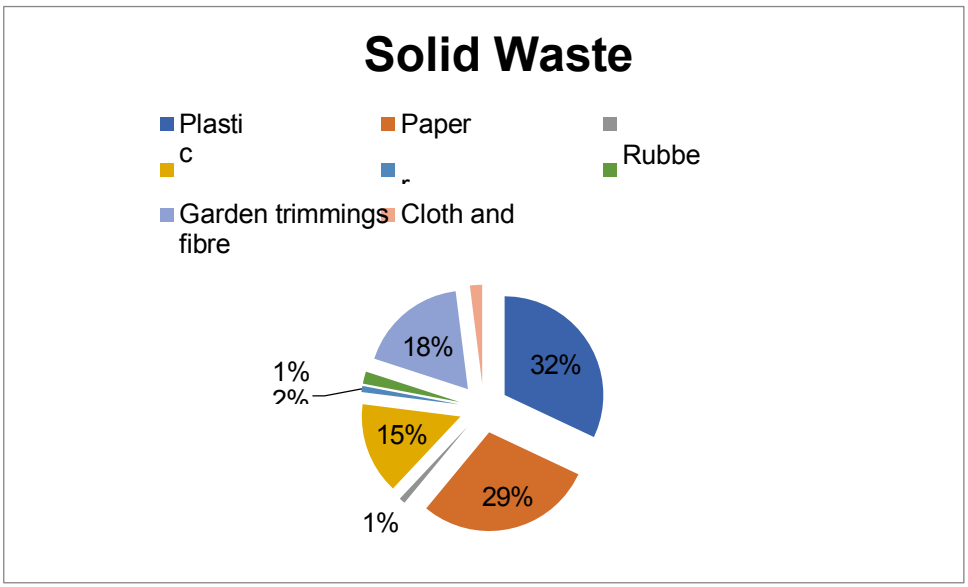
Sr. No.	Parameter	Reading
1	pH	7.29
2	COD	1985
3	BOD	101
4	TKN	28

Solid waste Audit

A waste audit is a physical analysis of waste composition to provide a detailed understanding of problems, identify potential opportunities, and give you a detailed analysis of your waste composition. A waste audit will help you clearly identify your waste generation to establish baseline or benchmark data, Characterize and quantify waste stream, Verify waste pathways, identify waste diversion opportunities and identify source reduction opportunities.

Solid waste is the unwanted or useless solid material generated from the human activities in residential, industrial or commercial area. Solid waste management reduce or eliminates the adverse impact on the environment and human health. Solid waste audit for SSPACE was carried out. The entire premise was analysed for solid waste generation and waste characterization. Overall waste was observed and characterization was done. The below table shows the components of solid waste at SSPACE campus. Quartering method was used and 1 Kg of waste was selected.

Sr. No.	Type of waste	Composition %
1	Plastic	32
2	Paper	29
3	Rubber	1
4	Food	15
5	Glass	1
6	Metals	2
7	Garden trimmings	18
8	Cloth and fibre	2



After analysing all the bins it was observed that plastic had highest contribution viz. 32% followed by the paper waste i.e. 29%. Mostly common observed plastic items were plastic wrappers of chips, soft drinks bottles and chocolate wrappers. The paper waste included paper wrappers, notebook pages, pamphlets and some pieces of cardboard. The third highest waste included garden trimmings. It included small grass, minute branches etc. The least contribution was of cloth, fibre, glass and metals.

Observations and Conclusion:

There are separate bins for wet waste and dry waste. Hence, source segregation takes place.

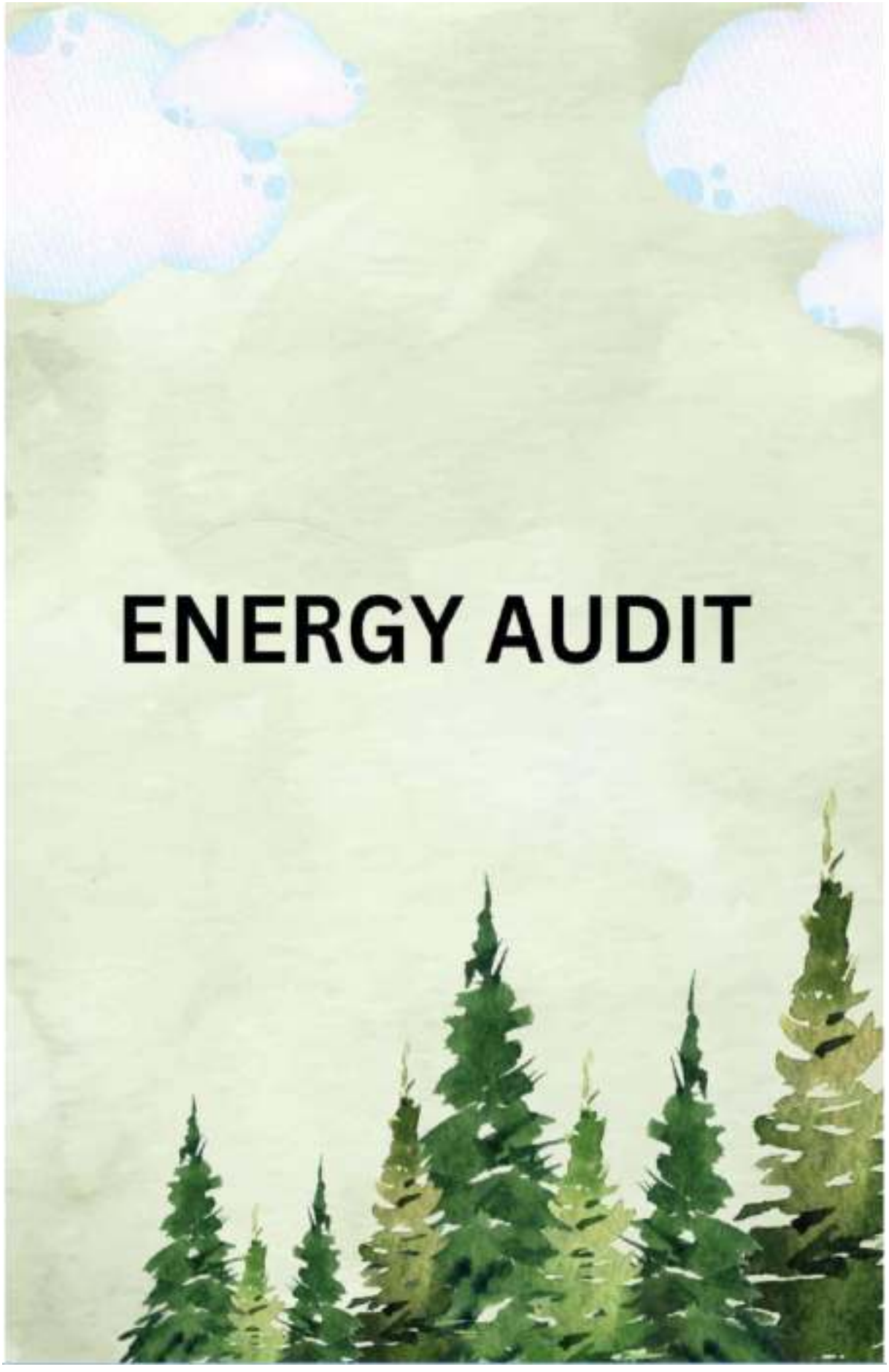
Institute has taken steps towards paper recycling. The paper waste collected from the bins is send to vendors.

Plastic ban in campus is implemented but due to lack of seriousness in the students plastic is used in campus. Institute should conduct plastic awareness seminars for both the staff and students.

Assessment of soil was done to determine the quality of soil:

Sr. No.	Test	Results
1	pH	**6.1**
2	NPK	**2:3:1**
3	Acidity	**129 mg/lit**
4	Hardness	**159 mg/lit**


DUSTBIN
DUSTBIN
DUSTBIN
USE ME
USE ME
USE ME


ENERGY AUDIT

Energy Audit

An energy audit is an inspection survey and an analysis of energy flows for energy conservation in a building. It may include a process or system to reduce the amount of energy input into the system without negatively affecting the output. In commercial and industrial real estate, an energy audit is the first step in identifying opportunities to reduce energy expense and carbon footprint.

A nation is tiring to advance in quantity and quality to the spread of education among the common India and development of their intelligence. In India the entire field of education and other fields of intelligent activities had been monopolized by a handful of men before independence. But today we are marching towards the desirable status of a developed nation with fast strides. But the development should be a sustained one. For achieving such an interminable development energy management is essential. As far as concerning electricity crisis, we are facing lack of electricity during office work. So, institutional management is taking design regarding production of electricity and saving electricity for Eco social aspect. Energy requirement of India is growing and incomplete domestic fossil fuel treasury. The country has motivated strategy to enlarge its renewable energy resources and policy to establish the nuclear power plants. India increases the involvement of nuclear power to largely electrical energy development facility from 4.2% to 9%. India's industrial demand accounted for 35% of electrical power requirement, domestic household use accounted for 28%, agriculture 21%, commercial 9%, and public lighting and other miscellaneous applications accounted for the rest. Energy conservation means reduction in energy consumption without making any sacrifice of quantity or quality. A successful energy management program begins with energy conservation; it will lead to adequate rating of equipment's, using high efficiency equipment and change of habits which causes enormous wastages of energy. By observing all these study lack of electricity and huge electricity demands. It is necessary to plan to be self-sufficient in electricity requirement.

Connection details:

Institute receives electricity from MSEB i.e. Maharashtra State Electricity Distribution Co. Ltd. Following are the details about connection.

Type of connection: HT (High tensioned)

Tariff: 146 HT-VII B

Contract demand: 200 KVA
Feeder voltage: 11 KW
Type: 3 Phase

Tariff Structure:

As per Distribution Company, HT and LT consumers have an option to take Time of Day (TOD) tariff instead of the normal tariff. Under TOD tariff electricity consumption and maximum demand in respect of HT consumers for different periods of the day i.e. normal period, peak load period and off-peak load period could be recorded by installing TOD meter. The maximum demand and consumption recorded in different periods could be billed on the following rates of the tariff applicable.

TOD Tariffs	Rate % (Rs./Unit)
0000 Hrs- 0600 Hrs & 2200 Hrs- 2400 Hrs	-1.500
0600 Hrs- 0900 Hrs & 1200 Hrs- 1800 Hrs	0.000
0900 Hrs- 1200 Hrs	0.800
1800 Hrs- 2200 Hrs	1.100

Power Factor:

Power Factor (PF) is an indicator of efficient utilization of power. In an AC (Alternating Current) electrical power system, PF is defined as the ratio of real power flowing to the load, to the apparent power in the circuit and is a dimensionless number.

Bill analysis:

Bill analysis for SSPACE had been done for academic year 2020-2021.

Sr. No.	Month	Consumption (Kw)	Bill Amount
1	Apr-20	2310	113648
2	May-20	2528	116368
3	Jun-20	2988	126542
4	Jul-20	2460	80908
5	Aug-20	2696	83678
6	Sep-20	2650	83206
7	Oct-20	3008	87573
8	Nov-20	3002	87354
9	Dec-20	2676	83218
10	Jan-21	2640	82811
11	Feb-21	2506	81291
12	Mar-21	2828	85381

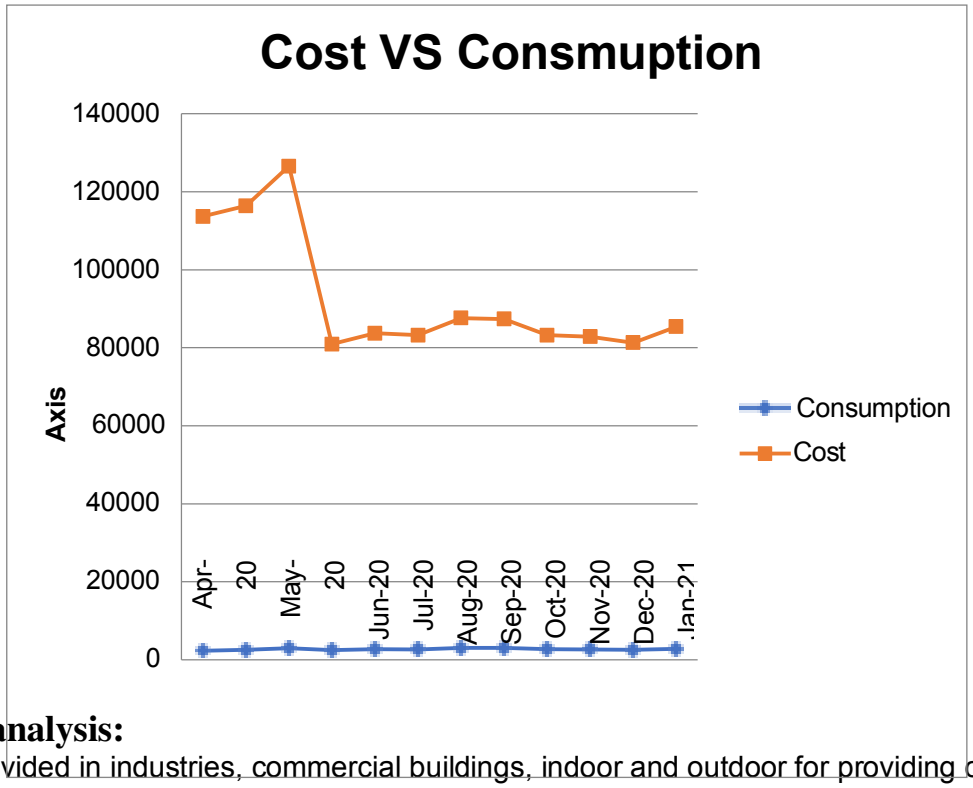
Cost Analaysis:

After analysisng the bill the average cost expenditure of the institute on energy is about 92664.83 Rs

Consumption analysis:

After analysisng the bill the average energy consumption of the institute is about 2691 Units

Cost VS Consumption:



ILER analysis:

Lighting is provided in industries, commercial buildings, indoor and outdoor for providing comfortable working environment. The primary objective is to provide the required lighting effect for the lowest installed load i.e. highest lighting at lowest power consumption. The purpose of performance test is to calculate the installed efficacy in terms of lux/watt/m² (existing or design) for general lighting installation. The calculated value can be compared with the norms for specific types of interior installations for assessing improvement options.

Range	Condition
0.5 or less	Urgent activity required (UAR)
0.51 - 0.70	Review Suggested (RS)
0.70- above	Good

ILER analysis for various sections in SSPACE were carried out. Firstly using LUX meter illumination was measured and then numerical analysis was carried out. ILER gives idea about lighting conditions and measured regarding improving them.

Main Building analysis

Sr. No.	Section	LUX reading	ILER	Condition
1	Library	161	0.72	Good
2	Study room	128	0.73	Good
3	Classroom B1	184	0.75	Good
4	Office	147	0.71	Good

Reasons for Good ILER:

Proper placement of windows and doors so that natural light is available well.
Good ventilation system.

Details of light fittings:

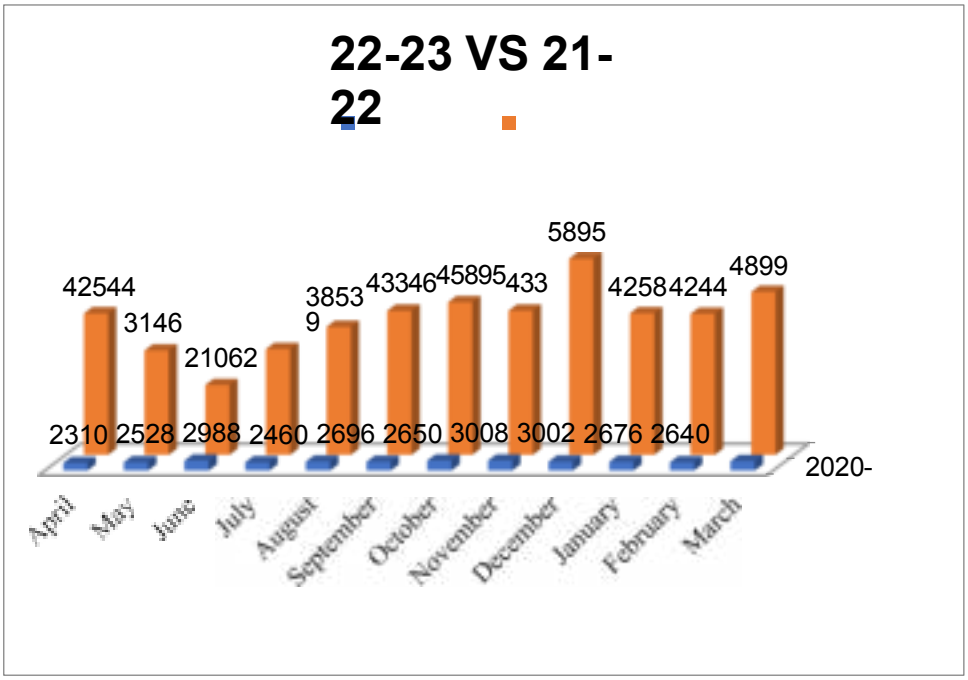
Below table shows the main fitting details in the institute building.

Energy	Count
LED	231
Fans	211
PC	280
Printer	7

Comparison of Electricity Consumption

This section presents comparison of electricity consumption. Comparison of 2020-2021 electricity consumption is done with 2019-2020 electricity data.

Month	Consumption (Kw)	Month	Consumption (Kw
Apr-20	2310	**Apr-19**	42544
May-20	2528	**May-19**	31462
Jun-20	2988	**Jun-19**	21062
Jul-20	2460	**Jul-19**	31878
Aug-20	2696	**Aug-19**	38539
Sep-20	2650	**Sep-19**	43346
Oct-20	3008	**Oct-19**	45895
Nov-20	3002	**Nov-19**	43384
Dec-20	2676	**Dec-19**	58955
Jan-21	2640	**Jan-20**	42589
Feb-21	2506	**Feb-20**	42445
Mar-21	2828	**Mar-20**	48995



Considering the consumption background the average consumption in the year 2021-2022 is 2691 units and consumption in the yare 2019-2020 is 40924 units.

Schedule of Lab equipments Physics lab

EQUIPMENTS		Count
1	Transistor in CB Configuration	1
2	Half and Full wave Bridge rectifier with and without filters	1
3	Zener Diode as a shunt voltage regulator	1
4	LDR Characteristics	1
5	Energy Band Gap of semiconductor material using reverse biased PN junction	1
6	To study characteristics of semiconducting diode	1
7	Characteristics of LED Kit	1
8	Resistivity by four probe method	1
9	Study of Hall Effect	1
10	e/m by Thomson method	1
11	Determination of wavelength of spectral line using diffraction grating spectrometer, sodium light system	1
12	Interference of light in the thin film (Newton's Ring Dia)	1
13	Study of Photocell and determination of Planks Constant	1
14	Combine unit / kit for divergence of LASER beam and grating element of a diffraction grating using Laser Beam	1
15	CRO	1
16	Function Generator	1
17	Spirit Level	3
18	Diffraction Grating	2
19	Spectrometer Prism ED 135x25	1

20	Zener Diode characteristics kit	1
21	Ammeter D.C, 0-50 mA	2
22	Ammeter D.C, 0-30 mA	2
23	Ammeter D.C, 0-10 mA	2
24	Voltmeter D.C.0-10 V	2
25	Voltmeter D.C.0-30 V	2
26	Voltmeter D.C.0-50 V	2
27	Prism simple	1
28	Soldering Iron 25W	1
29	Soldering wire	1
30	Soldering Paste	1
31	Screw driver set 812	1
32	Screw driver set 824	1
33	Screw driver set 936	1
34	Multimeter Analog Toyatone	1
35	Sodium Vapour Lamp 35 W	1
36	Mercury Lamp with wooden box and Transformer	1
37	Transistor Characteristics in CE Mode Model : SA-111	2
38	Transistor Characteristics in CB Mode Model : SA-112	1
39	Plano convex Lens	4
40	Semiconductor Diode Characteristics Kit Model : SA-101	2
41	Banana pins 2mm	20
42	Digital Multimeter 3 ¾ Auto ranging DMM with capacitor frequency measurement Make : Meco model : 801	8

43	Magnifier lens with light	2
44	Transistor Characteristics in CB configuration ASICO Kit	2
45	Transistor Characteristics in CE configuration ASICO Kit	2
46	Zener Diode char. Kit ASICO	2
47	PN Junction Diode kit ASICO	2
48	Diffraction Grating	2
49	Half wave Full wave Refractor kit	2
50	Digital Multimeter (inter model)	2
51	Forbidden Energy Gap kit	2
52	CB, CE and CC configuration kit	2
53	Half wave Full wave Rectifier kit	2
54	20 MHz Dual Trace CRO with probe Model :ST-201 Scientech	3
55	Function Generator Model: ST-4060 Scientech	2
56	Spectrometer	1
57	Quartz Prism for double refraction	1
58	Optical Bench 1 meter	1
59	Studty of Hall Effect	1
60	Ditital Multimeter	2
61	Table Lamp	2
62	Zener Diode kit	1
63	PN Junctioin kit	1
64	Zener Diode kit	1
65	PN Junctioin kit	1

66	e/m by Thomson method Complete setup	1
67	e/m by Thomson method Complete setup	1
68	Resistivity of Semiconductor by Four Probe Method	1
69	Sodium Lamp Assembly	1
70	Travelling Microscope	1
71	Diffraction Grating	1
72	Reading Lens	3
73	Spirit Level	1
74	Eye piece	4

Chemistry Lab

EQUIPMENTS		**Count**
1	Pensky Marten Close cup Flash Point App M. No. 1013A	3
2	Red Wood Viscometer No. 1 M. No. 1022C	2
3	Red Wood Viscometer No. 2 M. No. 1024C	2
4	PH Meter with Electrode M. No. 112	1
5	Photo Electric Calorimeter M. No. 312	1
6	Digital PH Meter Make EI Model No. 111	9
7	Weighing M/c Balance Digital Cap. 300 gm Make ELDER	2
8	Ph Meter Digital EI M No. 111	2
9	Digital Conductivity Meter Make EI M No. 611	1
10	Digital Photo Calorimeter Make EI M No. 312	1
11	Red Wood Viscometer No. 1 Model No.1022 A	2
12	Red Wood Viscometer No. 2 Model No. 1024 A	2

13	Pensky Marte Close cup Flash Point Apparatus M. No.1017	2
14	Abel Close cup Flash Point App. Model No. 1003 A	2
15	Water Still Cap. 4 Lit S.S. Distillation Assembly	2
16	Hot Air Oven with Digital Indicator 18"x18" 18" Hicon	1
17	Muffle Furnace (Digital) 1100 C 4x4x9 (Hicon)	1
18	Stop Clock Esel	40
19	Spring Balance Cap. 5 kg	1
20	Spring Balance With Cap. 2kg Barum	1
21	Spring Balance Cap. 5 kg	1
22	Digital pH Meter (EI) M. No. 111	5
23	Digital Conductivity Meter (EI) M.No. 611	1
24	Digital Photoelectric Calorimeter (EI) , M.No. 312	1
25	Heating Mantle Cap 2 Lit	2
26	Redwood Viscometer No.1	5
27	Redwood Viscometer No.2	9
28	Abel Close cup Flash Point Appratus	1
29	Penskey Marten Close cup Flash Point Apparatus	8
30	Claveland Open cup Flash point Apparatus	1
31	Redwood Viscometer No.1	5
32	Claveland Open cup Flash point Apparatus	2
33	Penskey Marten close cup Flash Point Apparatus	2
34	Weighiong M/c Digital Balance 10g to 300g (Aiwa)	1
35	Stop Clock Easel	30
36	Mechanical Stirrer	2

37	Digital Gloss 45 Deg Angle Head (Model No. RSPT-20)	1
38	Heating Mantle Cap. 2 Lit	4
39	Mechanical Stirrer Mount All Purpose/ REMI :RMQ 122/R	4
40	Heating Mantle Cap 2 Lit	1
41	Heating Mental 2000ml	1
42	Heating Mantal 2000 ml	6
43	Abel Flash Point Appratus with regulator	2
44	Heating Mantle Cap 2 Lit	6
45	Weighing M/c Digital Balance Cap. 1Kg (K-Roy)	1

Electronics Devices and Circuit Lab

EQUIPMENTS		**Count**
1	Collpit Oscillator Trainer	1
2	Emitter Follower Trainer	1
3	Two stage RC Coupled Amplifier Trainer	1
4	DC Regulated power supply 0-25V	1
5	DC Regulated power supply 0-15V	1
6	Half wave & Full wave rectifier with filter	1
7	Characteristics of PN Junction Diode	1
8	Characteristics of Zener Diode	1
9	Voltage Doubler Trainer (Voltage Regulator zener diode)	1
10	Characteristics of BJT in CE Mode	1
11	Characteristics of FET	1
12	Voltage Doubler Trainer	1

13	CRO Systronics Model 6020	2

Mechanical Measurement Lab

EQUIPMENT		**Count**
1	Basic Strain Gauge Apparatus	1
2	Measurement of force and weight using Load Cell	1
3	LVDT Instrument	1
4	Speed Measurement by using Inductive Pick up	1
5	Temperature Control using Thermocouple	1
6	Rotameter Test Rig	1
7	Stroboscope	1

Concrete technology Lab

EQUIPMENTS		**Count**
	Cube mould 15 cm	
1	i) 7.5 kg to 8 kg weight	1
2	ii) 9.0 kg to 9.5 kg weight	1
3	iii) 11 kg to 11.5 kg weight	1
4	Slump Test Apparatus	1
5	Tamping Rod	1
6	Cube Mould 7.06 cm	3
7	Fine Sieve 20 cm dia 4.75 mm	1
8	Compaction Factor Apparatus	1
9	LE CHATELIER MOULD (Set of Six)	1
	Enamel Tray	

10	i) 10”x12”	1
11	ii) 18”x12”	1
12	iii) 18”x24”	1
13	Gauging Trowel	2
14	Proving Ring 10 KN	1
15	Proving Ring 25 KN	1
16	Vicat Needle Apparatus	1
17	Beam Mould 150x150x700 mm	3
18	Spring Balance Dial Type 15 cm dia Cap. 50 Kg	2
19	Flow Table Hand Operated	1
20	VEE BEE Consistometer	1
21	Sieve Shaker Gyratory 20 cm	1
22	Hot Air Oven 24”x24”x24” S.S. 3 Tray	1
23	Compression Testing Machine 1000KN (100 Tonne)	1
24	Tiles Abrasion Testing Machine	1
25	Ultrasonic Pulse Velocity Tester	1

Heat Transfer lab

EQUIPMENTS		**Count**
1	Heat Transfer in Force Convection	1
2	Heat Transfer in Natural Convection	1
3	Dropwise & Filmwise condensation App.	1
4	Thermal Conductivity of Insulating Powder	1
5	Parallel Flow/Counter Flow Heat Exchanger	1

6	Stefen Boltzman Apparatus	1
7	Thermal Conductivity of Metal Bar	1

TOM lab

EQUIPMENTS		**Count**
1	Best Indian JPTI Make CAM Analysis Apparatus	1
2	Best Indian JPTI Make Whirling of Shaft App.	1
3	Best Indian JPTI Make Motorised Gyroscope	1
4	Best Indian JPTI Make Universal Vibration App.	1
5	Best Indian JPTI Make Governor Apparatus	1
6	Static and dynamic Balancing App.	1
7	Torsion Testing Machine	1

Digital Circuit lab

EQUIPMENTS		**Count**
1	Basic Logic Gates Trainer	1
2	Demorgan's Theorem Trainer	1
3	R-S Flip flop Trainer	1
4	Demultiplexer trainer kit	1
5	Modulo N Counter	1
6	Half/Full Adder	1
7	Half/Full Subtractor	1
8	TTL Clock Generator	1
9	CRO Systronic 6020	1

10	Trainer Kit for Universal gates by using NOR and NAND Gates Model : SB-312	2
11	Demorgan's Theorem Trainer Model : SB-311	2
12	Half/Full Adder SF : 305	2
13	Half/Full Subtractor SF : 306	2
14	Basic Logic Gates Trainer Kit AET-21 By Aquila	2
15	8:1 Multiplexer Trainer Kit AET 31M By Aquila	2
16	De-Multiplexer Trainer Kit AET 31D BY Aquila	2
17	Flip-Flop Trainer kit AET-60 By Aquila	2
18	Trainer kit of Synchronous counter by Aquilla Model AET 32A	2
19	Trainer kit of Asynchronous counter by Aquilla Model AET 32	2

TV lab

EQUIPMENT		**Counts**
1	Colour TV Trainer (51cm) by Anshuman Model: XPO-COL TV	3
2	Black & White TV Trainer with 14" CRT By Mars Edpal Model: ME 1200	1
3	Antenna Trainer with 10 Antennas (50 to 860 MHz)	1
4	Colour Patttern Genertor By Signet Model: Signet 1053 Mltichannel with colour VHF-UHF Ch.2 to Ch.12 VHF, 1 KHz FM Demodulation Attenuator 20 dB	2
5	Colour Pattern Generator by Saral (Markoni)	2
6	VCR Trainer Depmstratpr by Mars Edpal Model : ME 1215	1

Microprocessor lab

EQUIPMENTS		Count
1	8085 Microprocessor Kit with 16*2 LCD Display Model XPO Kit	5
2	8086 Microprocessor Kit with 16*2 LCD Display Model XPO Kit	5
3	SMPS For Microprocessor 8085 Kit	10
4	101 Keyboard	10
5	RS 232 Serial Link /cable & PC up/down Loading Software & Cross assembler on CD	10
6	8085 Microprocessor Kit with 16*2 LCD Display Model XPO Kit	5
7	8086 Microprocessor Kit with 16*2 LCD Display Model XPO Kit	5
8	SMPS For Microprocessor 8085 Kit	10
9	101 Keyboard	10
10	RS 232 Serial Link /cable & PC up/down Loading Software & Cross assembler on CD	10
11	8051 Microcontroller Kit	1

RAC lab

EQUIPMENT		Count
1	Computerised Variable Compression Ratio Petrol Engine	1
2	Air Conditioner Trainer Duct Type	1
3	Digital Anemometer	1
4	5 Gas Analyser	1
5	24 Column Matrix Printer	1
6	Rolling Charts	38

Production technology lab

EQUIPMENT		Count
1	Floating Carriage Diameter Measuring Machine Model EDM-75	1
2	Sodium Vapour Monochromatic light unit	1
3	Specimen Set: include 4 Test surface of dia 50 mm, Optical flat 01 No. Steel flat 01 No.	1
4	Optical flat 25 mm	1
5	Optical flat 30 mm	1
6	Optical flat 50 mm	1
7	Dial Indicator Range 1mm L.C. 0.001mm	1
8	Straight Edge size 300x50x8	1
9	Straight Edge Size450x50x8	1
10	Tool Maker Microscope Model TM -50	1
11	Venire Height Gauge 12 inch	1
12	Sine Bar 100 mm	2
13	Slip Gauge set	1
14	Dial Gauge Stand	1
15	Digital Micrometre For Floating Carriage	1

Metallurgy lab

EQUIPMENT		Count
1	Impact Testing Machine for Izod & Chirpy Test	1
2	Rockwell Hardness Testing M/c	1
3	Metal Sample Box	1

4	Inclined monocular metallurgical microscope Model n56	1
5	Binocular metallurgical microscope model 57	1
6	Metallurgical Image Analyser	1
7	specimen	1 set

Fluid power lab

EQUIPMENT		**Count**
1	Centrifugal Pump Test Rig	1
2	Reynolds Apparatus	1
3	Verification of Bernoulli's Theorem	1
4	Equipment List	1
5	Rota meter Test Rig	1
6	Flow Measured by Venturimeter & Orifice meter	1

Structural analysis lab

EQUIPMENT		**Count**
1	Behaviour of Column and Truss App.	1
2	Hinged Arches	1
3	Verification of Maxwell Reciprocal Theorem	1
4	Deflection of Truss App.	1

Transportation lab

EQUIPMENT		**Count**
1	Penskey Morten Flash Point App.	1
2	Flakiness Gauge	1
3	Length Gauge	1

4	Standard Penetrometer	1
5	Ring & Ball App.	1
6	Coarse Sieve 45 cm Dia GI	14
7	Ductility Testing Machine Model EIE 040	1
8	Specific Gravity and Water Absor. Test App.	1
9	Aggregate Crushing Value App. 15 CM	1
10	C.B.R. Testing Machine	1
11	Aggregate Impact Testing Machine	1
12	Electronic Balance 10 KG /1GM	1
13	Los Angeles Abrasion Testing Machine	1

Fluid mechanics lab

EQUIPMENT		**Count**
1	Bernoullis Theorem App.	1
2	Impact of Jet App.	1
3	Orifice and Mouthpiece App.	1
4	Reynolds App.	1
5	Metacentric Height App	1
6	Notch Apparatus	1
7	Pitot Tube apparatus	1

Survey lab

EQUIPMENT		Count
1	Levelling Staff 4 mtr (compact)	3
2	Transit Vernier Theodolite	1
3	Measuring chain 30 Mtr 150 Link	3
4	Measuring chain 20 Mtr 100 Link	3
5	Ranging Rod 3 Mtr	5
6	Prismatic Compass	1
7	Surveyers Compass	1
8	Dumpy Level with Stand	3
9	Plane Table	2
10	Measuring Tape Steel 30 Mtr	3
11	Trough Compass	2

Soil lab

EQUIPMENT		Count
1	Liquid Limit Device, Hand operated	1
2	Test Sieves 20 cm dia brass frame size 425 micron	1
3	Plastic limit kit	1
4	Shrinkage Limit Apparatus	1
5	Pycnometer Brass Cone, Metal Ring & Rubber seal	1
6	Particle size determination IS Test sieve 20 cm dia brass frame without any joint 4.75 mm to 150 micron	1
7	Sieve 75 micron	1
8	Lid and Receiver for above	1

9	Permeability Apparatus	1
10	Overhead tank for above made of GI sheet	1
11	Apparatus for soil determination Core cutter with Dolly & Rammer	1
12	Sand Pouring Cylinder Large	1
13	Stop Watch (Mechanical)	5
14	Glass Thermometer 0-200 Degree	1
15	Glass Thermometer 0-50 Degree	1
16	Glass Thermometer 0-110 Degree	1
17	Moisture Cane 50x50MM	4
18	Measuring Cylinder (Glass) 100 ML	2
19	Measuring Cylinder (Glass) 250 ML	2
20	Measuring Cylinder (Glass) 500 ML	2
21	Measuring Cylinder (Glass) 1000 ML	2
22	Measuring Cylinder (Plastic) 50 ML	2
23	Measuring Cylinder (Plastic) 100 ML	2
24	Measuring Cylinder (Plastic) 250 ML	2
25	Measuring Cylinder (Plastic) 500 ML	2
26	Measuring Cylinder (Plastic) 1000 ML	2
27	Evaporating Dish 150 mm dia Porcelain	2
28	Evaporating Dish 100 mm dia Porcelain	2
29	Specific Gravity Bottle 25 ml	1
30	Specific Gravity Bottle 50 ml	1
31	Specific Gravity Bottle 100 ml	1

32	G.I. Tray 18”x24”x2” with Handles	1
33	Moisture Cane 75x50MM	4
34	Glass Rod 20 cm Long x 6 mm dia	2
35	Electronic Balance 500 gm./10mg	1
36	Electronic Balance 50 kg/1g	1
37	Proctor Needle Hydraulic Type	1

Environmental engineering lab

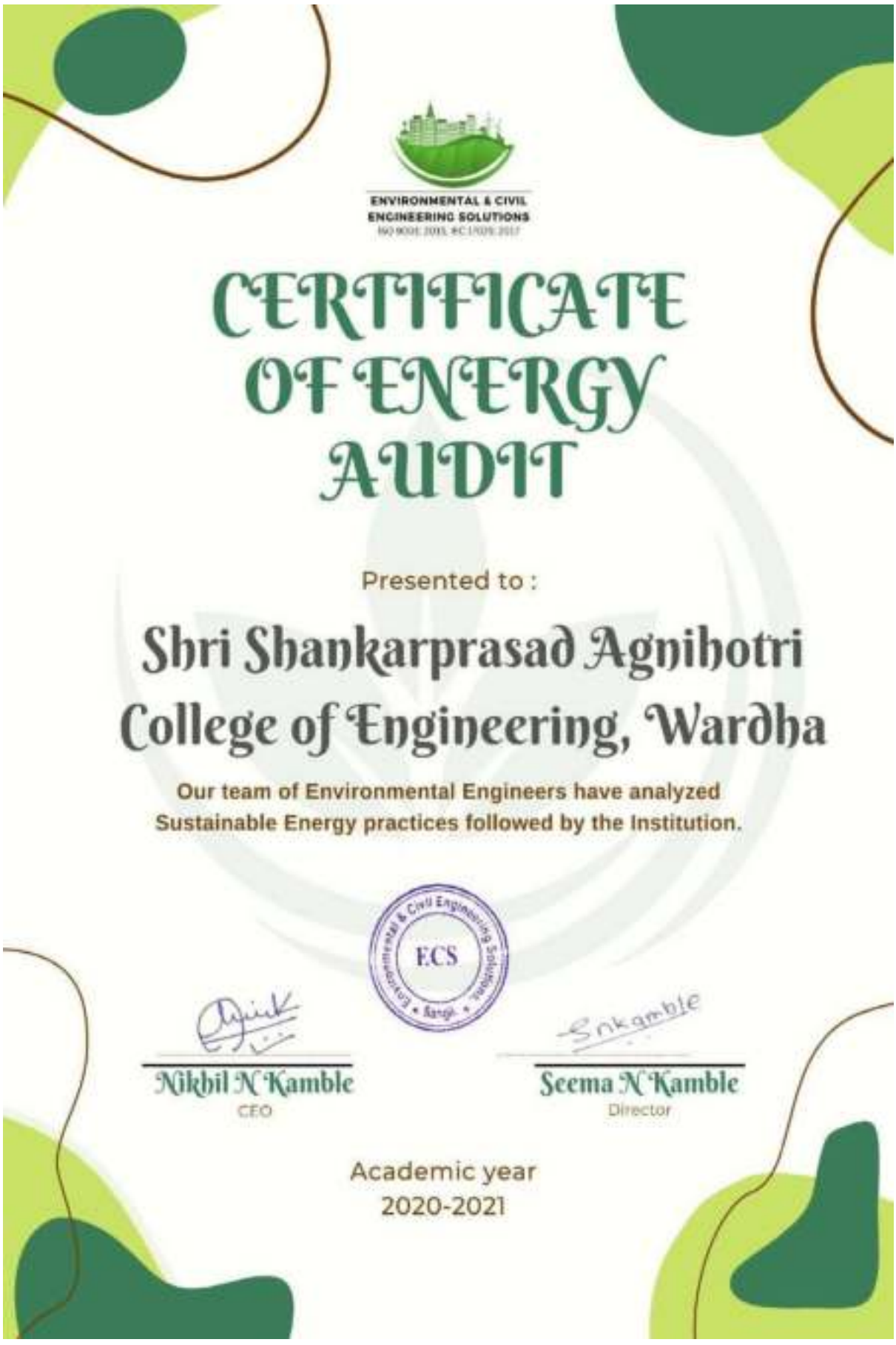
EQUIPMENTS		**Count**
1	Hot Air Oven 14”x14”x14” S.S.	1
2	Ph. Meter PM-100 Digital	1
3	Turbidity Meter	1
4	Sound Level Meter	1
5	Flocculate	1

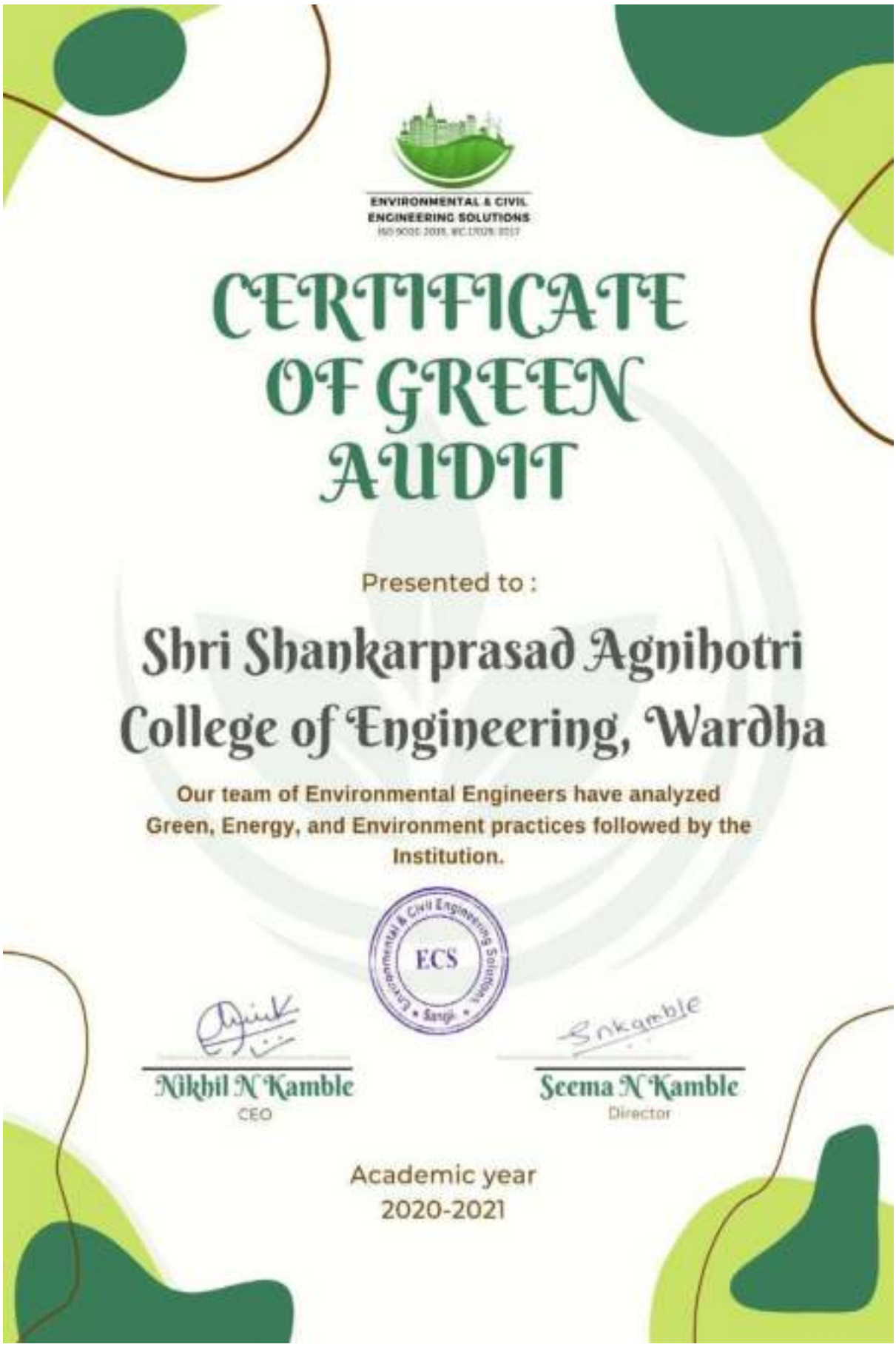
Engineering geology lab

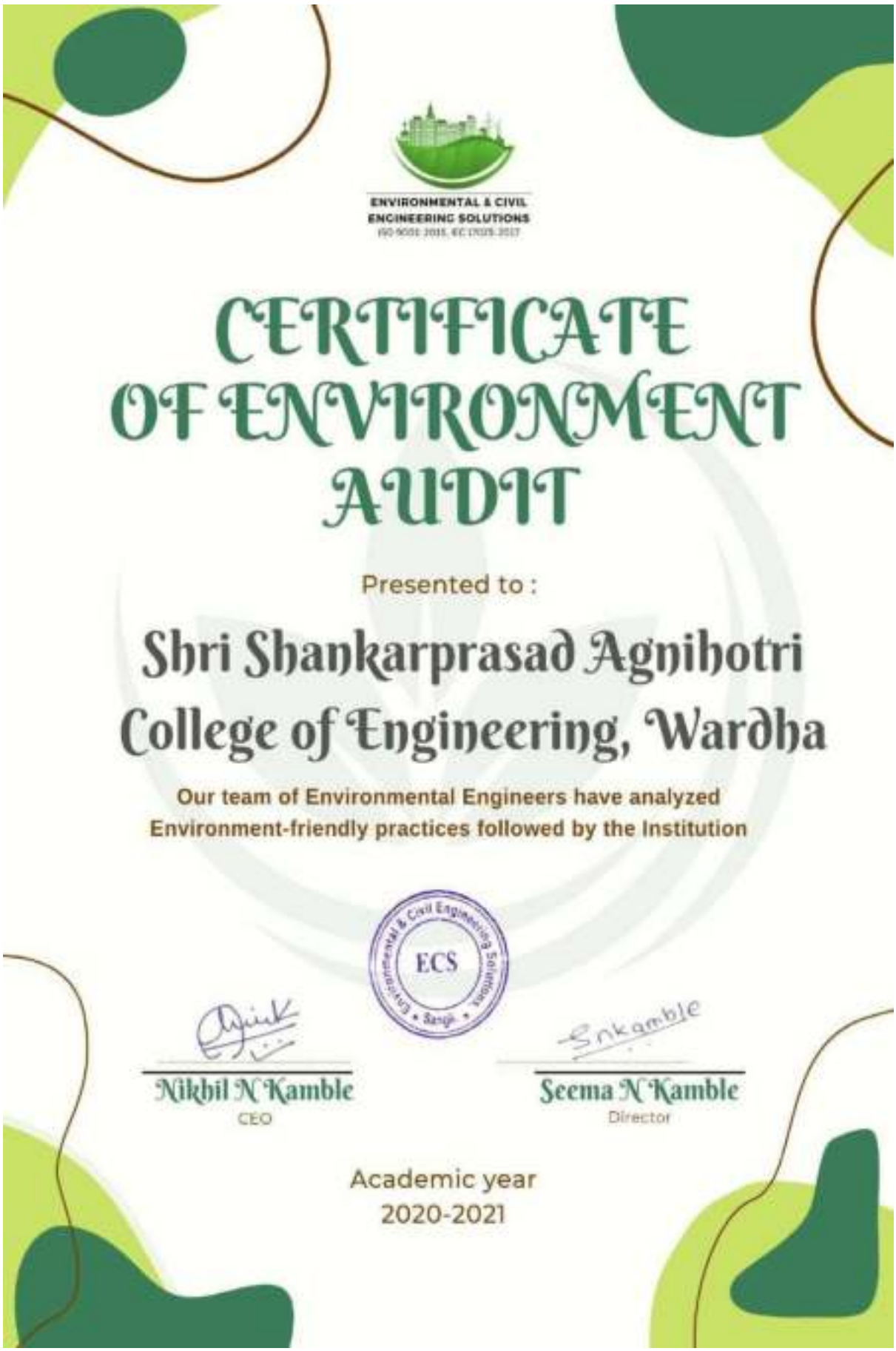
EQUIPMENTS		**Count**
1	Specimen Rocks	14
2	Specimen Minerals	18
3	Mirror Stereoscope	1
4	Transparent Geographical Globe	1
5	Bruntan Compass	1
6	Charts	9
7	Models	25

Details of PC, CPU, Keyboard and Mouse in Programming labs

Lab Name	EQUIPMENTS		Count
PROGRAMMING LAB 2	1	MONITOR	24
		CPU	24
		KEYBOARD	24
		MOUSE	24
PROGRAMMING LAB 2	2	MONITOR	60
		CPU	60
		KEYBOARD	60
		MOUSE	60
PROGRAMMING LAB 3	3	MONITOR	60
		CPU	60
		KEYBOARD	60
		MOUSE	60
DBMS LAB	4	MONITOR	24
		CPU	24
		KEYBOARD	24
		MOUSE	24
OPERATING SYSTEM LAB	5	MONITOR	24
		CPU	24
		KEYBOARD	24
		MOUSE	24
COMPUTER NETWORK LAB	6	MONITOR	16
		CPU	16
		KEYBOARD	16
		MOUSE	16


ENVIRONMENTAL & CIVIL
ENGINEERING SOLUTIONS
CERTIFICATE
OF ENERGY
AUDIT
Presented to :
Shri Shankarprasad Agnihotri
College of Engineering, Wardha
Our team of Environmental Engineers have analyzed
Sustainable Energy practices followed by the Institution.
ECS
Nikhil N Kamble
CEO
Seema N Kamble
Director
Academic year
2020-2021


ENVIRONMENTAL & CIVIL
ENGINEERING SOLUTIONS
CERTIFICATE
OF GREEN
AUDIT
Presented to :
Shri Shankarprasad Agnihotri
College of Engineering, Wardha
Our team of Environmental Engineers have analyzed
Green, Energy, and Environment practices followed by the
Institution.
ECS
Nikhil N Kamble
CEO
Seema N Kamble
Director
Academic year
2020-2021


ENVIRONMENTAL & CIVIL
ENGINEERING SOLUTIONS
CERTIFICATE
OF ENVIRONMENT
AUDIT
Presented to :
Shri Shankarprasad Agnihotri
College of Engineering, Wardha
Our team of Environmental Engineers have analyzed
Environment-friendly practices followed by the Institution
ECS
Nikhil N Kamble
CEO
Seema N Kamble
Director
Academic year
2020-2021

SHRI SHANKARPRASAD AGNIHOTRI COLLEGE OF ENGINEERING, WARDHA

2021-2022

ENVIRONMENTAL & CIVIL
ENGINEERING SOLUTIONS

Editorial

In the Era of global warming and climate change every citizen has to reduce their own carbon foot prints to tackle with the adverse impacts of climate change. A green audit of any academic institution revels ways in which we can reduce energy consumption, water use and reduction in emission of carbon dioxide in the environment. It is a process to look into and ask ourselves whether we are also contributing to the degradation of the environment and if so, in what manner and how we can minimize this contribution and bring down to zero and preserve our environment for future generation.

Shri Shankarprasad Agnihotri College of Engineering, Wardha administration has already taken a step towards the green approach and conducted green audit of campus in the year 2021-2022. As an outcome of this institute has taken green steps to reduce its carbon foot prints by several means in campus viz. sustainable fittings, tree plantation and green computing in the administration and examination. The responsibility of carrying out the scientific green audit was given to Environmental and Civil Engineering Solutions. The organization has followed the rules and regulation of Ministry of Environment and Forest, Govt. of India and Central Pollution Control Board, New Delhi.

A questionnaire was prepared based on the guidelines and format of CPCB, New Delhi to conduct green audit. The information related to consumption of resources like water, electricity and handling of solid and hazardous waste was collected in the formats from main building support services and departments. The data collected was grouped and was tabulated in Excel sheets and analysed. The graphs of the analysed data were prepared for getting quick idea of the status. Interpretation of the overall outcomes was made which incorporates primary and secondary data, references and interrelations within. Final report preparation was carried out using this interpretation to prepare environment management plan of institute for next two years.

During the preparation of the Audit Report Hon. Principal, Dean Academics and IQAC encouraged us with their full support and the audit team wants to mention a warm vote of thanks towards them.

Nik
(C.E
Env **vil Engineering Solutions**

ACKNOWLEDGEMENT

We express our gratitude for calling upon us for this audit, mainly the Principal and all other staff members, who were ever helpful and supported us with all the inputs needed for this audit. We thank all the teaching, non-teaching and students for helping us in conducting this audit.
Green Audit Team

Mr. Nikhil N. Kamble
PhD (Sustainability), M. Tech. (Env. Eng.)
Mr. Smithesh L. Bhatt
B. E. (Civil. Eng.)

Miss. Maithilee N. Kamble M.B.A, B. Tech. (Mech. Eng.) **Mrs. Seema N. Kamble** Director, ECS, B. E. (Electrical)

Institutional Audit Committee

Prof. Abhishek Kumar Singh
(Principal)
Prof. Harshad Mummadwar
(Assistant Professor)

Prof. Shailesh Watekar (Assistant Professor) **Prof. Mohan Wake** (Assistant Professor)

Introduction:

The modernization and industrialization are the two important outputs of twentieth century which have made human life more luxurious and comfortable. Simultaneously, they are responsible for voracious use of natural resources, exploitation of forests and wildlife, producing massive solid waste, polluting the scarce and sacred water resources and finally making our mother Earth ugly and inhospitable. Today, people are getting more familiar to the global issues like global warming, greenhouse effect, ozone depletion and climate change etc. Now, it is considered as a final call by mother Earth to walk on the path of sustainable development. The time has come to wake up, unite and combat together for sustainable environment.

Considering the present environmental problems of pollution and excess use of natural resources, Hon. Prime Minister, Shri. Narendra Modiji has declared the Mission of Swachch Bharat Abhiyan. Also, University Grants Commission has mentioned “Green Campus, Clean Campus” mission mandatory for all higher educational institutes. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent. Green Audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings. Green audit can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E- waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

Need of audit:

Green auditing is the process of identifying and determining whether institutions practices are eco-friendly and sustainable. Traditionally, we are good and efficient users of natural resources. But over the period of time excess use of resources like energy, water, chemicals are become habitual for everyone especially, in common areas. Now, it is necessary to check

whether our processes are consuming more than required resources? Whether we are handling waste carefully? Green audit regulates all such practices and gives an efficient way of natural resource utilization. In the era of climate change and resource depletion it is necessary to verify the processes and convert it in to green and clean one. Green audit provides an approach for it. It also increases overall consciousness among the people working in institution towards an environment.

Goals of audit:

Institute has conducted a audit with specific goals as:

- Identification and documentation of green practices followed by college.
- Identify strength and weakness in green practices.
- Conduct a survey to know the ground reality about green practices.
- Analyse and suggest solution for problems identified from survey.
- Assess facility of different types of waste management.
- Increase environmental awareness throughout campus.
- Identify and assess environmental risk.
- Motivates staff for optimized sustainable use of available resources.
- The long term goal of the environmental audit program is to collect baseline data of environmental parameters and resolve environmental issue before they become problem.

Objectives of Audit:

- To examine the current practices which can impact on environment such as of resource utilization, waste management etc.
- To identify and analyse significant environmental issues.
- Setup goal, vision and mission for Green practices in campus.
- Establish and implement Environmental Management in various departments.
- Continuous assessment for betterment in performance in green practices and its evaluation.
- To prepare an Environmental Statement Report on green practices followed by different departments, support services and administration building.

NAAC criteria VII Environmental Consciousness:

Institutes are playing a key role in development of human resources worldwide. Higher education institutes campus run various activities with aim to percolate the knowledge along with practical dimension among the society. Likewise different technological problems higher education institutes also try to give solution for issues related to environment. Different types of evolutionary methods are used to assess the problem concerning environment. It includes Environmental Impact Assessment (EIA), Social Impact Assessment (SIA), Carbon Footprint Mapping, Green audit etc

National Assessment and Accreditation Council (NAAC) which is a self-governing organization that declares the institutions as Grade according to the scores assigned at the time of accreditation of the institution. Green Audit has become mandatory procedure for educational institutes under Criterion of NAAC. The intention of green audit is to upgrade the environmental condition inside and around the institution. It is performed by considering environmental parameters like water and wastewater accounting, energy conservation, waste management, air, noise monitoring etc. for making the institution more eco-friendly. Students are the major strength of any academic institution. Practicing green actions in any educational institution will inculcate the good habit of caring natural resources in students. Many environmental activities like plantation and nurturing saplings and trees, Cleanliness drives, Bird watching camps, No vehicle day, Rain water harvesting, etc. will make the students good citizen of the country. Through Green Audit, higher educational institutions can ensure that they contribute towards the reduction of Global warming through Carbon Footprint reduction measures.

Benefits of Green Audit to an Educational Institute:

There are many advantages of green audit to an Educational Institute:

- It would help to protect the environment in and around the campus.
- Recognize the cost saving methods through waste minimization and energy conservation.
- Find out the prevailing and forthcoming complications
- Empower the organization to frame a better environmental performance.
- It portrays good image of institution through its clean and green campus.

Overview of Institute:

Shri Shankarprasad Agnihotri College of Engineering, Wardha was established in the year of 1985. Institute has huge area, infrastructure and been serving the mankind in the field engineering and technology.

The landscaped grounds of college are widely admired for their beauty. The most valuable investment any educational institution can make is “Nurturing Future Leaders”. With the continuous rise in expectation of essential leadership standards, the institute has torch bearers have taken a responsibility for this investment to nurture the NextGen leaders with a vision to bridge the existing skill gap. With a firm step forward to attain an academic excellence, computer labs, and industry-academia associations has been setup at the College in association with the top leaders. The College believes that its primary stakeholders are the students. All aspects of education focus on the core values of contributing to national development while fostering global competencies among students. The College admits students from all social milieus and empowers them through intensive mentoring and counselling to face the challenges of life and become responsible and sensitized citizens of the country.

Jai Mahakali Shikshan Sanstha (JMSS), established in 1985,has emerged as one of the largest groups of educational institutions in Vidarbha region. As a result of benevolence, dedication and untiring efforts of the chairman JMSS, honourable Pt. Shri Shankar Prasad Agnihotri, the group has a stupendous growth of more than twenty institutions. It includes schools for tribal and ruler children with free lodging & boarding facility and education from pre-primary to doctoral research in various disciplines.
Shri Shankarprasad Agnihotri College of Engineering, Wardha was established under Agnihorti Group of Institution. It was established in 1985 by Pandit Shri. Shankar Prasadji Agnihotri as a result of dedication and motivation of late Smt. Ranibai Agnihotri who was inspired by the father of the nation Mahatma Gandhi and Vinoba Bhave. It's now grown up with more than 20 educational units of various kinds, right from pre-primary schools to post graduate institution. Vision: To develop globally competent, efficient learner and community oriented model of Engineering education. Mission: To create value added, competent and research oriented trained Engineering professionals for sustainable development of the society.

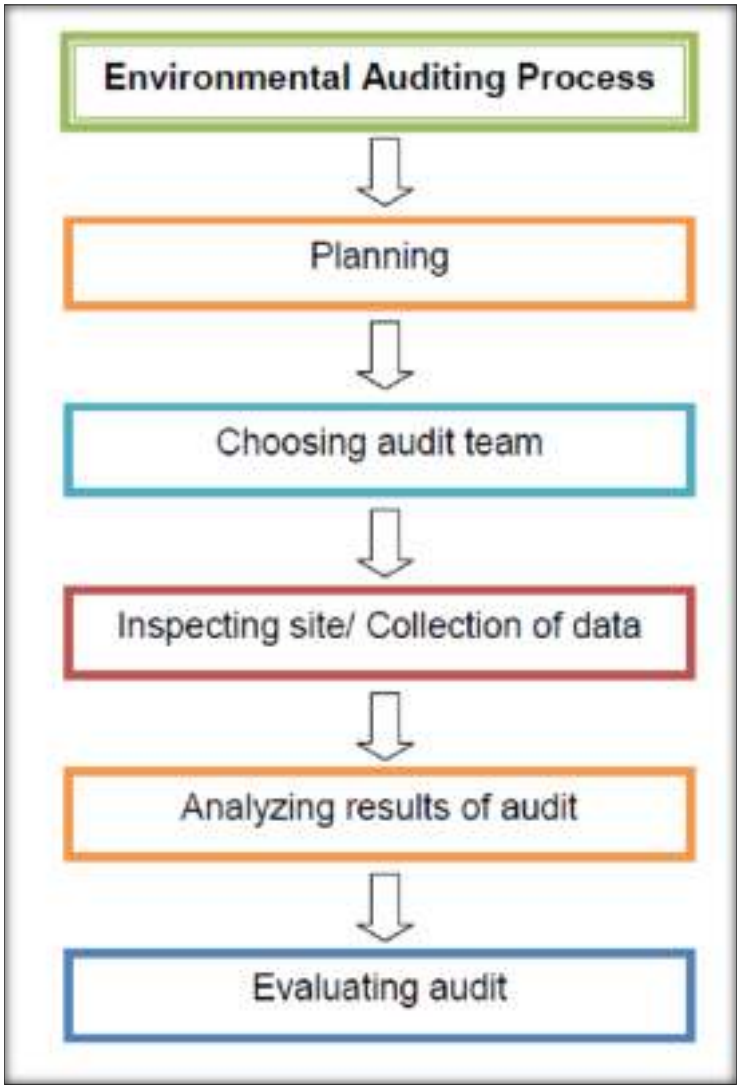
Vision of the institute:

To develop globally competent, efficient learner and community oriented model of engineering education.

Mission of the institute:

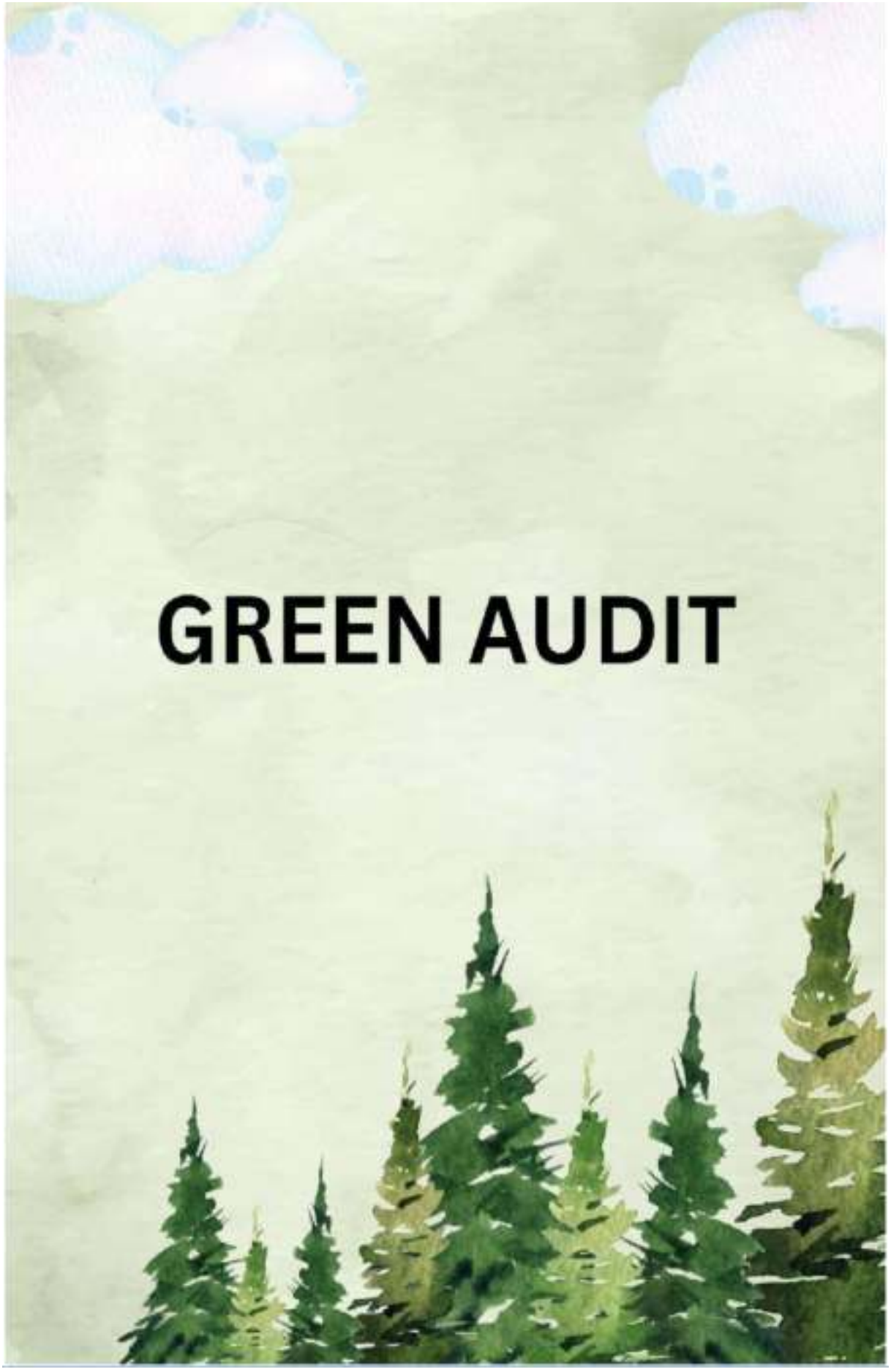
To create value added competent and research oriented trained engineering professionals for sustainable development of the society.

Methodology:



Audits to be carried out:

Green and carbon footprint audit
Energy audit
Environmental audit
Water audit
Wastewater audit


GREEN AUDIT

Green and Carbon footprint audit:

Green Audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings. Green audit can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E- waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

Carbon is the basis of life on mother Earth. It is incorporated into the plants through photosynthesis, consumed by animal species through the food, present in the form of carbon dioxide (CO_2) the atmosphere, locked into the rocks as limestone and compressed into the different fossil fuels such as coal and oil. As CO_2 level in the atmosphere continue to increase, most climate designs or project that the oceans of the world and trees will keep soaking up more than half CO_2 . The plants on land and in the sea, taken up carbon by over many years increased the percentage discharged during decay, and this increased carbon became locked away as fossil fuels beneath the surface of the planet. The starting of the 21st century brought growing concern about global warming, climate change, food security, poverty and population growth. In the 21st century more carbon has been released into the atmosphere than that has been absorbed. CO_2 is a principle component causing global warming. Atmospheric carbon dioxide levels have increased to 40 % from preindustrial levels to more than 390 parts per million CO_2. On this background it is a need of time to cover the research areas interrelated with climate change.

Green Cover at SSPACE:

SSPACE has got a huge green cover and has almost 50 species of vegetation inside the campus. The institute has huge campus and most of this is covered by green area. Institute has huge plantations along with variation in species Greenery is maintained well by the institute. .

Figure 1 SSPACE, Campus

SSPACE has taken huge efforts to develop its green cover. In the vicinity of the institute there is huge vegetation along the road side and around the campus. The below table shows different species of tress available in the campus and vicinity.

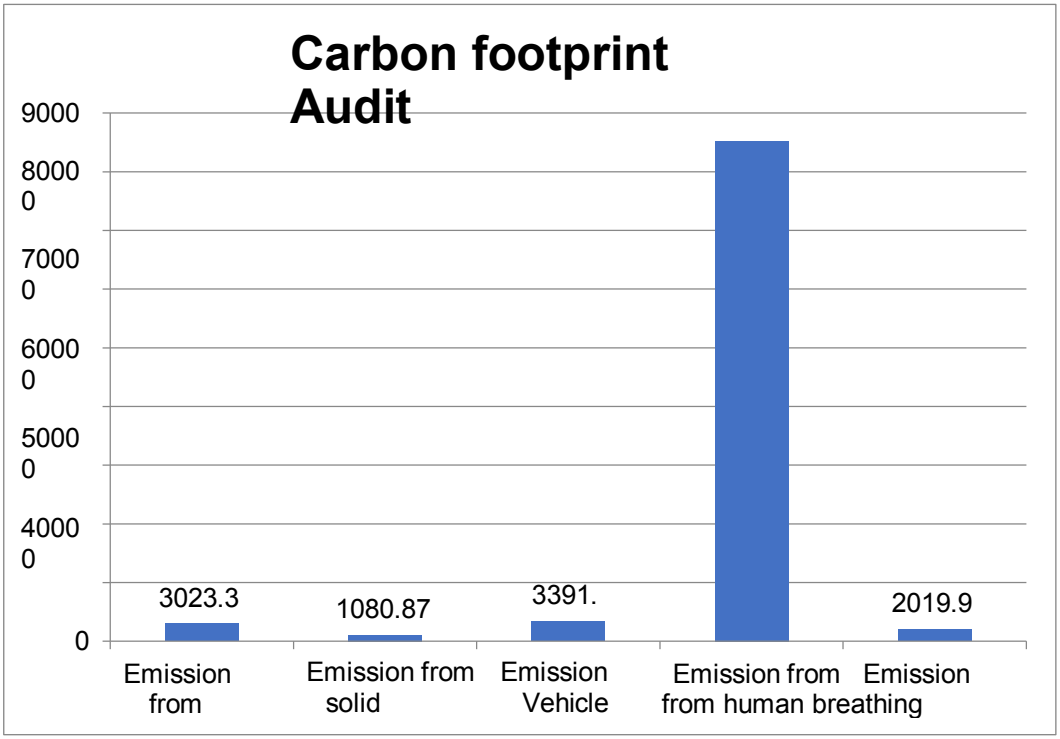
Species	Count	Species	Count
Neem	18	Thuja	38
Chapha	14	Aam	1
Pipal	3	Shiv Babul	3
Vad	1	Maringo	9
Karanji	17	Umba	2
Badam	1	Mogra	20

Mostly there are trees of Chapha, Thuja and Mogra etc. Due to this the institute has high carbon sequesterial values. Considering the vicinity some dry plants were observed to approximately about 2. Plants absorb sunlight, 50% is absorbed and 30% reflected so this helps to create a cooler and more pleasant climate through a 3°C temperature reduction in the vicinity. This has also leaded to increase in biodiversity as more than 13 species of birds were observed. Some off the common birds were viz. Sparrow, wild parrots, little stint, black kite etc.

Carbon Footprint Audit:

SSPACE has estimated its carbon footprint by factor methodology. Various factors were used to estimate the carbon emissions from Consumption of electricity, generation of solid waste, use of vehicles in campus, carbon emissions due to human breathing and emissions from buildings. At last they have also calculated Carbon sequesterial value i.e. carbon that is absorbed by the plants.

Sr. No.	Section	Emission
1	Emission from electricity	3023.34 kg CO_2 eq./year.
2	Emission from solid waste	1081 kg CO_2 eq. per year.
3	Emission from Vehicles	3391 kg CO_2 eq. per year.
4	Emission from human breathing	85.2 tons of CO_2 eq. per year.
5	Emission from buildings	2020 kg CO_2 eq. per year.
6	Carbon sequesterial	611 kg CO_2 eq. per year.



Hence as per the calculation the carbon emission for electricity is 3687 kg CO_2 eq./year. Secondly considering emissions from human breathing, the institute has total 852 students and staff. The staff's works for about averagely 6 hours a day in the institute and the students are present for 5 hours averagely daily. Vehicles emit significant amount of gases in environment and SSPACE has various parking sections in the campus. It was found that averagely 102 vehicles entered the institute daily and travel about 450 m of distance from the

gate. Cars also enter the institute and as per observation 6 cars are observed daily. Hence the overall the institute emits 3391 Kg CO_2 eq. per year.

Solid waste is very important as it emits significant amount of carbon through it. SSPACE has a good solid waste management system. Hence the institute develops about 1250 kg of waste daily in both the form of wet and dry. Hence the emission is about 1080 kg CO_2 eq. per year. Buildings play an important role in carbon contribution. During the construction operation and use phase they emit significant amount of carbon. Hence considering total built-up area the carbon emissions could be evaluated. After the estimation the total built-up area observed was approximately about 10099.95 sq. m and the carbon emission were 2019.99 kg CO_2 eq. per year. Carbon sequesterial in important as it is the carbon absorbed by the trees. SSPACE campus has 187 fully grown trees in the campus; hence the sequesterial value is about 611 kg CO_2 eq. per year.

Conclusion:

- Highest carbon emission was observed from human breathing i.e. 85.2 tons of CO_2 eq. per Year. There is no any significant mean to reduce this number as it is not controllable.
- The next is solid waste. The emission from solid waste comprises of 1080 kg CO_2 eq. per year. This can be significantly reduced by following simple means. Waste segregation is properly observed by the institute and they should follow the cut out plastic plans. There should be complete ban in using the plastic inside the campus. There should be minimization of food waste as it contributes highest in carbon emissions.
- Considering emission from electricity they can be significantly reduced by decrease in electricity use. This can be done by installing LED lights and using energy efficient equipment's such as machines with high star ratings which save more. Institute can recognize renewable energy sources and have a setup in the institute. This can lead in significant saving of electricity and reduction in carbon emissions.
- Vehicles have the least emissions in SSPACE and it is due to the easy approached parking so that vehicles do not roam in the vicinity. All the vehicles travel hardly 550 m in the campus and this has led to lower emissions. Still institute can follows "NO Vehicle Day" on every 2nd Saturday of each month.

Institute reduces about 0.611tons of CO_2 per year by the means of plants. This could be increased by increasing in plantations. SSPACE can plant more trees next to chemistry section, surrounding to play ground, front of applied science department etc.

The plants having highest Carbon sequestration values are suggested. Cinnamomum verum, Eugenia caryophyllid, Bumelia celestina, Acacia Berland Eri, Acacia Francescana, Chinaberry tree, Moringa oleífer, Carya illusoriness, Pinus Arizonian and Buddleia cordata are some of the suggested species for plantation.

SUSTAINABLE PRACTICES

SSPACE follows sustainable practices in the section of water, energy and waste management.

LED Tubes

Institute has almost 240 LED tubes present in various sections viz. classrooms, office and laboratories. The main advantages of having LED tubes are:

Long Lifespan: Compared to the lifespan of your average incandescent bulb, the lifespan of a LED light is far superior. The average incandescent bulb lasts about a thousand hours. The lifespan of an average LED light is 50,000 hours. Depending on how you use it, its life may be as long as 100,000 hours. This means that an LED light can last anywhere from six to 12 years before you need to replace it. That is 40 times longer than an incandescent bulb. As such, savings extend not only to replacement costs but also to the maintenance costs of your company's lighting bill.

Energy Efficiency: Another one of the leading LED lighting advantages is their energy-efficient operation. You can measure the energy efficiency of a lighting source in useful lumens, which describes the amount of lighting that the device emits for each unit of power, or watt, that the bulb uses. If you replaced all the lighting in your

office, school or other facility with LEDs, you could see as much as a 60% to 70% improvement in your overall energy savings. In some cases, the improvement could be as great as 90%, depending on what kind of lights you are replacing and what kind of LED lights you are using.

Improved Environmental Performance: It is becoming increasingly important for companies to become eco-friendly. Customers increasingly want environmentally friendly options and using an environmentally friendly light source can help companies reduce their energy use, as well as attract a socially conscious consumer base. The environmental benefits of LED lighting also extend to their manufacturing process. Many traditional lighting sources, like fluorescent lighting and mercury vapour lights, use mercury internally as part of their construction. Because of this, when they reach the end of their lifespans, they require special handling. You do not have to worry about any of these issues with LED lights.

No Heat or UV Emissions: LEDs emit almost no heat, and most of the light they emit is within the visible spectrum. This feature is one reason that medical experts are looking at LEDs as a possible solution for Seasonal Affective Disorder (SAD), which affects many people during the darker months of the year. It also makes LEDs ideal for illuminating works of art that will degrade or break down over time with exposure to UV rays.

Low Voltage Operation: If your business is in a location where flooding may occur, you want to be able to light your facility with devices that require as little voltage as possible. LEDs are perfect for this because they operate on very low voltage. When you use a low-voltage system in areas that may be prone to flooding, you are protecting your staff and others from potentially harmful or fatal shocks. If, during a flood clean-up, someone mistakenly touches some electrical component, a low- voltage lighting system that generates 12 volts is much safer than a line voltage system that generates 120 volts.

Open well water system

Institute has Open well in its campus and it acts as the primary source of water. The main advantage of having the open well system is that the institute reduces the load on Municipal Corporation and the supply water is throughout the year from the well.

RO Water system

The problem with drinking tap water is that it contains harmful toxins and inorganic compounds such as lead, which in excess can cause high blood pressure and kidney problems. Because of the pollution in our environment and the deterioration of natural

resources, we need a way to filter out these pollutants in our drinking water. The main reason for the RO water purification to be so much in demand is its ability to remove impurities from the water. It is able to clean around 97 percentages of bacteria, virus and other elements that can cause serious health problems. The likes of micro particles which are smaller than 10 microns can also be removed by an RO purifier.

Septic tanks

Septic tanks are secure systems for storing and subsequently disposing of faecal waste. A simple decantation and sedimentation process eliminates any solids in the wastewater, thus preventing them from contaminating the soil or freshwater sources. Institute has installed septic tanks and they offer effective pre-treatment before the water purification phase since they are inexpensive. They don't produce foul odour and prevents the appearance of pests, such as flies and mosquitoes.

Fire Extinguisher

SSPACE have installed fire extinguishers at every necessary section in the premises. These help easily as they are portable fire extinguishers and can be quickly brought to the scene of a fire.

Roof top solar panel system

Saving on bills: While regular electricity is powered through fuel across the country, it becomes an expensive ordeal, especially with rising fuel prices. Solar energy is readily available and can be harnessed as a substitute for fuel-based electricity, thus being a cheaper alternative in the long run.

Accessibility: India is a country that holds diverse communities from multiple walks of life, not all of whom have accessible sources of energy, other than petrol and diesel. Solar Energy has become an economically viable and safe option for them.

Low maintenance: Post the installation of a rooftop solar, the product itself requires negligible maintenance and, therefore, lower added costs. Rooftop Solar are known to have a long service life span.

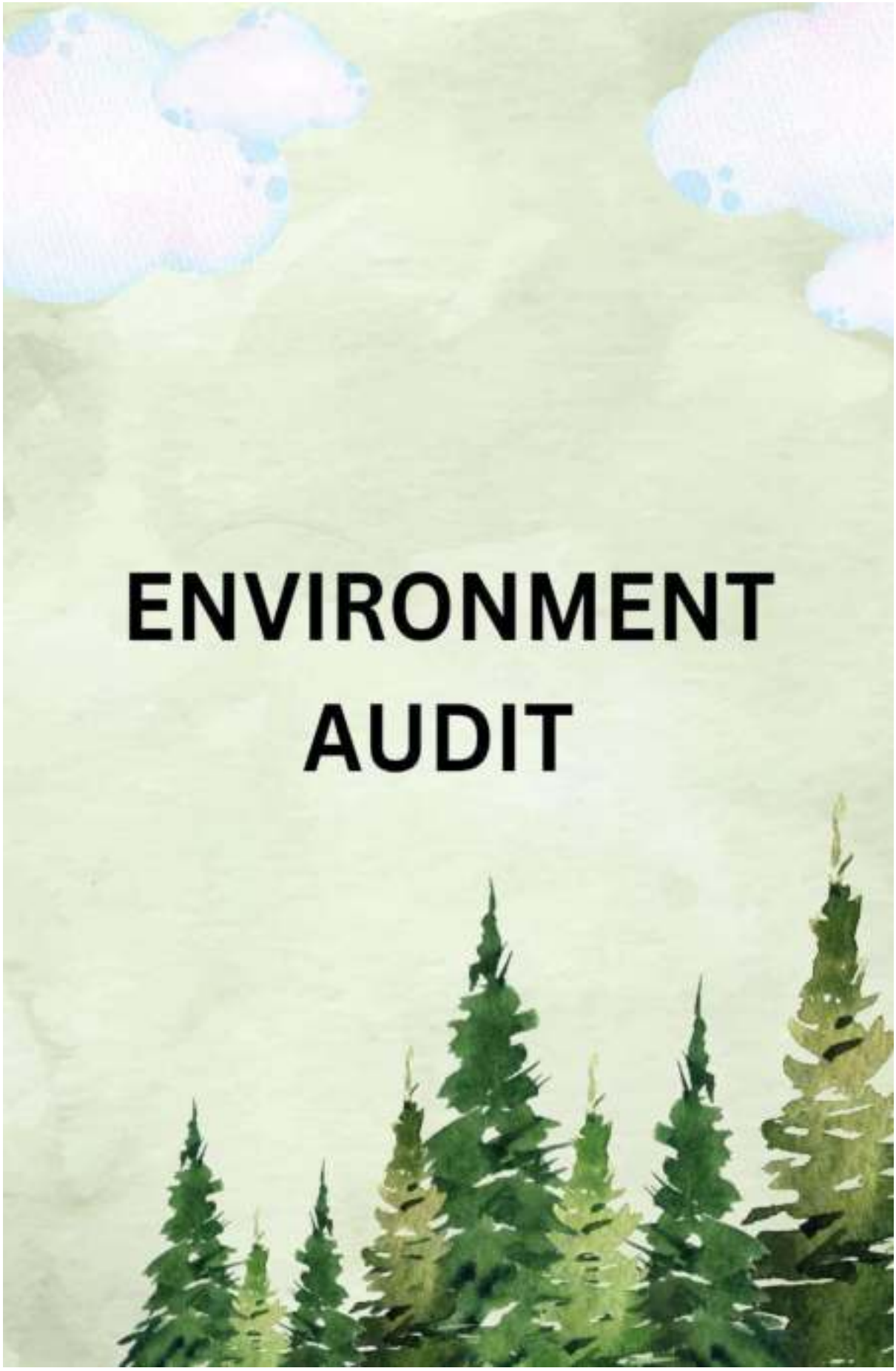
Reduced carbon footprint: Right from installation to use, rooftop solar neither emit harmful greenhouse gases nor cause health hazards, resulting in a lowered carbon footprint.

Rain water harvesting:

Rainwater harvesting is the simple process or technology used to conserve rainwater by collecting, storing, conveying and purifying of rainwater that runs off from rooftops, parks,

roads, open grounds, etc. for later use. Here, let us have a look at the diagram of rainwater harvesting system. It is beneficial for the institute as:

- Less cost.
- Helps in reducing the water bill.
- Decreases the demand for water.
- Reduces the need for imported water.
- Promotes both water and energy conservation.
- Improves the quality and quantity of groundwater.
- Does not require a filtration system for landscape irrigation.
- This technology is relatively simple, easy to install and operate.
- It reduces soil erosion, storm water runoff, flooding, and pollution of surface water with fertilizers, pesticides, metals and other sediments.
- It is an excellent source of water for landscape irrigation with no chemicals, dissolved salts and free from all minerals.


ENVIRONMENT
AUDIT

Environmental Audit:

An environmental audit is a type of evaluation intended to identify environmental compliance and management system implementation gaps, along with related corrective actions. ISO 14001 is a voluntary international standard for environmental management systems ("EMS"). ISO 14001:2004 provides the requirements for an EMS and ISO 14004 gives general EMS guidelines. An EMS meeting the requirements of ISO 14001:2004 is a management tool enabling an organization of any size or type to:

Identify and control the environmental impact of its activities, products or services;
Improve its environmental performance continually, and
Implement a systematic approach to setting environmental objectives and targets, to achieving these and to demonstrating that they have been achieved.

The audit examines the potential hazards or risks posed by the institutes. Areas examined may include environmental policies and procedures, energy use practices, recycling, waste, conservation, and pollution. Then, the institute can use the results to determine what changes need to be made for compliance. In a broad sense, environmental auditing aims to help protect the environment and minimize the risks of business activities to the environment and human safety and health.

Water Audit and wastewater audit:

Water auditing is a method of quantifying water flows and quality in systems, with a view to reducing water usage and often saving money on otherwise unnecessary water use. Water audit is an effective management tool for minimizing losses, optimizing various uses and thus enabling considerable conservation of water. Water audits trace water use from its point of entry into the facility/system to its discharge into the sewer/river/canal etc. Wastewater audit deals with effective management of wastewater in the system. It deals with proper generation, management, treatment, transfer and disposal of wastewater.
SSPACE has carried out its water and wastewater audit and has suggested many more ways for water conservation, reuse and recycle. The detail water and waste water report is mentioned below.

Water Audit report

Water audit for the “SSPACE” was carried out. The purpose of the water audit is to provide a thorough understanding of the water uses by identifying and measuring all water using fixtures, appliances, and practices in order to recommend potential water saving efficiencies.

PRIMARY DATA

Sr. No.	Title	Information
1	**Name of Institute**	Shri Shankarprasad Agnihotri College of Engineering, Wardha
2	**Address**	Wardha 442001
3	**Name of company under which water audit is carried out**	Environmental and Civil Engineering Solutions, Sangli
4	**Number of floors**	G + 3 (Variable)
5	**Category of building**	Educational Institute
6	**Nearest ESR location**	Campus
7	**Water supply hours**	NA
8	**Water meter present**	No

POPULATION DETAILS

Title	Information
Fixed population (Working staff and Students)	Gents: 491
	Ladies: 361
Variable population (Visiting persons)	Gents: 10
	Ladies: 8

SOURCE INFORMATION

Title	Information
Sources of water	Open well
Connection details	1” PVC pipe inlet and 1” outlet distribution pipe

STORAGE DETAILS

Title	Information
Overhead tank type	RCC tank
Location	On terrace
Number of tanks	2 X 10,000 lit RCC | 1 X 21,000 lit RCC 1 X 22,000 lit RCC | 1 X 40,000 lit RCC
Motor connection details	5 Hp for Building 1 3 Hp for Building 2
Pumping period	4 hours daily
Underground sump	Yes
Capacity of underground sump	40,000 Lit RCC

WATER USAGE

Toilet	Number of users	Water consumption
Gents toilet	491 users	491 X 15 lit = 7365
Washbasin	852 users	852 X 0.75 lit = 639
Ladies toilet	361 users	361 X 18 lit = 6498
Toilet cleaning	800 liters	800 liters
Floor cleaning	1700 liters	1700 liters
Gardening	3500 liters	3500 liters
Laboratories	3000 liters	3000 liters
Total		**23,502 lit**

SCHEDULE OF TOILETS AND WASHROOMS:

Number of Students and staff toilets in each floor for Building 1 and 2

Sr. No.	Toilet	Boys	Girls	Staff
1	**Ground floor**	2	0	5
2	**First floor**	1	2	0
3	**Second floor**	2	1	0
4	**Third floor**	1	2	0

WATER USED FOR DRINKING

There are coolers cum water purifiers present in the institute. Sample assessment for 3 months was done and average values are presented below for each section.

Potable water assessment:

Open well assessment

Sr. No.	Test	Results	Limit
1	pH	**7.6**	6.5-8.5
2	TDS	**1248**	-
3	E.C	**2689**	-
4	Hardness	**185**	200
5	Chlorides	**122**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

RO No 1 Building 1

Sr. No.	Test	Results	Limit
1	pH	**6.5-7.2**	6.5-8.5
2	TDS	**102**	-
3	E.C	**91**	-
4	Hardness	**120**	200
5	Chlorides	**118**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

RO No 2 Building 1

Sr. No.	Test	Results	Limit
1	pH	**6.6-7.2**	6.5-8.5
2	TDS	**112**	-
3	E.C	**99**	-
4	Hardness	**118**	200
5	Chlorides	**122**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

RO No 1 Building 2

Sr. No.	Test	Results	Limit
1	pH	**6.8-7.1**	6.5-8.5
2	TDS	**108**	-
3	E.C	**101**	-
4	Hardness	**128**	200
5	Chlorides	**105**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

RO No 1 Building 2

Sr. No.	Test	Results	Limit
1	pH	**6.8-7.6**	6.5-8.5
2	TDS	**109**	-
3	E.C	**125**	-
4	Hardness	**144**	200
5	Chlorides	**125**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

Testing specifications:

Test	ISO Code
pH	ISO 3025:11 (1993)
TDS	ISO 3025: 16 (1984)
E.C	ISO 3025: 14 (1984)
Total Hardness	ISO 1055: 12 (2012)
Chloride	ISO 3025: 40 (1991)
MPN	ISO 9308: 2 (2012)

Water Consumption in Hostel sections

Institute has hostels present for both Boys and girls. Following table shows the water cosnumption

Sr. No.	Section	Count	Demand	Water usage
1	**Boys Hostel**	106	135 LPCD	14,310
2	**Girls Hostel**	67	135 LPCD	9,045

Waste water audit

SSPACE campus generates huge amount of wastewater. The source for wastewater in the campus is hostels, institute, mess and the washrooms and urinals inside the campus. To estimate the amount of wastewater generated all the water that is used in the washrooms and hostels is considered as wastewater.

Sr. No.	Section	Wastewater generated in litres
1	Water usage generated in campus	**23,502.25**
2	Water usage in hostel section	**23,355.29**
Waste water generated		**35,142.75**

Waste water treatment plant at SSPACE:

Currently SSPACE lets all it waste water into sewers. Currently there is no any waste treatment facility. Sampling of waste water was done for 3 months for the parameters of COD, BOD, TKN and pH. Following table shows the characterization of wastewater.

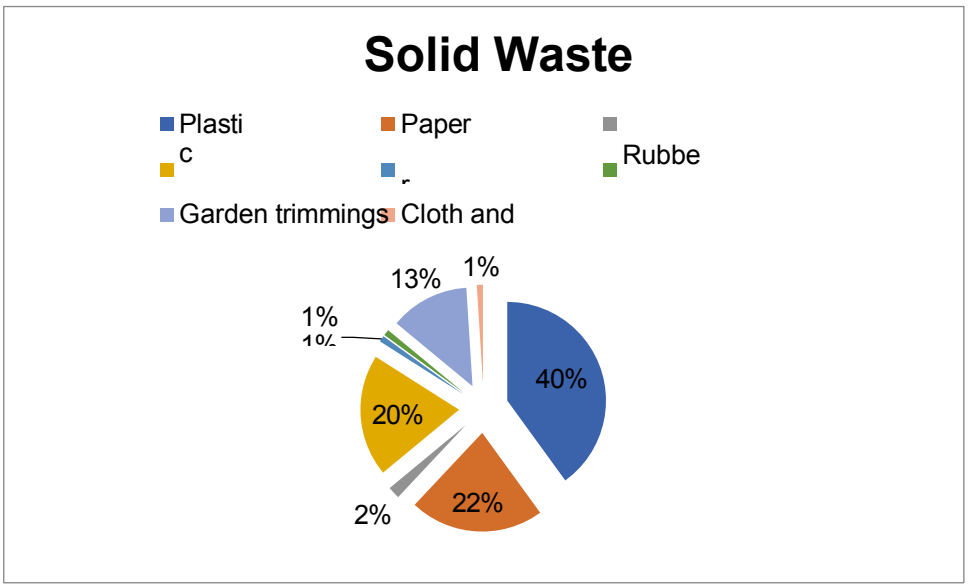
Sr. No.	Parameter	Reading
1	pH	7.10
2	COD	2108
3	BOD	117
4	TKN	22

Solid waste Audit

A waste audit is a physical analysis of waste composition to provide a detailed understanding of problems, identify potential opportunities, and give you a detailed analysis of your waste composition. A waste audit will help you clearly identify your waste generation to establish baseline or benchmark data, Characterize and quantify waste stream, Verify waste pathways, identify waste diversion opportunities and identify source reduction opportunities.

Solid waste is the unwanted or useless solid material generated from the human activities in residential, industrial or commercial area. Solid waste management reduce or eliminates the adverse impact on the environment and human health. Solid waste audit for SSPACE was carried out. The entire premise was analysed for solid waste generation and waste characterization. Overall waste was observed and characterization was done. The below table shows the components of solid waste at SSPACE campus. Quartering method was used and 1 Kg of waste was selected.

Sr. No.	Type of waste	Composition %
1	Plastic	40
2	Paper	22
3	Rubber	2
4	Food	20
5	Glass	1
6	Metals	1
7	Garden trimmings	13
8	Cloth and fibre	1



After analysing all the bins it was observed that plastic had highest contribution viz. 40% followed by the paper waste i.e. 22%. Mostly common observed plastic items were plastic wrappers of chips, soft drinks bottles and chocolate wrappers. The paper waste included paper wrappers, notebook pages, pamphlets and some pieces of cardboard. The third highest waste included garden trimmings. It included small grass, minute branches etc. The least contribution was of cloth, fibre, glass and metals.

Observations and Conclusion:

There are separate bins for wet waste and dry waste. Hence, source segregation takes place.

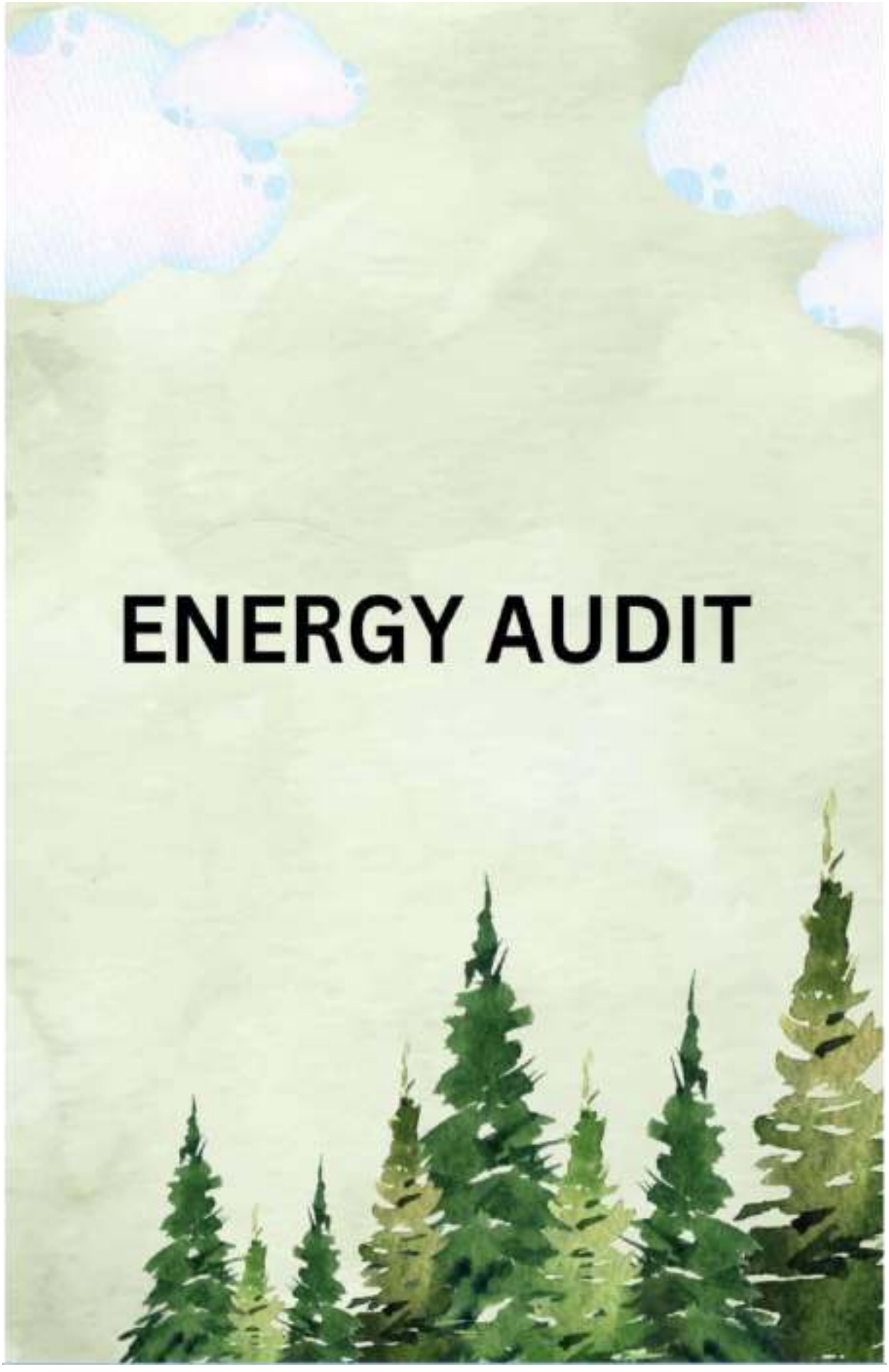
Institute has taken steps towards paper recycling. The paper waste collected from the bins is send to vendors.

Plastic ban in campus is implemented but due to lack of seriousness in the students plastic is used in campus. Institute should conduct plastic awareness seminars for both the staff and students.

Assessment of soil was done to determine the quality of soil:

Sr. No.	Test	Results
1	pH	**6.1**
2	NPK	**2:3:1**
3	Acidity	**130 mg/lit**
4	Hardness	**161 mg/lit**


DUSTBIN
DUSTBIN
DUSTBIN
USE ME
USE ME
USE ME


ENERGY AUDIT

Energy Audit

An energy audit is an inspection survey and an analysis of energy flows for energy conservation in a building. It may include a process or system to reduce the amount of energy input into the system without negatively affecting the output. In commercial and industrial real estate, an energy audit is the first step in identifying opportunities to reduce energy expense and carbon footprint.

A nation is tiring to advance in quantity and quality to the spread of education among the common India and development of their intelligence. In India the entire field of education and other fields of intelligent activities had been monopolized by a handful of men before independence. But today we are marching towards the desirable status of a developed nation with fast strides. But the development should be a sustained one. For achieving such an interminable development energy management is essential. As far as concerning electricity crisis, we are facing lack of electricity during office work. So, institutional management is taking design regarding production of electricity and saving electricity for Eco social aspect. Energy requirement of India is growing and incomplete domestic fossil fuel treasury. The country has motivated strategy to enlarge its renewable energy resources and policy to establish the nuclear power plants. India increases the involvement of nuclear power to largely electrical energy development facility from 4.2% to 9%. India's industrial demand accounted for 35% of electrical power requirement, domestic household use accounted for 28%, agriculture 21%, commercial 9%, and public lighting and other miscellaneous applications accounted for the rest. Energy conservation means reduction in energy consumption without making any sacrifice of quantity or quality. A successful energy management program begins with energy conservation; it will lead to adequate rating of equipment's, using high efficiency equipment and change of habits which causes enormous wastages of energy. By observing all these study lack of electricity and huge electricity demands. It is necessary to plan to be self-sufficient in electricity requirement.

Connection details:

Institute receives electricity from MSEB i.e. Maharashtra State Electricity Distribution Co. Ltd. Following are the details about connection.

Type of connection: HT (High tensioned)

Tariff: 146 HT-VII B

Contract demand: 200 KVA
Feeder voltage: 11 KW
Type: 3 Phase

Tariff Structure:

As per Distribution Company, HT and LT consumers have an option to take Time of Day (TOD) tariff instead of the normal tariff. Under TOD tariff electricity consumption and maximum demand in respect of HT consumers for different periods of the day i.e. normal period, peak load period and off-peak load period could be recorded by installing TOD meter. The maximum demand and consumption recorded in different periods could be billed on the following rates of the tariff applicable.

TOD Tariffs	Rate % (Rs./Unit)
0000 Hrs- 0600 Hrs & 2200 Hrs- 2400 Hrs	-1.500
0600 Hrs- 0900 Hrs & 1200 Hrs- 1800 Hrs	0.000
0900 Hrs- 1200 Hrs	0.800
1800 Hrs- 2200 Hrs	1.100

Power Factor:

Power Factor (PF) is an indicator of efficient utilization of power. In an AC (Alternating Current) electrical power system, PF is defined as the ratio of real power flowing to the load, to the apparent power in the circuit and is a dimensionless number.

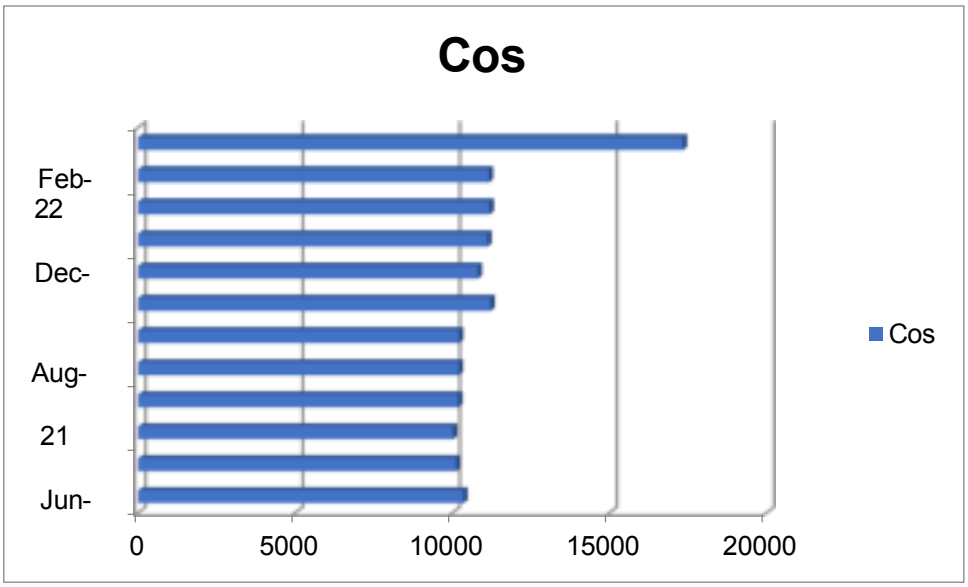
Bill analysis:

Bill analysis for SSPACE had been done for academic year 2021-2022.

Sr. No.	Month	Consumption (Kw)	Bill Amount
1	Apr-21	2947	103548
2	May-21	2888	101258
3	Jun-21	2856	100258
4	Jul-21	2985	101889
5	Aug-21	2965	102058
6	Sep-21	2974	102168
7	Oct-21	3729	112165
8	Nov-21	3421	108095
9	Dec-21	3648	111190
10	Jan-22	3701	111837
11	Feb-22	3682	111659
12	Mar-22	8457	173390

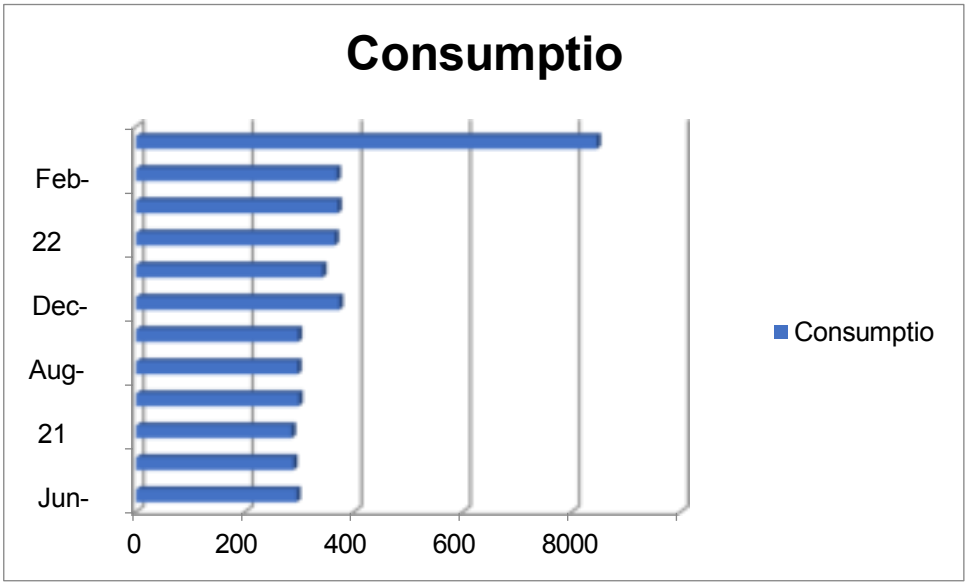
Cost Analaysis:

After analysisng the bill the average cost expenditure of the institute on energy is about 111626.3 Rs

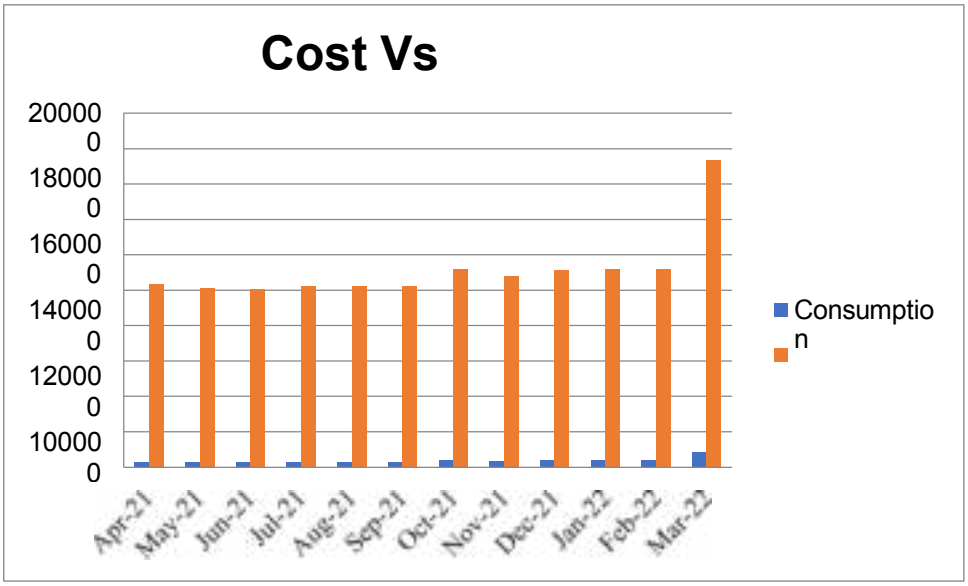


Consumption analysis:

After analysisng the bill the average energy consumption of the institute is about 3686.75 Units



Cost VS Consumption:



ILER analysis:

Lighting is provided in industries, commercial buildings, indoor and outdoor for providing comfortable working environment. The primary objective is to provide the required lighting effect for the lowest installed load i.e. highest lighting at lowest power consumption. The purpose of performance test is to calculate the installed efficacy in terms of lux/watt/m²

(existing or design) for general lighting installation. The calculated value can be compared with the norms for specific types of interior installations for assessing improvement options.

Range	Condition
0.5 or less	Urgent activity required (UAR)
0.51 - 0.70	Review Suggested (RS)
0.70- above	Good

ILER analysis for various sections in SSPACE were carried out. Firstly using LUX meter illumination was measured and then numerical analysis was carried out. ILER gives idea about lighting conditions and measured regarding improving them.

Main Building analysis

Sr. No.	Section	LUX reading	ILER	Condition
1	Library	158	0.72	Good
2	Study room	131	0.76	Good
3	Classroom B1	129	0.70	Good
4	Classrooms B2	111	0.70	Good
5	Laboratories	131	0.84	Good
6	Office	117	0.74	Good

Reasons for Good ILER:

Proper placement of windows and doors so that natural light is available well.
Good ventilation system.

Details of light fittings:

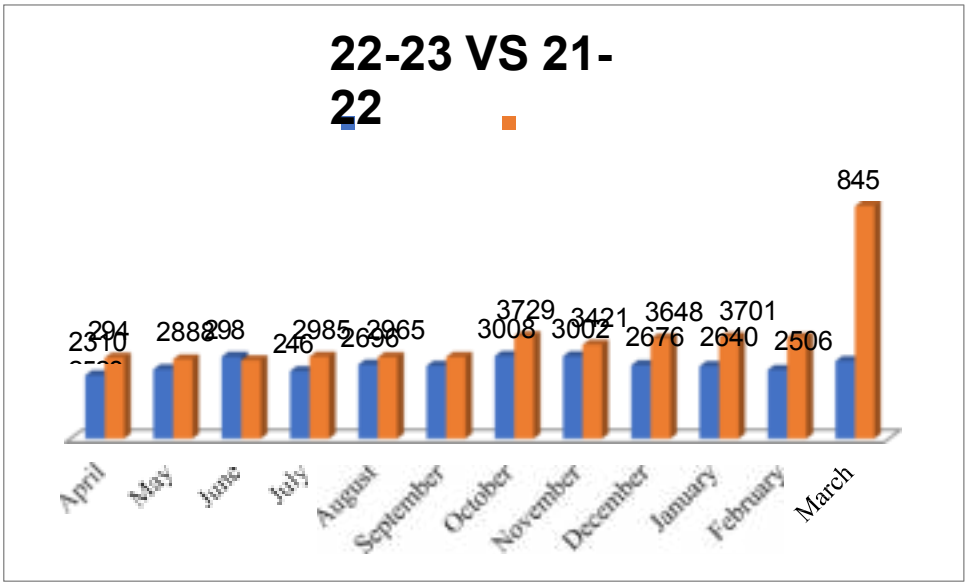
Below table shows the main fitting details in the institute building.

Energy	Count
LED	238
Fans	211
PC	300
Printer	7

Comparison of Electricity Consumption

This section presents comparison of electricity consumption. Comparison of 2021-2022 electricity consumption is done with 2020-2021 electricity data.

Month	Consumption (Kw)	Month	Consumption (Kw
Apr-20	2310	**Apr-21**	2947
May-20	2528	**May-21**	2888
Jun-20	2988	**Jun-21**	2856
Jul-20	2460	**Jul-21**	2985
Aug-20	2696	**Aug-21**	2965
Sep-20	2650	**Sep-21**	2974
Oct-20	3008	**Oct-21**	3729
Nov-20	3002	**Nov-21**	3421
Dec-20	2676	**Dec-21**	3648
Jan-21	2640	**Jan-22**	3701
Feb-21	2506	**Feb-22**	3682
Mar-21	2828	**Mar-22**	8457



Considering the consumption background the average consumption in the year 2021-2022 is 3687 units and consumption in the yare 2020-2021 is 2691 units. Comparing both the consumption in 2021-2022 has increased by 996 units.

Schedule of Lab equipments Physics lab

EQUIPMENTS		Count
1	Transistor in CB Configuration	1
2	Half and Full wave Bridge rectifier with and without filters	1
3	Zener Diode as a shunt voltage regulator	1
4	LDR Characteristics	1
5	Energy Band Gap of semiconductor material using reverse biased PN junction	1
6	To study characteristics of semiconducting diode	1
7	Characteristics of LED Kit	1
8	Resistivity by four probe method	1
9	Study of Hall Effect	1
10	e/m by Thomson method	1
11	Determination of wavelength of spectral line using diffraction grating spectrometer, sodium light system	1
12	Interference of light in the thin film (Newton's Ring Dia)	1
13	Study of Photocell and determination of Planks Constant	1
14	Combine unit / kit for divergence of LASER beam and grating element of a diffraction grating using Laser Beam	1
15	CRO	1
16	Function Generator	1
17	Spirit Level	3
18	Diffraction Grating	2
19	Spectrometer Prism ED 135x25	1

20	Zener Diode characteristics kit	1
21	Ammeter D.C, 0-50 mA	2
22	Ammeter D.C, 0-30 mA	2
23	Ammeter D.C, 0-10 mA	2
24	Voltmeter D.C.0-10 V	2
25	Voltmeter D.C.0-30 V	2
26	Voltmeter D.C.0-50 V	2
27	Prism simple	1
28	Soldering Iron 25W	1
29	Soldering wire	1
30	Soldering Paste	1
31	Screw driver set 812	1
32	Screw driver set 824	1
33	Screw driver set 936	1
34	Multimeter Analog Toyatone	1
35	Sodium Vapour Lamp 35 W	1
36	Mercury Lamp with wooden box and Transformer	1
37	Transistor Characteristics in CE Mode Model : SA-111	2
38	Transistor Characteristics in CB Mode Model : SA-112	1
39	Plano convex Lens	4
40	Semiconductor Diode Characteristics Kit Model : SA-101	2
41	Banana pins 2mm	20
42	Digital Multimeter 3 ¾ Auto ranging DMM with capacitor frequency measurement Make : Meco model : 801	8

43	Magnifier lens with light	2
44	Transistor Characteristics in CB configuration ASICO Kit	2
45	Transistor Characteristics in CE configuration ASICO Kit	2
46	Zener Diode char. Kit ASICO	2
47	PN Junction Diode kit ASICO	2
48	Diffraction Grating	2
49	Half wave Full wave Refractor kit	2
50	Digital Multimeter (inter model)	2
51	Forbidden Energy Gap kit	2
52	CB, CE and CC configuration kit	2
53	Half wave Full wave Rectifier kit	2
54	20 MHz Dual Trace CRO with probe Model :ST-201 Scientech	3
55	Function Generator Model: ST-4060 Scientech	2
56	Spectrometer	1
57	Quartz Prism for double refraction	1
58	Optical Bench 1 meter	1
59	Studty of Hall Effect	1
60	Ditital Multimeter	2
61	Table Lamp	2
62	Zener Diode kit	1
63	PN Junctioin kit	1
64	Zener Diode kit	1
65	PN Junctioin kit	1

66	e/m by Thomson method Complete setup	1
67	e/m by Thomson method Complete setup	1
68	Resistivity of Semiconductor by Four Probe Method	1
69	Sodium Lamp Assembly	1
70	Travelling Microscope	1
71	Diffraction Grating	1
72	Reading Lens	3
73	Spirit Level	1
74	Eye piece	4

Chemistry Lab

EQUIPMENTS		**Count**
1	Pensky Marten Close cup Flash Point App M. No. 1013A	3
2	Red Wood Viscometer No. 1 M. No. 1022C	2
3	Red Wood Viscometer No. 2 M. No. 1024C	2
4	PH Meter with Electrode M. No. 112	1
5	Photo Electric Calorimeter M. No. 312	1
6	Digital PH Meter Make EI Model No. 111	9
7	Weighing M/c Balance Digital Cap. 300 gm Make ELDER	2
8	Ph Meter Digital EI M No. 111	2
9	Digital Conductivity Meter Make EI M No. 611	1
10	Digital Photo Calorimeter Make EI M No. 312	1
11	Red Wood Viscometer No. 1 Model No.1022 A	2
12	Red Wood Viscometer No. 2 Model No. 1024 A	2

13	Pensky Marte Close cup Flash Point Apparatus M. No.1017	2
14	Abel Close cup Flash Point App. Model No. 1003 A	2
15	Water Still Cap. 4 Lit S.S. Distillation Assembly	2
16	Hot Air Oven with Digital Indicator 18"x18" 18" Hicon	1
17	Muffle Furnace (Digital) 1100 C 4x4x9 (Hicon)	1
18	Stop Clock Esel	40
19	Spring Balance Cap. 5 kg	1
20	Spring Balance With Cap. 2kg Barum	1
21	Spring Balance Cap. 5 kg	1
22	Digital pH Meter (EI) M. No. 111	5
23	Digital Conductivity Meter (EI) M.No. 611	1
24	Digital Photoelectric Calorimeter (EI) , M.No. 312	1
25	Heating Mantle Cap 2 Lit	2
26	Redwood Viscometer No.1	5
27	Redwood Viscometer No.2	9
28	Abel Close cup Flash Point Appratus	1
29	Penskey Marten Close cup Flash Point Apparatus	8
30	Claveland Open cup Flash point Apparatus	1
31	Redwood Viscometer No.1	5
32	Claveland Open cup Flash point Apparatus	2
33	Penskey Marten close cup Flash Point Apparatus	2
34	Weighiong M/c Digital Balance 10g to 300g (Aiwa)	1
35	Stop Clock Easel	30
36	Mechanical Stirrer	2

37	Digital Gloss 45 Deg Angle Head (Model No. RSPT-20)	1
38	Heating Mantle Cap. 2 Lit	4
39	Mechanical Stirrer Mount All Purpose/ REMI :RMQ 122/R	4
40	Heating Mantle Cap 2 Lit	1
41	Heating Mental 2000ml	1
42	Heating Mantal 2000 ml	6
43	Abel Flash Point Appratus with regulator	2
44	Heating Mantle Cap 2 Lit	6
45	Weighing M/c Digital Balance Cap. 1Kg (K-Roy)	1

Electronics Devices and Circuit Lab

EQUIPMENTS		**Count**
1	Collpit Oscillator Trainer	1
2	Emitter Follower Trainer	1
3	Two stage RC Coupled Amplifier Trainer	1
4	DC Regulated power supply 0-25V	1
5	DC Regulated power supply 0-15V	1
6	Half wave & Full wave rectifier with filter	1
7	Characteristics of PN Junction Diode	1
8	Characteristics of Zener Diode	1
9	Voltage Doubler Trainer (Voltage Regulator zener diode)	1
10	Characteristics of BJT in CE Mode	1
11	Characteristics of FET	1
12	Voltage Doubler Trainer	1

13	CRO Systronics Model 6020	2

Mechanical Measurement Lab

EQUIPMENT		**Count**
1	Basic Strain Gauge Apparatus	1
2	Measurement of force and weight using Load Cell	1
3	LVDT Instrument	1
4	Speed Measurement by using Inductive Pick up	1
5	Temperature Control using Thermocouple	1
6	Rotameter Test Rig	1
7	Stroboscope	1

Concrete technology Lab

EQUIPMENTS		**Count**
	Cube mould 15 cm	
1	i) 7.5 kg to 8 kg weight	1
2	ii) 9.0 kg to 9.5 kg weight	1
3	iii) 11 kg to 11.5 kg weight	1
4	Slump Test Apparatus	1
5	Tamping Rod	1
6	Cube Mould 7.06 cm	3
7	Fine Sieve 20 cm dia 4.75 mm	1
8	Compaction Factor Apparatus	1
9	LE CHATELIER MOULD (Set of Six)	1
	Enamel Tray	

10	i) 10”x12”	1
11	ii) 18”x12”	1
12	iii) 18”x24”	1
13	Gauging Trowel	2
14	Proving Ring 10 KN	1
15	Proving Ring 25 KN	1
16	Vicat Needle Apparatus	1
17	Beam Mould 150x150x700 mm	3
18	Spring Balance Dial Type 15 cm dia Cap. 50 Kg	2
19	Flow Table Hand Operated	1
20	VEE BEE Consistometer	1
21	Sieve Shaker Gyratory 20 cm	1
22	Hot Air Oven 24”x24”x24” S.S. 3 Tray	1
23	Compression Testing Machine 1000KN (100 Tonne)	1
24	Tiles Abrasion Testing Machine	1
25	Ultrasonic Pulse Velocity Tester	1

Heat Transfer lab

EQUIPMENTS		**Count**
1	Heat Transfer in Force Convection	1
2	Heat Transfer in Natural Convection	1
3	Dropwise & Filmwise condensation App.	1
4	Thermal Conductivity of Insulating Powder	1
5	Parallel Flow/Counter Flow Heat Exchanger	1

6	Stefen Boltzman Apparatus	1
7	Thermal Conductivity of Metal Bar	1

TOM lab

EQUIPMENTS		**Count**
1	Best Indian JPTI Make CAM Analysis Apparatus	1
2	Best Indian JPTI Make Whirling of Shaft App.	1
3	Best Indian JPTI Make Motorised Gyroscope	1
4	Best Indian JPTI Make Universal Vibration App.	1
5	Best Indian JPTI Make Governor Apparatus	1
6	Static and dynamic Balancing App.	1
7	Torsion Testing Machine	1

Digital Circuit lab

EQUIPMENTS		**Count**
1	Basic Logic Gates Trainer	1
2	Demorgan's Theorem Trainer	1
3	R-S Flip flop Trainer	1
4	Demultiplexer trainer kit	1
5	Modulo N Counter	1
6	Half/Full Adder	1
7	Half/Full Subtractor	1
8	TTL Clock Generator	1
9	CRO Systronic 6020	1

10	Trainer Kit for Universal gates by using NOR and NAND Gates Model : SB-312	2
11	Demorgan's Theorem Trainer Model : SB-311	2
12	Half/Full Adder SF : 305	2
13	Half/Full Subtractor SF : 306	2
14	Basic Logic Gates Trainer Kit AET-21 By Aquila	2
15	8:1 Multiplexer Trainer Kit AET 31M By Aquila	2
16	De-Multiplexer Trainer Kit AET 31D BY Aquila	2
17	Flip-Flop Trainer kit AET-60 By Aquila	2
18	Trainer kit of Synchronous counter by Aquilla Model AET 32A	2
19	Trainer kit of Asynchronous counter by Aquilla Model AET 32	2

TV lab

EQUIPMENT		**Counts**
1	Colour TV Trainer (51cm) by Anshuman Model: XPO-COL TV	3
2	Black & White TV Trainer with 14" CRT By Mars Edpal Model: ME 1200	1
3	Antenna Trainer with 10 Antennas (50 to 860 MHz)	1
4	Colour Patttern Genertor By Signet Model: Signet 1053 Mltichannel with colour VHF-UHF Ch.2 to Ch.12 VHF, 1 KHz FM Demodulation Attenuator 20 dB	2
5	Colour Pattern Generator by Saral (Markoni)	2
6	VCR Trainer Depmstratpr by Mars Edpal Model : ME 1215	1

Microprocessor lab

EQUIPMENTS		Count
1	8085 Microprocessor Kit with 16*2 LCD Display Model XPO Kit	5
2	8086 Microprocessor Kit with 16*2 LCD Display Model XPO Kit	5
3	SMPS For Microprocessor 8085 Kit	10
4	101 Keyboard	10
5	RS 232 Serial Link /cable & PC up/down Loading Software & Cross assembler on CD	10
6	8085 Microprocessor Kit with 16*2 LCD Display Model XPO Kit	5
7	8086 Microprocessor Kit with 16*2 LCD Display Model XPO Kit	5
8	SMPS For Microprocessor 8085 Kit	10
9	101 Keyboard	10
10	RS 232 Serial Link /cable & PC up/down Loading Software & Cross assembler on CD	10
11	8051 Microcontroller Kit	1

RAC lab

EQUIPMENT		Count
1	Computerised Variable Compression Ratio Petrol Engine	1
2	Air Conditioner Trainer Duct Type	1
3	Digital Anemometer	1
4	5 Gas Analyser	1
5	24 Column Matrix Printer	1
6	Rolling Charts	38

Production technology lab

EQUIPMENT		Count
1	Floating Carriage Diameter Measuring Machine Model EDM-75	1
2	Sodium Vapour Monochromatic light unit	1
3	Specimen Set: include 4 Test surface of dia 50 mm, Optical flat 01 No. Steel flat 01 No.	1
4	Optical flat 25 mm	1
5	Optical flat 30 mm	1
6	Optical flat 50 mm	1
7	Dial Indicator Range 1mm L.C. 0.001mm	1
8	Straight Edge size 300x50x8	1
9	Straight Edge Size450x50x8	1
10	Tool Maker Microscope Model TM -50	1
11	Venire Height Gauge 12 inch	1
12	Sine Bar 100 mm	2
13	Slip Gauge set	1
14	Dial Gauge Stand	1
15	Digital Micrometre For Floating Carriage	1

Metallurgy lab

EQUIPMENT		Count
1	Impact Testing Machine for Izod & Chirpy Test	1
2	Rockwell Hardness Testing M/c	1
3	Metal Sample Box	1

4	Inclined monocular metallurgical microscope Model n56	1
5	Binocular metallurgical microscope model 57	1
6	Metallurgical Image Analyser	1
7	specimen	1 set

Fluid power lab

EQUIPMENT		**Count**
1	Centrifugal Pump Test Rig	1
2	Reynolds Apparatus	1
3	Verification of Bernoulli's Theorem	1
4	Equipment List	1
5	Rota meter Test Rig	1
6	Flow Measured by Venturimeter & Orifice meter	1

Structural analysis lab

EQUIPMENT		**Count**
1	Behaviour of Column and Truss App.	1
2	Hinged Arches	1
3	Verification of Maxwell Reciprocal Theorem	1
4	Deflection of Truss App.	1

Transportation lab

EQUIPMENT		**Count**
1	Penskey Morten Flash Point App.	1
2	Flakiness Gauge	1
3	Length Gauge	1

4	Standard Penetrometer	1
5	Ring & Ball App.	1
6	Coarse Sieve 45 cm Dia GI	14
7	Ductility Testing Machine Model EIE 040	1
8	Specific Gravity and Water Absor. Test App.	1
9	Aggregate Crushing Value App. 15 CM	1
10	C.B.R. Testing Machine	1
11	Aggregate Impact Testing Machine	1
12	Electronic Balance 10 KG /1GM	1
13	Los Angeles Abrasion Testing Machine	1

Fluid mechanics lab

EQUIPMENT		**Count**
1	Bernoullis Theorem App.	1
2	Impact of Jet App.	1
3	Orifice and Mouthpiece App.	1
4	Reynolds App.	1
5	Metacentric Height App	1
6	Notch Apparatus	1
7	Pitot Tube apparatus	1

Survey lab

EQUIPMENT		Count
1	Levelling Staff 4 mtr (compact)	3
2	Transit Vernier Theodolite	1
3	Measuring chain 30 Mtr 150 Link	3
4	Measuring chain 20 Mtr 100 Link	3
5	Ranging Rod 3 Mtr	5
6	Prismatic Compass	1
7	Surveyers Compass	1
8	Dumpy Level with Stand	3
9	Plane Table	2
10	Measuring Tape Steel 30 Mtr	3
11	Trough Compass	2

Soil lab

EQUIPMENT		Count
1	Liquid Limit Device, Hand operated	1
2	Test Sieves 20 cm dia brass frame size 425 micron	1
3	Plastic limit kit	1
4	Shrinkage Limit Apparatus	1
5	Pycnometer Brass Cone, Metal Ring & Rubber seal	1
6	Particle size determination IS Test sieve 20 cm dia brass frame without any joint 4.75 mm to 150 micron	1
7	Sieve 75 micron	1
8	Lid and Receiver for above	1

9	Permeability Apparatus	1
10	Overhead tank for above made of GI sheet	1
11	Apparatus for soil determination Core cutter with Dolly & Rammer	1
12	Sand Pouring Cylinder Large	1
13	Stop Watch (Mechanical)	5
14	Glass Thermometer 0-200 Degree	1
15	Glass Thermometer 0-50 Degree	1
16	Glass Thermometer 0-110 Degree	1
17	Moisture Cane 50x50MM	4
18	Measuring Cylinder (Glass) 100 ML	2
19	Measuring Cylinder (Glass) 250 ML	2
20	Measuring Cylinder (Glass) 500 ML	2
21	Measuring Cylinder (Glass) 1000 ML	2
22	Measuring Cylinder (Plastic) 50 ML	2
23	Measuring Cylinder (Plastic) 100 ML	2
24	Measuring Cylinder (Plastic) 250 ML	2
25	Measuring Cylinder (Plastic) 500 ML	2
26	Measuring Cylinder (Plastic) 1000 ML	2
27	Evaporating Dish 150 mm dia Porcelain	2
28	Evaporating Dish 100 mm dia Porcelain	2
29	Specific Gravity Bottle 25 ml	1
30	Specific Gravity Bottle 50 ml	1
31	Specific Gravity Bottle 100 ml	1

32	G.I. Tray 18”x24”x2” with Handles	1
33	Moisture Cane 75x50MM	4
34	Glass Rod 20 cm Long x 6 mm dia	2
35	Electronic Balance 500 gm./10mg	1
36	Electronic Balance 50 kg/1g	1
37	Proctor Needle Hydraulic Type	1

Environmental engineering lab

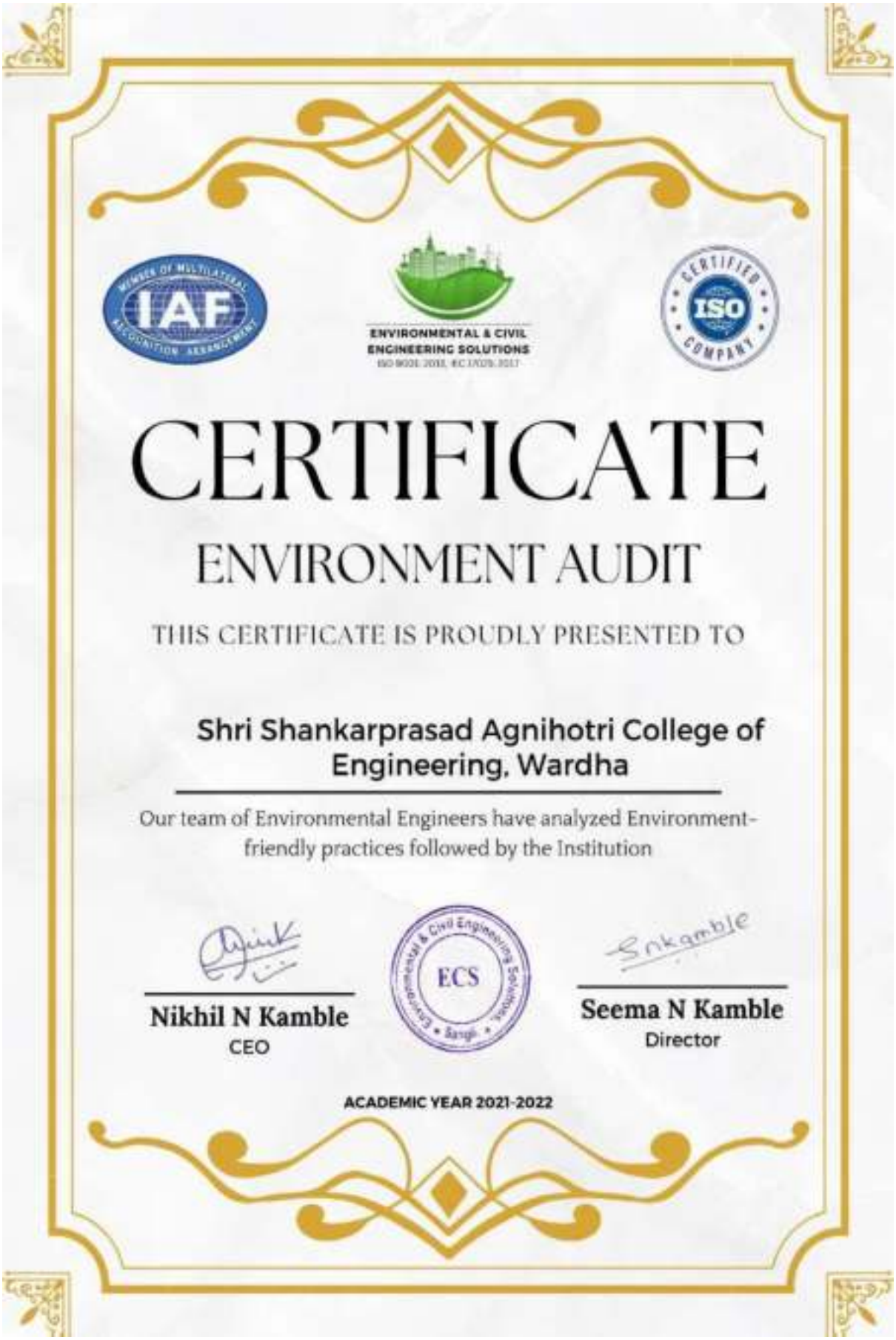
EQUIPMENTS		**Count**
1	Hot Air Oven 14”x14”x14” S.S.	1
2	Ph. Meter PM-100 Digital	1
3	Turbidity Meter	1
4	Sound Level Meter	1
5	Flocculate	1

Engineering geology lab

EQUIPMENTS		**Count**
1	Specimen Rocks	14
2	Specimen Minerals	18
3	Mirror Stereoscope	1
4	Transparent Geographical Globe	1
5	Bruntan Compass	1
6	Charts	9
7	Models	25

Details of PC, CPU, Keyboard and Mouse in Programming labs

Lab Name	EQUIPMENTS		Count
PROGRAMMING LAB 2	1	MONITOR	24
		CPU	24
		KEYBOARD	24
		MOUSE	24
PROGRAMMING LAB 2	2	MONITOR	60
		CPU	60
		KEYBOARD	60
		MOUSE	60
PROGRAMMING LAB 3	3	MONITOR	60
		CPU	60
		KEYBOARD	60
		MOUSE	60
DBMS LAB	4	MONITOR	24
		CPU	24
		KEYBOARD	24
		MOUSE	24
OPERATING SYSTEM LAB	5	MONITOR	24
		CPU	24
		KEYBOARD	24
		MOUSE	24
COMPUTER NETWORK LAB	6	MONITOR	16
		CPU	16
		KEYBOARD	16
		MOUSE	16



ENVIRONMENTAL & CIVIL ENGINEERING SOLUTIONS

CERTIFICATE

ENVIRONMENT AUDIT

THIS CERTIFICATE IS PROUDLY PRESENTED TO

Shri Shankarprasad Agnihotri College of Engineering, Wardha

Our team of Environmental Engineers have analyzed Environment-friendly practices followed by the Institution

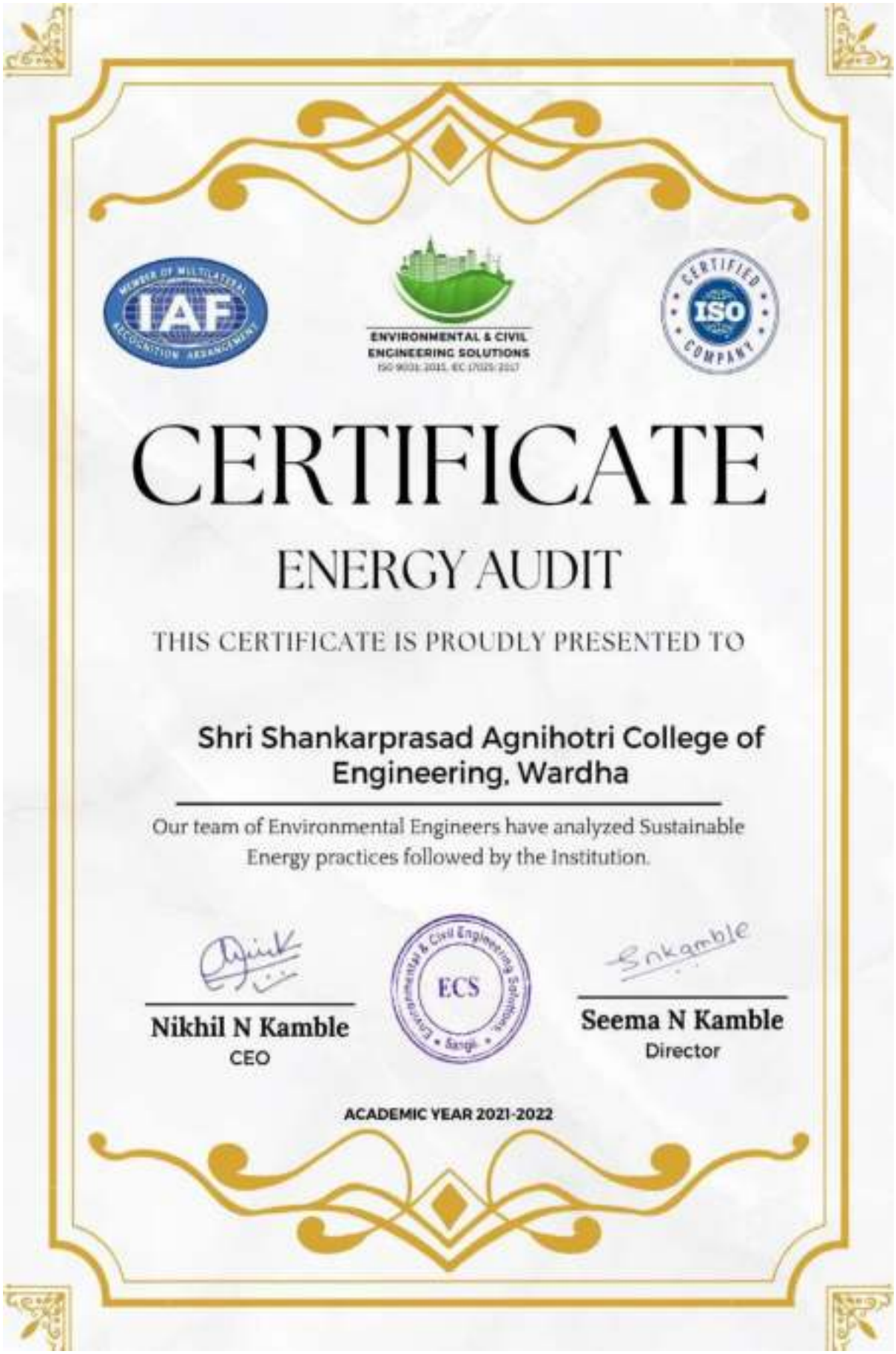
Nikhil N Kamble
CEO

ECS

Seema N Kamble
Director

ACADEMIC YEAR 2021-2022


IAF
ENVIRONMENTAL & CIVIL
ENGINEERING SOLUTIONS
CERTIFIED
ISO
COMPANY
CERTIFICATE
GREEN AUDIT
THIS CERTIFICATE IS PROUDLY PRESENTED TO
Shri Shankarprasad Agnihotri College of Engineering, Wardha
Our team of Environmental Engineers have analyzed Green, Energy, and Environment practices followed by the Institution.
Nikhil N Kamble
CEO
ECS
Seema N Kamble
Director
ACADEMIC YEAR 2021-2022


IAF
ENVIRONMENTAL & CIVIL
ENGINEERING SOLUTIONS
CERTIFIED
ISO
COMPANY
CERTIFICATE
ENERGY AUDIT
THIS CERTIFICATE IS PROUDLY PRESENTED TO
Shri Shankarprasad Agnihotri College of Engineering, Wardha
Our team of Environmental Engineers have analyzed Sustainable Energy practices followed by the Institution.
Nikhil N Kamble
CEO
ECS
Seema N Kamble
Director
ACADEMIC YEAR 2021-2022

SHRI SHANKARPRASAD AGNIHOTRI COLLEGE OF ENGINEERING, WARDHA

2022-2023

AUDIT REPORT

ENVIRONMENTAL & CIVIL
ENGINEERING SOLUTIONS
ISO 9001: 2015, IEC 17025: 2017

Editorial

In the Era of global warming and climate change every citizen has to reduce their own carbon foot prints to tackle with the adverse impacts of climate change. A green audit of any academic institution revels ways in which we can reduce energy consumption, water use and reduction in emission of carbon dioxide in the environment. It is a process to look into and ask ourselves whether we are also contributing to the degradation of the environment and if so, in what manner and how we can minimize this contribution and bring down to zero and preserve our environment for future generation.

Shri Shankarprasad Agnihotri College of Engineering, Wardha administration has already taken a step towards the green approach and conducted green audit of campus in the year 2022-2023. As an outcome of this institute has taken green steps to reduce its carbon foot prints by several means in campus viz. sustainable fittings, tree plantation and green computing in the administration and examination. The responsibility of carrying out the scientific green audit was given to Environmental and Civil Engineering Solutions. The organization has followed the rules and regulation of Ministry of Environment and Forest, Govt. of India and Central Pollution Control Board, New Delhi.

A questionnaire was prepared based on the guidelines and format of CPCB, New Delhi to conduct green audit. The information related to consumption of resources like water, electricity and handling of solid and hazardous waste was collected in the formats from main building support services and departments. The data collected was grouped and was tabulated in Excel sheets and analysed. The graphs of the analysed data were prepared for getting quick idea of the status. Interpretation of the overall outcomes was made which incorporates primary and secondary data, references and interrelations within. Final report preparation was carried out using this interpretation to prepare environment management plan of institute for next two years.

During the preparation of the Audit Report Hon. Principal, Dean Academics and IQAC encouraged us with their full support and the audit team wants to mention a warm vote of thanks towards them.

Nik
(C.E
Env **vil Engineering Solutions**

ACKNOWLEDGEMENT

We express our gratitude for calling upon us for this audit, mainly the Principal and all other staff members, who were ever helpful and supported us with all the inputs needed for this audit. We thank all the teaching, non-teaching and students for helping us in conducting this audit.
Green Audit Team

Mr. Nikhil N. Kamble
PhD (Sustainability), M. Tech. (Env. Eng.)
Mr. Smithesh L. Bhatt
B. E. (Civil. Eng.)

Miss. Maithilee N. Kamble M.B.A, B. Tech. (Mech. Eng.) **Mrs. Seema N. Kamble** Director, ECS, B. E. (Electrical)

Institutional Audit Committee

Prof. Abhishek Kumar Singh
(Principal)
Prof. Harshad Mummadwar
(Assistant Professor)

Prof. Shailesh Watekar (Assistant Professor) **Prof. Mohan Wake** (Assistant Professor)

Introduction:

The modernization and industrialization are the two important outputs of twentieth century which have made human life more luxurious and comfortable. Simultaneously, they are responsible for voracious use of natural resources, exploitation of forests and wildlife, producing massive solid waste, polluting the scarce and sacred water resources and finally making our mother Earth ugly and inhospitable. Today, people are getting more familiar to the global issues like global warming, greenhouse effect, ozone depletion and climate change etc. Now, it is considered as a final call by mother Earth to walk on the path of sustainable development. The time has come to wake up, unite and combat together for sustainable environment.

Considering the present environmental problems of pollution and excess use of natural resources, Hon. Prime Minister, Shri. Narendra Modiji has declared the Mission of Swachch Bharat Abhiyan. Also, University Grants Commission has mentioned “Green Campus, Clean Campus” mission mandatory for all higher educational institutes. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent. Green Audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings. Green audit can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E- waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

Need of audit:

Green auditing is the process of identifying and determining whether institutions practices are eco-friendly and sustainable. Traditionally, we are good and efficient users of natural resources. But over the period of time excess use of resources like energy, water, chemicals are become habitual for everyone especially, in common areas. Now, it is necessary to check

whether our processes are consuming more than required resources? Whether we are handling waste carefully? Green audit regulates all such practices and gives an efficient way of natural resource utilization. In the era of climate change and resource depletion it is necessary to verify the processes and convert it in to green and clean one. Green audit provides an approach for it. It also increases overall consciousness among the people working in institution towards an environment.

Goals of audit:

Institute has conducted a audit with specific goals as:

- Identification and documentation of green practices followed by college.
- Identify strength and weakness in green practices.
- Conduct a survey to know the ground reality about green practices.
- Analyse and suggest solution for problems identified from survey.
- Assess facility of different types of waste management.
- Increase environmental awareness throughout campus.
- Identify and assess environmental risk.
- Motivates staff for optimized sustainable use of available resources.
- The long term goal of the environmental audit program is to collect baseline data of environmental parameters and resolve environmental issue before they become problem.

Objectives of Audit:

- To examine the current practices which can impact on environment such as of resource utilization, waste management etc.
- To identify and analyse significant environmental issues.
- Setup goal, vision and mission for Green practices in campus.
- Establish and implement Environmental Management in various departments.
- Continuous assessment for betterment in performance in green practices and its evaluation.
- To prepare an Environmental Statement Report on green practices followed by different departments, support services and administration building.

NAAC criteria VII Environmental Consciousness:

Institutes are playing a key role in development of human resources worldwide. Higher education institutes campus run various activities with aim to percolate the knowledge along with practical dimension among the society. Likewise different technological problems higher education institutes also try to give solution for issues related to environment. Different types of evolutionary methods are used to assess the problem concerning environment. It includes Environmental Impact Assessment (EIA), Social Impact Assessment (SIA), Carbon Footprint Mapping, Green audit etc

National Assessment and Accreditation Council (NAAC) which is a self-governing organization that declares the institutions as Grade according to the scores assigned at the time of accreditation of the institution. Green Audit has become mandatory procedure for educational institutes under Criterion of NAAC. The intention of green audit is to upgrade the environmental condition inside and around the institution. It is performed by considering environmental parameters like water and wastewater accounting, energy conservation, waste management, air, noise monitoring etc. for making the institution more eco-friendly. Students are the major strength of any academic institution. Practicing green actions in any educational institution will inculcate the good habit of caring natural resources in students. Many environmental activities like plantation and nurturing saplings and trees, Cleanliness drives, Bird watching camps, No vehicle day, Rain water harvesting, etc. will make the students good citizen of the country. Through Green Audit, higher educational institutions can ensure that they contribute towards the reduction of Global warming through Carbon Footprint reduction measures.

Benefits of Green Audit to an Educational Institute:

There are many advantages of green audit to an Educational Institute:

- It would help to protect the environment in and around the campus.
- Recognize the cost saving methods through waste minimization and energy conservation.
- Find out the prevailing and forthcoming complications
- Empower the organization to frame a better environmental performance.
- It portrays good image of institution through its clean and green campus.

Overview of Institute:

Shri Shankarprasad Agnihotri College of Engineering, Wardha was established in the year of 1985. Institute has huge area, infrastructure and been serving the mankind in the field engineering and technology.

The landscaped grounds of college are widely admired for their beauty. The most valuable investment any educational institution can make is “Nurturing Future Leaders”. With the continuous rise in expectation of essential leadership standards, the institute has torch bearers have taken a responsibility for this investment to nurture the NextGen leaders with a vision to bridge the existing skill gap. With a firm step forward to attain an academic excellence, computer labs, and industry-academia associations has been setup at the College in association with the top leaders. The College believes that its primary stakeholders are the students. All aspects of education focus on the core values of contributing to national development while fostering global competencies among students. The College admits students from all social milieus and empowers them through intensive mentoring and counselling to face the challenges of life and become responsible and sensitized citizens of the country.

Jai Mahakali Shikshan Sanstha (JMSS), established in 1985,has emerged as one of the largest groups of educational institutions in Vidarbha region. As a result of benevolence, dedication and untiring efforts of the chairman JMSS, honourable Pt. Shri Shankar Prasad Agnihotri, the

group has a stupendous growth of more than twenty institutions. It includes schools for tribal and ruler children with free lodging & boarding facility and education from pre-primary to doctoral research in various disciplines.

Shri Shankarprasad Agnihotri College of Engineering, Wardha was established under Agnihorti Group of Institution. It was established in 1985 by Pandit Shri. Shankar Prasadji Agnihotri as a result of dedication and motivation of late Smt. Ranibai Agnihotri who was inspired by the father of the nation Mahatma Gandhi and Vinoba Bhave. It's now grown up with more than 20 educational units of various kinds, right from pre-primary schools to post graduate institution. Vision: To develop globally competent, efficient learner and community oriented model of Engineering education. Mission: To create value added, competent and research oriented trained Engineering professionals for sustainable development of the society.

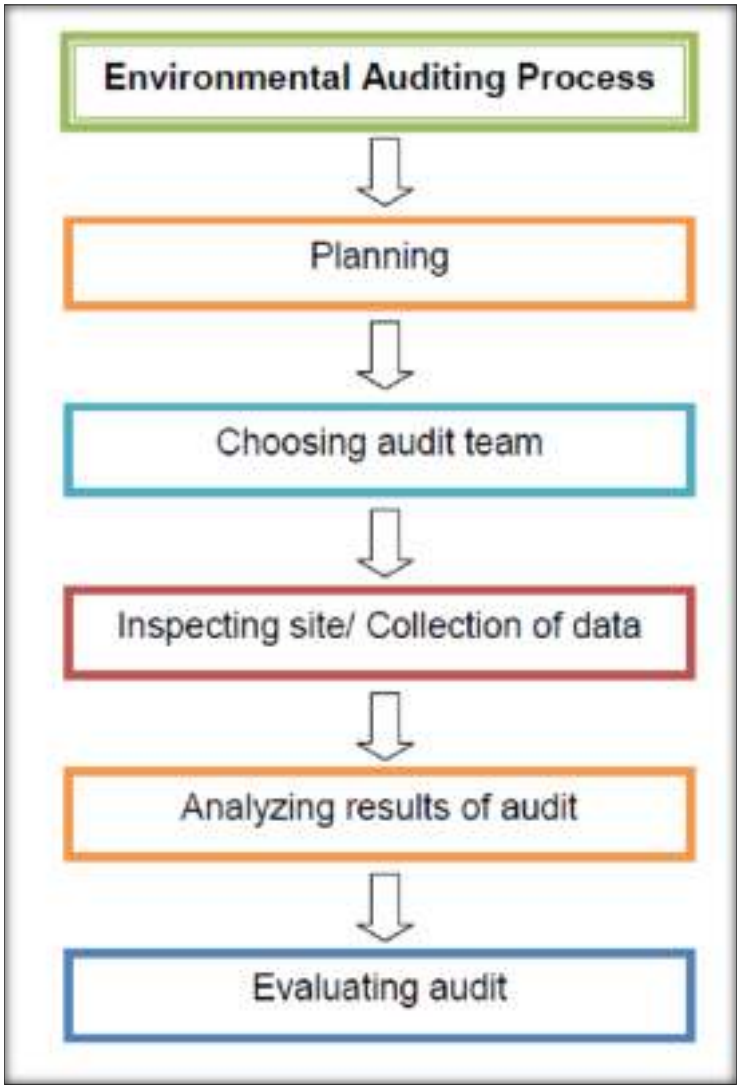
Vision of the institute:

To develop globally competent, efficient learner and community oriented model of engineering education.

Mission of the institute:

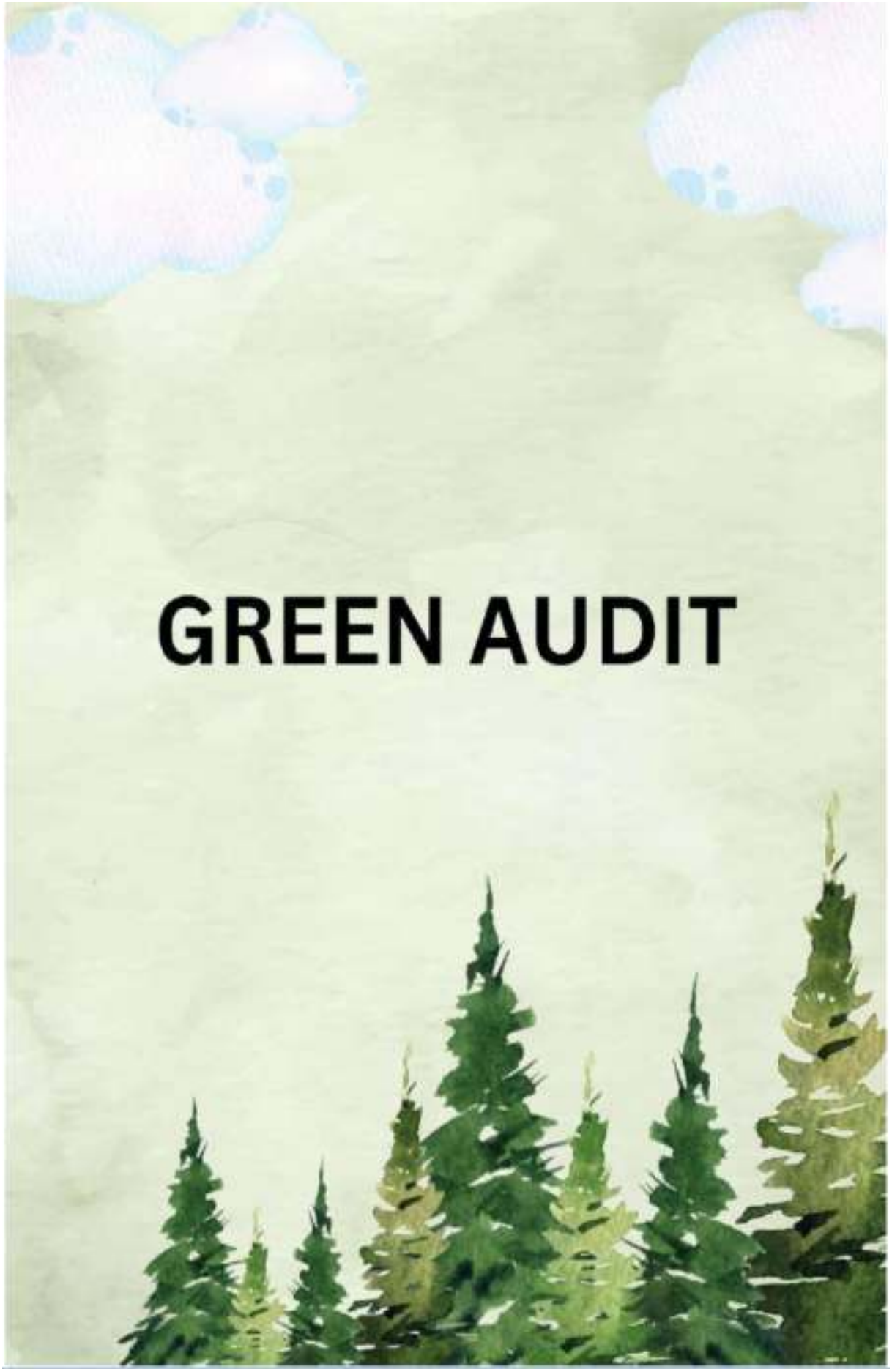
To create value added competent and research oriented trained engineering professionals for sustainable development of the society.

Methodology:



Audits to be carried out:

Green and carbon footprint audit
Energy audit
Environmental audit
Water audit
Wastewater audit


GREEN AUDIT

Green and Carbon footprint audit:

Green Audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings. Green audit can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E- waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

Carbon is the basis of life on mother Earth. It is incorporated into the plants through photosynthesis, consumed by animal species through the food, present in the form of carbon dioxide (CO_2) the atmosphere, locked into the rocks as limestone and compressed into the different fossil fuels such as coal and oil. As CO_2 level in the atmosphere continue to increase, most climate designs or project that the oceans of the world and trees will keep soaking up more than half CO_2 . The plants on land and in the sea, taken up carbon by over many years increased the percentage discharged during decay, and this increased carbon became locked away as fossil fuels beneath the surface of the planet. The starting of the 21st century brought growing concern about global warming, climate change, food security, poverty and population growth. In the 21st century more carbon has been released into the atmosphere than that has been absorbed. CO_2 is a principle component causing global warming. Atmospheric carbon dioxide levels have increased to 40 % from preindustrial levels to more than 390 parts per million CO_2. On this background it is a need of time to cover the research areas interrelated with climate change.

Green Cover at SSPACE:

SSPACE has got a huge green cover and has almost 50 species of vegetation inside the campus. The institute has huge campus and most of this is covered by green area. Institute has huge plantations along with variation in species Greenery is maintained well by the institute. .

Figure 0-1 SSPACE, Campus

SSPACE has taken huge efforts to develop its green cover. In the vicinity of the institute there is huge vegetation along the road side and around the campus. The below table shows different species of tress available in the campus and vicinity.

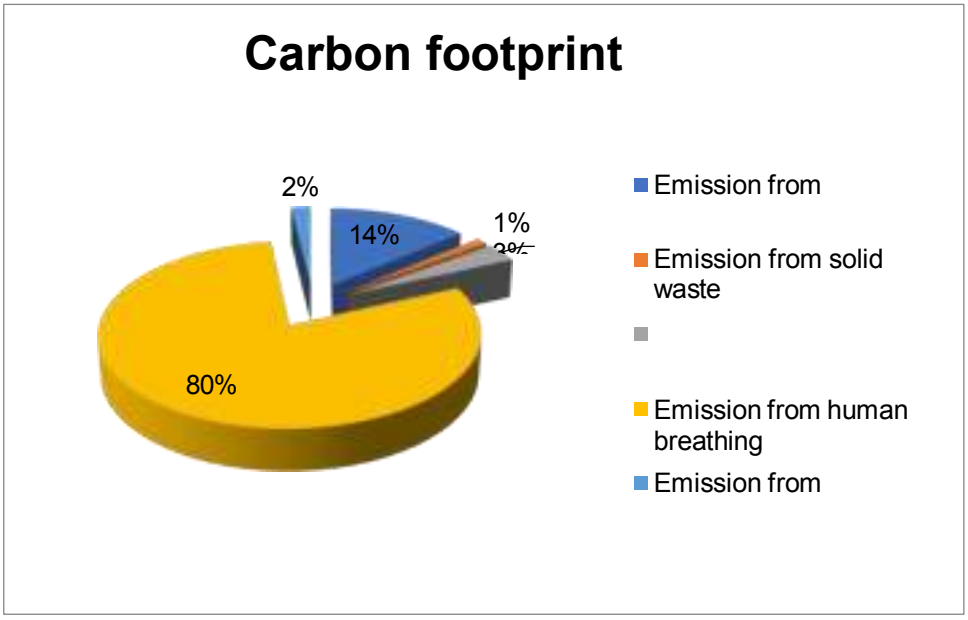
Species	Count	Species	Count
Neem	20	Thuja	37
Chapha	15	Aam	1
Pipal	3	Shiv Babul	3
Vad	1	Maringo	9
Karanji	16	Umba	2
Badam	1	Mogra	22

Mostly there are trees of Chapha, Thuja and Mogra etc. Due to this the institute has high carbon sequesterial values. Considering the vicinity some dry plants were observed to approximately about 3. Plants absorb sunlight, 50% is absorbed and 30% reflected so this helps to create a cooler and more pleasant climate through a 3°C temperature reduction in the vicinity. This has also leaded to increase in biodiversity as more than 12 species of birds were observed. Some off the common birds were viz. Sparrow, wild parrots, little stint, black kite etc.

Carbon Footprint Audit:

SSPACE has estimated its carbon footprint by factor methodology. Various factors were used to estimate the carbon emissions from Consumption of electricity, generation of solid waste, use of vehicles in campus, carbon emissions due to human breathing and emissions from buildings. At last they have also calculated Carbon sequesterial value i.e. carbon that is absorbed by the plants.

Sr. No.	Section	Emission
1	Emission from electricity	14470 kg CO_2 eq./year.
2	Emission from solid waste	1297 kg CO_2 eq. per year.
3	Emission from Vehicles	3498 kg CO_2 eq. per year.
4	Emission from human breathing	83.4 tons of CO_2 eq. per year.
5	Emission from buildings	2020 kg CO_2 eq. per year.
6	Carbon sequesterial	659 kg CO_2 eq. per year.



Hence as per the calculation the carbon emission for electricity is 14470 kg CO_2 eq./year. Secondly considering emissions from human breathing, the institute has total 843 students and staff. The staff's works for about averagely 6 hours a day in the institute and the students are present for 5 hours averagely daily. Vehicles emit significant amount of gases in environment and SSPACE has various parking sections in the campus. It was found that averagely 106 vehicles entered the institute daily and travel about 450 m of distance from the gate. Cars also enter the institute and as per observation 6 cars are observed daily. Hence the overall the institute emits 3498 Kg CO_2 eq. per year.

Solid waste is very important as it emits significant amount of carbon through it. SSPACE has a good solid waste management system. Hence the institute develops about 1500 kg of waste daily in both the form of wet and dry. Hence the emission is about 1297.05 kg CO_2 eq. per year. Buildings play an important role in carbon contribution. During the construction operation and use phase they emit significant amount of carbon. Hence considering total built-up area the carbon emissions could be evaluated. After the estimation the total built-up area observed was approximately about 10099.95 sq. m and the carbon emission were 2019.99 kg CO_2 eq. per year. Carbon sequesterial in important as it is the carbon absorbed by the trees. SSPACE campus has 190 fully grown trees in the campus; hence the sequesterial value is about 659 kg CO_2 eq. per year.

Conclusion:

- Highest carbon emission was observed from human breathing i.e. 84.3 tons of CO_2 eq. per. Year. There is no any significant mean to reduce this number as it is not controllable.
- The next is solid waste. The emission from solid waste comprises of 1297 kg CO_2 eq. per year. This can be significantly reduced by following simple means. Waste segregation is properly observed by the institute and they should follow the cut out plastic plans. There should be complete ban in using the plastic inside the campus. There should be minimization of food waste as it contributes highest in carbon emissions.
- Considering emission from electricity they can be significantly reduced by decrease in electricity use. This can be done by installing LED lights and using energy efficient equipment's such as machines with high star ratings which save more. Institute can recognize renewable energy sources and have a setup in the institute. This can lead in significant saving of electricity and reduction in carbon emissions.
- Vehicles have the least emissions in SSPACE and it is due to the easy approached parking so that vehicles do not roam in the vicinity. All the vehicles travel hardly 550 m in the campus and this has led to lower emissions. Still institute can follows "NO Vehicle Day" on every 2nd Saturday of each month.
- Institute reduces about 0.659 tons of CO_2 per year by the means of plants. This could be increased by increasing in plantations. SSPACE can plant more trees next to

chemistry section, surrounding to play ground, front of applied science department etc.

The plants having highest Carbon sequestration values are suggested. Cinnamomum verum, Eugenia caryophyllid, Bumelia celestina, Acacia Berland Eri, Acacia Francescana, Chinaberry tree, Moringa oleífer, Carya illusoriness, Pinus Arizonian and Buddleia cordata are some of the suggested species for plantation.

SUSTAINABLE PRACTICES

SSPACE follows sustainable practices in the section of water, energy and waste management.

LED Tubes

Institute has almost 240 LED tubes present in various sections viz. classrooms, office and laboratories. The main advantages of having LED tubes are:

Long Lifespan: Compared to the lifespan of your average incandescent bulb, the lifespan of a LED light is far superior. The average incandescent bulb lasts about a thousand hours. The lifespan of an average LED light is 50,000 hours. Depending on how you use it, its life may be as long as 100,000 hours. This means that an LED light can last anywhere from six to 12 years before you need to replace it. That is 40 times longer than an incandescent bulb. As such, savings extend not only to replacement costs but also to the maintenance costs of your company's lighting bill.

Energy Efficiency: Another one of the leading LED lighting advantages is their energy-efficient operation. You can measure the energy efficiency of a lighting source in useful lumens, which describes the amount of lighting that the device emits for each unit of power, or watt, that the bulb uses. If you replaced all the lighting in your

office, school or other facility with LEDs, you could see as much as a 60% to 70% improvement in your overall energy savings. In some cases, the improvement could be as great as 90%, depending on what kind of lights you are replacing and what kind of LED lights you are using.

Improved Environmental Performance: It is becoming increasingly important for companies to become eco-friendly. Customers increasingly want environmentally friendly options and using an environmentally friendly light source can help companies reduce their energy use, as well as attract a socially conscious consumer base. The environmental benefits of LED lighting also extend to their manufacturing process. Many traditional lighting sources, like fluorescent lighting and mercury vapour lights, use mercury internally as part of their construction. Because of this, when they reach the end of their lifespans, they require special handling. You do not have to worry about any of these issues with LED lights.

No Heat or UV Emissions: LEDs emit almost no heat, and most of the light they emit is within the visible spectrum. This feature is one reason that medical experts are looking at LEDs as a possible solution for Seasonal Affective Disorder (SAD), which affects many people during the darker months of the year. It also makes LEDs ideal for illuminating works of art that will degrade or break down over time with exposure to UV rays.

Low Voltage Operation: If your business is in a location where flooding may occur, you want to be able to light your facility with devices that require as little voltage as possible. LEDs are perfect for this because they operate on very low voltage. When you use a low-voltage system in areas that may be prone to flooding, you are protecting your staff and others from potentially harmful or fatal shocks. If, during a flood clean-up, someone mistakenly touches some electrical component, a low- voltage lighting system that generates 12 volts is much safer than a line voltage system that generates 120 volts.

Open well water system

Institute has Open well in its campus and it acts as the primary source of water. The main advantage of having the open well system is that the institute reduces the load on Municipal Corporation and the supply water is throughout the year from the well.

RO Water system

The problem with drinking tap water is that it contains harmful toxins and inorganic compounds such as lead, which in excess can cause high blood pressure and kidney problems. Because of the pollution in our environment and the deterioration of natural

resources, we need a way to filter out these pollutants in our drinking water. The main reason for the RO water purification to be so much in demand is its ability to remove impurities from the water. It is able to clean around 97 percentages of bacteria, virus and other elements that can cause serious health problems. The likes of micro particles which are smaller than 10 microns can also be removed by an RO purifier.

Septic tanks

Septic tanks are secure systems for storing and subsequently disposing of faecal waste. A simple decantation and sedimentation process eliminates any solids in the wastewater, thus preventing them from contaminating the soil or freshwater sources. Institute has installed septic tanks and they offer effective pre-treatment before the water purification phase since they are inexpensive. They don't produce foul odour and prevents the appearance of pests, such as flies and mosquitoes.

Fire Extinguisher

SSPACE have installed fire extinguishers at every necessary section in the premises. These help easily as they are portable fire extinguishers and can be quickly brought to the scene of a fire.

Roof top solar panel system

Saving on bills: While regular electricity is powered through fuel across the country, it becomes an expensive ordeal, especially with rising fuel prices. Solar energy is readily available and can be harnessed as a substitute for fuel-based electricity, thus being a cheaper alternative in the long run.

Accessibility: India is a country that holds diverse communities from multiple walks of life, not all of whom have accessible sources of energy, other than petrol and diesel. Solar Energy has become an economically viable and safe option for them.

Low maintenance: Post the installation of a rooftop solar, the product itself requires negligible maintenance and, therefore, lower added costs. Rooftop Solar are known to have a long service life span.

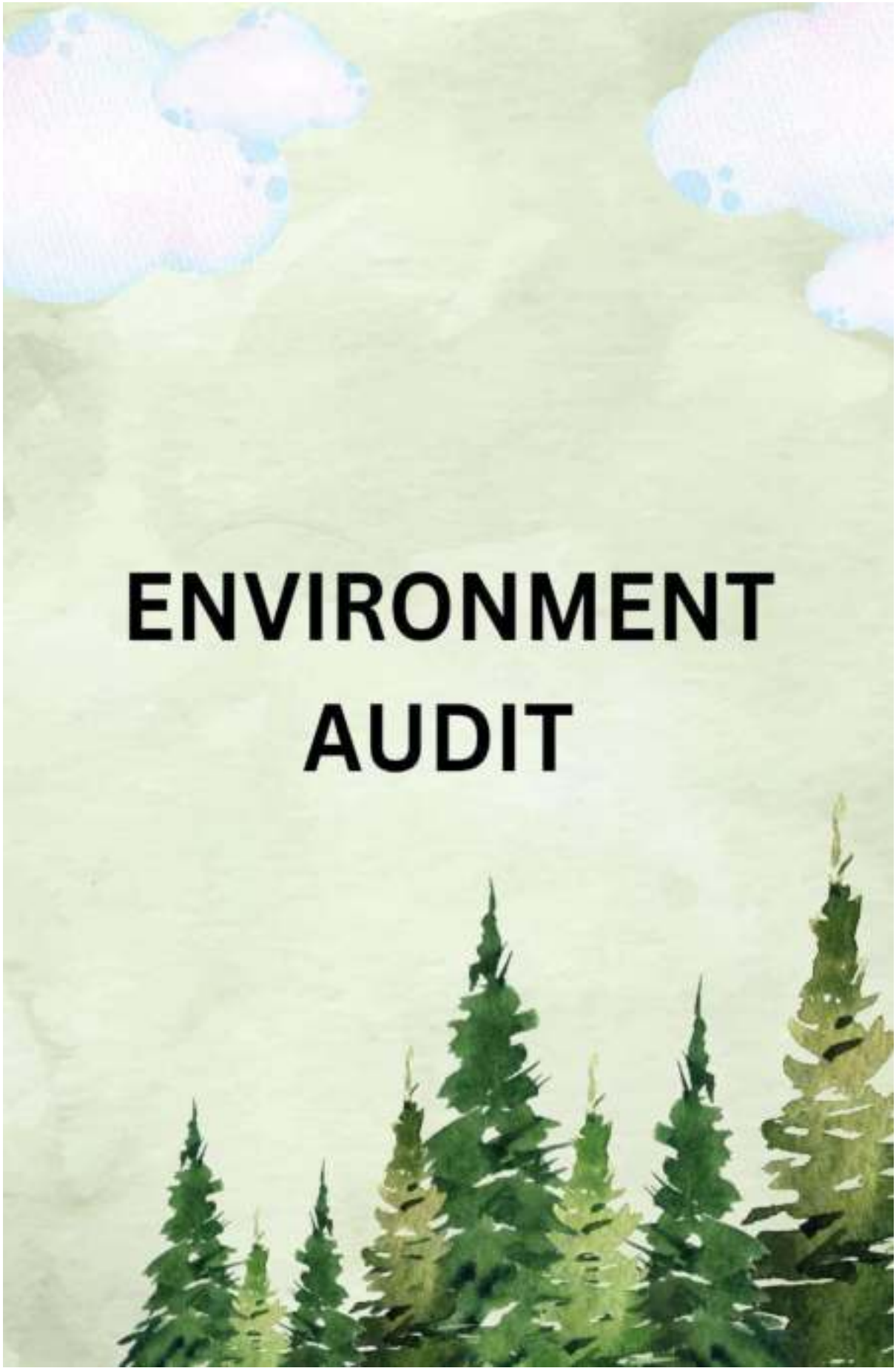
Reduced carbon footprint: Right from installation to use, rooftop solar neither emit harmful greenhouse gases nor cause health hazards, resulting in a lowered carbon footprint.

Rain water harvesting:

Rainwater harvesting is the simple process or technology used to conserve rainwater by collecting, storing, conveying and purifying of rainwater that runs off from rooftops, parks,

roads, open grounds, etc. for later use. Here, let us have a look at the diagram of rainwater harvesting system. It is beneficial for the institute as:

- Less cost.
- Helps in reducing the water bill.
- Decreases the demand for water.
- Reduces the need for imported water.
- Promotes both water and energy conservation.
- Improves the quality and quantity of groundwater.
- Does not require a filtration system for landscape irrigation.
- This technology is relatively simple, easy to install and operate.
- It reduces soil erosion, storm water runoff, flooding, and pollution of surface water with fertilizers, pesticides, metals and other sediments.
- It is an excellent source of water for landscape irrigation with no chemicals, dissolved salts and free from all minerals.


ENVIRONMENT
AUDIT

Environmental Audit:

An environmental audit is a type of evaluation intended to identify environmental compliance and management system implementation gaps, along with related corrective actions. ISO 14001 is a voluntary international standard for environmental management systems ("EMS"). ISO 14001:2004 provides the requirements for an EMS and ISO 14004 gives general EMS guidelines. An EMS meeting the requirements of ISO 14001:2004 is a management tool enabling an organization of any size or type to:

- Identify and control the environmental impact of its activities, products or services;
- Improve its environmental performance continually, and
- Implement a systematic approach to setting environmental objectives and targets, to achieving these and to demonstrating that they have been achieved.

The audit examines the potential hazards or risks posed by the institutes. Areas examined may include environmental policies and procedures, energy use practices, recycling, waste, conservation, and pollution. Then, the institute can use the results to determine what changes need to be made for compliance. In a broad sense, environmental auditing aims to help protect the environment and minimize the risks of business activities to the environment and human safety and health.

Water Audit and wastewater audit:

Water auditing is a method of quantifying water flows and quality in systems, with a view to reducing water usage and often saving money on otherwise unnecessary water use. Water audit is an effective management tool for minimizing losses, optimizing various uses and thus enabling considerable conservation of water. Water audits trace water use from its point of entry into the facility/system to its discharge into the sewer/river/canal etc. Wastewater audit deals with effective management of wastewater in the system. It deals with proper generation, management, treatment, transfer and disposal of wastewater.
SSPACE has carried out its water and wastewater audit and has suggested many more ways for water conservation, reuse and recycle. The detail water and waste water report is mentioned below.

Water Audit report

Water audit for the “SSPACE” was carried out. The purpose of the water audit is to provide a thorough understanding of the water uses by identifying and measuring all water using fixtures, appliances, and practices in order to recommend potential water saving efficiencies.

PRIMARY DATA

Sr. No.	Title	Information
1	**Name of Institute**	Shri Shankarprasad Agnihotri College of Engineering, Wardha
2	**Address**	Wardha 442001
3	**Name of company under which water audit is carried out**	Environmental and Civil Engineering Solutions, Sangli
4	**Number of floors**	G + 3 (Variable)
5	**Category of building**	Educational Institute
6	**Nearest ESR location**	Campus
7	**Water supply hours**	NA
8	**Water meter present**	No

POPULATION DETAILS

Title	Information
Fixed population (Working staff and Students)	Gents: 478
	Ladies: 365
Variable population (Visiting persons)	Gents: 20
	Ladies: 15

SOURCE INFORMATION

Title	Information
Sources of water	Open well
Connection details	1” PVC pipe inlet and 1” outlet distribution pipe

STORAGE DETAILS

Title	Information
Overhead tank type	RCC tank
Location	On terrace
Number of tanks	2 X 10,000 lit RCC | 1 X 21,000 lit RCC 1 X 22,000 lit RCC | 1 X 40,000 lit RCC
Motor connection details	5 Hp for Building 1 3 Hp for Building 2
Pumping period	4 hours daily
Underground sump	Yes
Capacity of underground sump	40,000 Lit RCC

WATER USAGE

Toilet	Number of users	Water consumption
Gents toilet	478 users	478 X 15 lit = 7170
Washbasin	843 users	843 X 0.75 lit = 632
Ladies toilet	365 users	365 X 18 lit = 6570
Toilet cleaning	800 liters	800 liters
Floor cleaning	1700 liters	1700 liters
Gardening	3500 liters	3500 liters
Laboratories	3000 liters	3000 liters
Total		**23,372 lit**

SCHEDULE OF TOILETS AND WASHROOMS:

Number of Students and staff toilets in each floor for Building 1 and 2

Sr. No.	Toilet	Boys	Girls	Staff
1	**Ground floor**	2	0	5
2	**First floor**	1	2	0
3	**Second floor**	2	1	0
4	**Third floor**	1	2	0

WATER USED FOR DRINKING

There are coolers cum water purifiers present in the institute. Sample assessment for 3 months was done and average values are presented below for each section.

Potable water assessment:

Open well assessment

Sr. No.	Test	Results	Limit
1	pH	**7.8**	6.5-8.5
2	TDS	**1277**	-
3	E.C	**2745**	-
4	Hardness	**188**	200
5	Chlorides	**121**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

RO No 1 Building 1

Sr. No.	Test	Results	Limit
1	pH	**6.5-7.2**	6.5-8.5
2	TDS	**102**	-
3	E.C	**97**	-
4	Hardness	**122**	200
5	Chlorides	**114**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

RO No 2 Building 1

Sr. No.	Test	Results	Limit
1	pH	**6.6-7.2**	6.5-8.5
2	TDS	**111**	-
3	E.C	**99**	-
4	Hardness	**118**	200
5	Chlorides	**116**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

RO No 1 Building 2

Sr. No.	Test	Results	Limit
1	pH	**6.8-7.7**	6.5-8.5
2	TDS	**108**	-
3	E.C	**99**	-
4	Hardness	**131**	200
5	Chlorides	**105**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

RO No 1 Building 2

Sr. No.	Test	Results	Limit
1	pH	**6.5-7.6**	6.5-8.5
2	TDS	**109**	-
3	E.C	**99**	-
4	Hardness	**130**	200
5	Chlorides	**104**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

Testing specifications:

Test	ISO Code
pH	ISO 3025:11 (1993)
TDS	ISO 3025: 16 (1984)
E.C	ISO 3025: 14 (1984)
Total Hardness	ISO 1055: 12 (2012)
Chloride	ISO 3025: 40 (1991)
MPN	ISO 9308: 2 (2012)

Water Consumption in Hostel sections

Institute has hostels present for both Boys and girls. Following table shows the water cosnumption

Sr. No.	Section	Count	Demand	Water usage
1	**Boys Hostel**	112	135 LPCD	15,120
2	**Girls Hostel**	57	135 LPCD	7,695

Waste water audit

SSPACE campus generates huge amount of wastewater. The source for wastewater in the campus is hostels, institute, mess and the washrooms and urinals inside the campus. To estimate the amount of wastewater generated all the water that is used in the washrooms and hostels is considered as wastewater.

Sr. No.	Section	Wastewater generated in litres
1	Water usage generated in campus	**23,372.25**
2	Water usage in Hostels	**22,815.25**
Waste water generated		**37,737.75**

Waste water treatment plant at SSPACE:

Currently SSPACE lets all it waste water into sewers. Currently there is no any waste treatment facility. Sampling of waste water was done for 3 months for the parameters of COD, BOD, TKN and pH. Following table shows the characterization of wastewater.

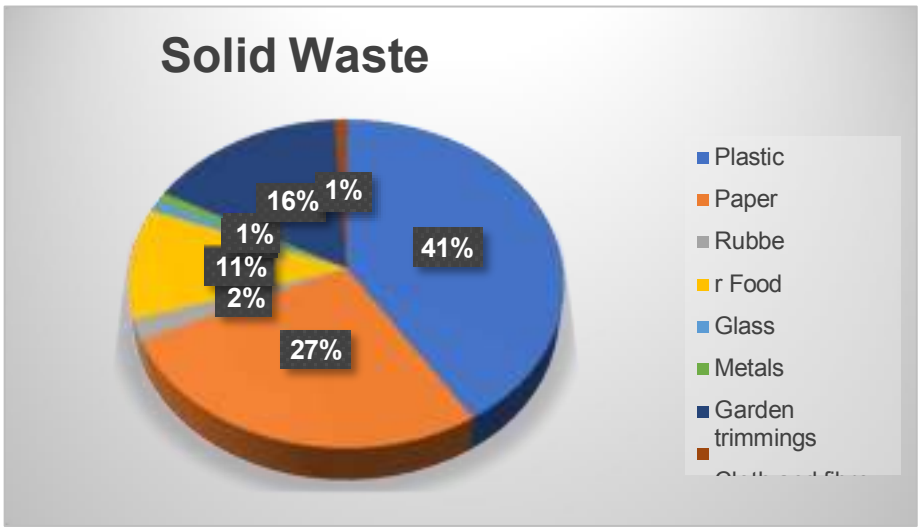
Sr. No.	Parameter	Reading
1	pH	7.10
2	COD	211
3	BOD	116
4	TKN	21

Solid waste Audit

A waste audit is a physical analysis of waste composition to provide a detailed understanding of problems, identify potential opportunities, and give you a detailed analysis of your waste composition. A waste audit will help you clearly identify your waste generation to establish baseline or benchmark data, Characterize and quantify waste stream, Verify waste pathways, identify waste diversion opportunities and identify source reduction opportunities.

Solid waste is the unwanted or useless solid material generated from the human activities in residential, industrial or commercial area. Solid waste management reduce or eliminates the adverse impact on the environment and human health. Solid waste audit for SSPACE was carried out. The entire premise was analysed for solid waste generation and waste characterization. Overall waste was observed and characterization was done. The below table shows the components of solid waste at SSPACE campus. Quartering method was used and 1 Kg of waste was selected.

Sr. No.	Type of waste	Composition %
1	Plastic	41
2	Paper	27
3	Rubber	2
4	Food	11
5	Glass	1
6	Metals	1
7	Garden trimmings	16
8	Cloth and fibre	1



After analysing all the bins it was observed that plastic had highest contribution viz. 41% followed by the paper waste i.e. 27%. Mostly common observed plastic items were plastic wrappers of chips, soft drinks bottles and chocolate wrappers. The paper waste included paper wrappers, notebook pages, pamphlets and some pieces of cardboard. The third highest waste included garden trimmings. It included small grass, minute branches etc. The least contribution was of cloth, fibre, glass and metals.

Observations and Conclusion:

There are separate bins for wet waste and dry waste. Hence, source segregation takes place.

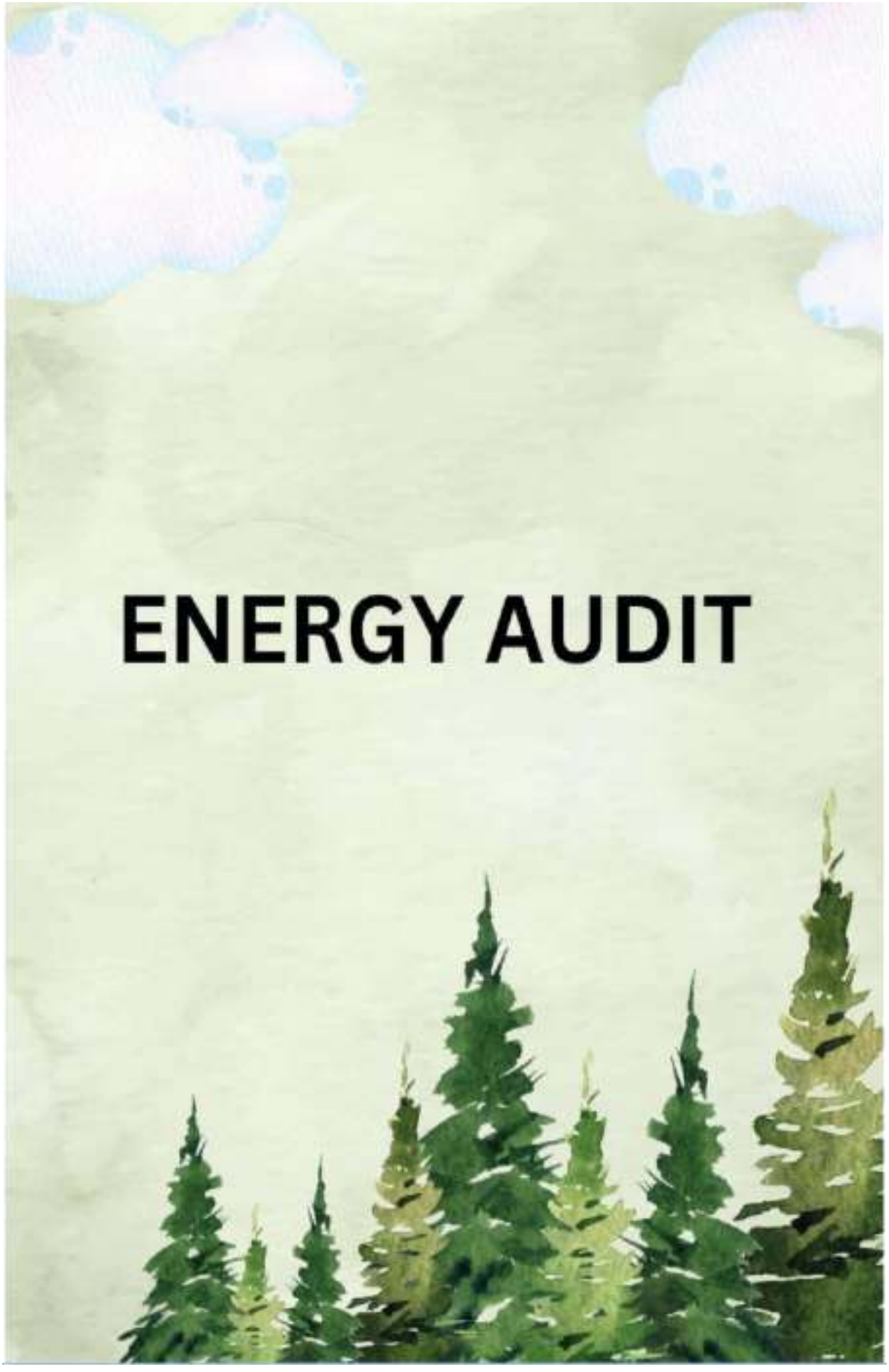
Institute has taken steps towards paper recycling. The paper waste collected from the bins is send to vendors.

Plastic ban in campus is implemented but due to lack of seriousness in the students plastic is used in campus. Institute should conduct plastic awareness seminars for both the staff and students.

Assessment of soil was done to determine the quality of soil:

Sr. No.	Test	Results
1	pH	**6.1**
2	NPK	**2:3:1**
3	Acidity	**131 mg/lit**
4	Hardness	**169 mg/lit**


DUSTBIN
DUSTBIN
DUSTBIN
USE ME
USE ME
USE ME


ENERGY AUDIT

Energy Audit

An energy audit is an inspection survey and an analysis of energy flows for energy conservation in a building. It may include a process or system to reduce the amount of energy input into the system without negatively affecting the output. In commercial and industrial real estate, an energy audit is the first step in identifying opportunities to reduce energy expense and carbon footprint.

A nation is tiring to advance in quantity and quality to the spread of education among the common India and development of their intelligence. In India the entire field of education and other fields of intelligent activities had been monopolized by a handful of men before independence. But today we are marching towards the desirable status of a developed nation with fast strides. But the development should be a sustained one. For achieving such an interminable development energy management is essential. As far as concerning electricity crisis, we are facing lack of electricity during office work. So, institutional management is taking design regarding production of electricity and saving electricity for Eco social aspect. Energy requirement of India is growing and incomplete domestic fossil fuel treasury. The country has motivated strategy to enlarge its renewable energy resources and policy to establish the nuclear power plants. India increases the involvement of nuclear power to largely electrical energy development facility from 4.2% to 9%. India's industrial demand accounted for 35% of electrical power requirement, domestic household use accounted for 28%, agriculture 21%, commercial 9%, and public lighting and other miscellaneous applications accounted for the rest. Energy conservation means reduction in energy consumption without making any sacrifice of quantity or quality. A successful energy management program begins with energy conservation; it will lead to adequate rating of equipment's, using high efficiency equipment and change of habits which causes enormous wastages of energy. By observing all these study lack of electricity and huge electricity demands. It is necessary to plan to be self-sufficient in electricity requirement.

Connection details:

Institute receives electricity from MSEB i.e. Maharashtra State Electricity Distribution Co. Ltd. Following are the details about connection.

Type of connection: HT (High tensioned)

Tariff: 146 HT-VII B

Contract demand: 200 KVA
Feeder voltage: 11 KW
Type: 3 Phase

Tariff Structure:

As per Distribution Company, HT and LT consumers have an option to take Time of Day (TOD) tariff instead of the normal tariff. Under TOD tariff electricity consumption and maximum demand in respect of HT consumers for different periods of the day i.e. normal period, peak load period and off-peak load period could be recorded by installing TOD meter. The maximum demand and consumption recorded in different periods could be billed on the following rates of the tariff applicable.

TOD Tariffs	Rate % (Rs./Unit)
0000 Hrs- 0600 Hrs & 2200 Hrs- 2400 Hrs	-1.500
0600 Hrs- 0900 Hrs & 1200 Hrs- 1800 Hrs	0.000
0900 Hrs- 1200 Hrs	0.800
1800 Hrs- 2200 Hrs	1.100

Power Factor:

Power Factor (PF) is an indicator of efficient utilization of power. In an AC (Alternating Current) electrical power system, PF is defined as the ratio of real power flowing to the load, to the apparent power in the circuit and is a dimensionless number.

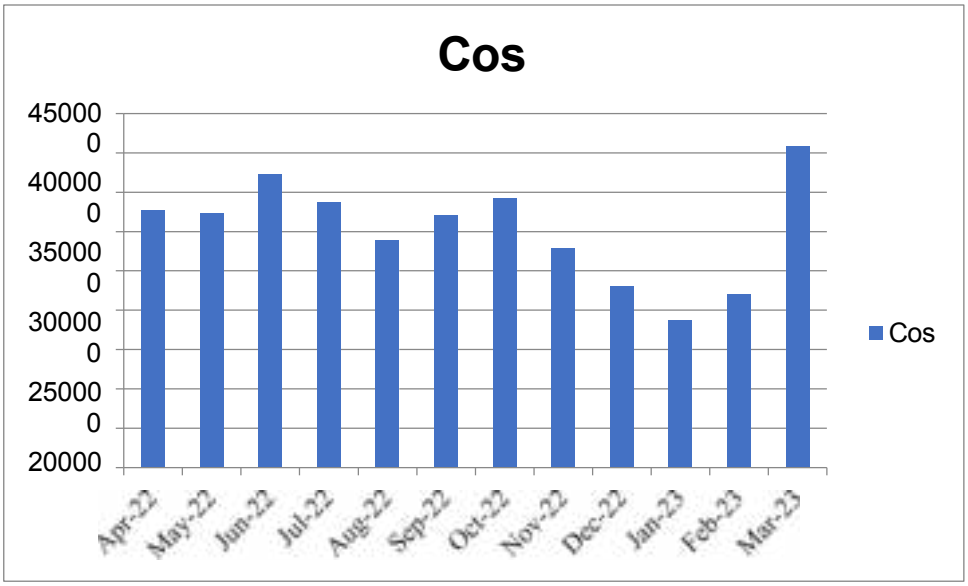
Bill analysis:

Bill analysis for SSPACE had been done for academic year 2022-2023.

Sr. No.	Month	Consumption (Kw)	Bill Amount
1	Apr-22	22238	326896
2	May-22	21948	323088
3	Jun-22	22568	373055
4	Jul-22	19687	337496
5	Aug-22	16297	289381
6	Sep-22	18596	321430
7	Oct-22	19985	342596
8	Nov-22	15358	278482
9	Dec-22	11791	230625
10	Jan-23	8486	187426
11	Feb-23	9773	220245
12	Mar-23	25035	408642

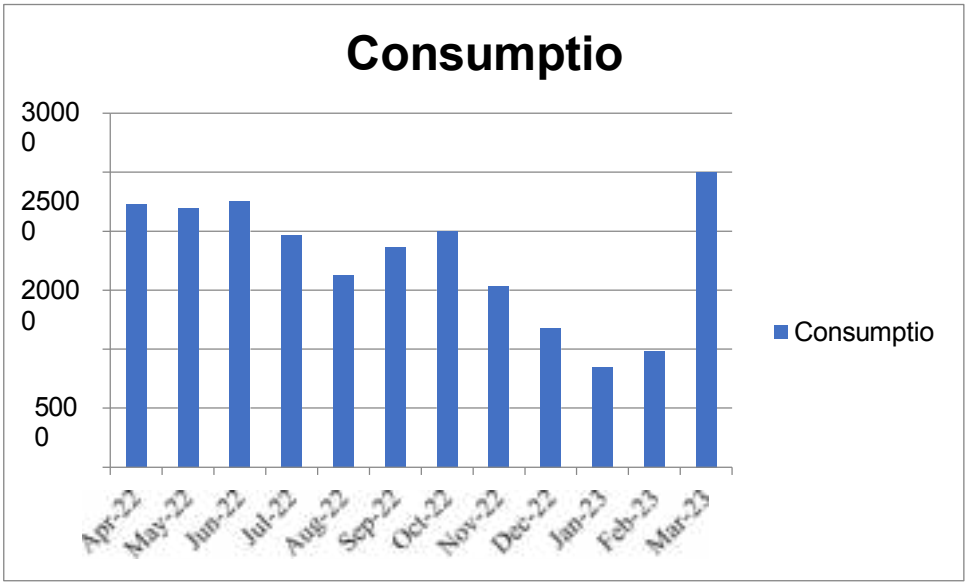
Cost Analaysis:

After analysisng the bill the average cost expenditure of the institute on energy is about 303280.2 Rs

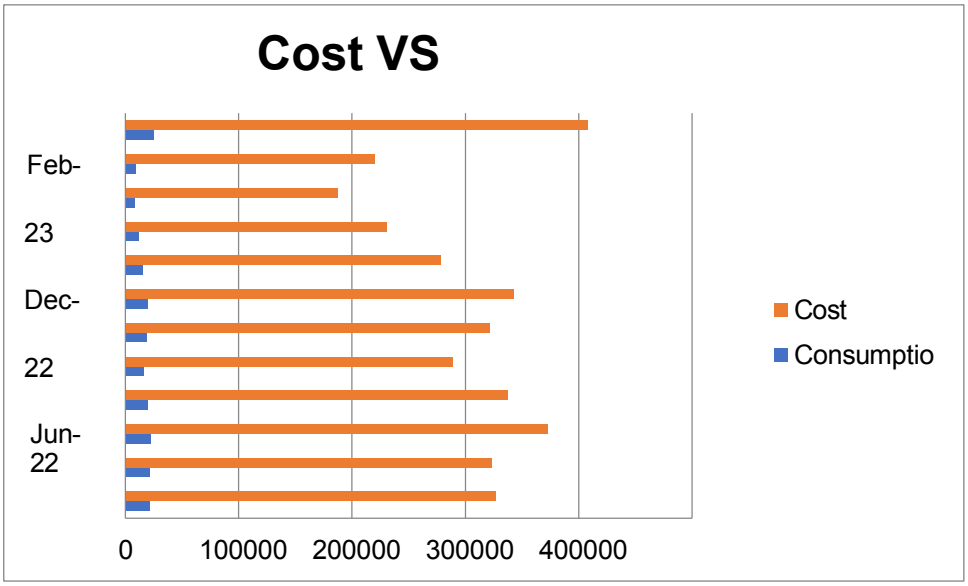


Consumption analysis:

After analysisng the bill the average energy consumption of the institute is about 17646.83 Units



Cost VS Consumption:



ILER analysis:

Lighting is provided in industries, commercial buildings, indoor and outdoor for providing comfortable working environment. The primary objective is to provide the required lighting effect for the lowest installed load i.e. highest lighting at lowest power consumption. The purpose of performance test is to calculate the installed efficacy in terms of lux/watt/m²

(existing or design) for general lighting installation. The calculated value can be compared with the norms for specific types of interior installations for assessing improvement options.

Range	Condition
0.5 or less	Urgent activity required (UAR)
0.51 - 0.70	Review Suggested (RS)
0.70- above	Good

ILER analysis for various sections in SSPACE were carried out. Firstly using LUX meter illumination was measured and then numerical analysis was carried out. ILER gives idea about lighting conditions and measured regarding improving them.

Main Building analysis

Sr. No.	Section	LUX reading	ILER	Condition
1	Library	166	0.71	Good
2	Study room	124	0.71	Good
3	Classroom B1	128	0.77	Good
4	Classrooms B2	107	0.58	Good
5	Laboratories	147	0.84	Good
6	Office	166	0.74	Good

Reasons for Good ILER:

Proper placement of windows and doors so that natural light is available well.
Good ventilation system.

Details of light fittings:

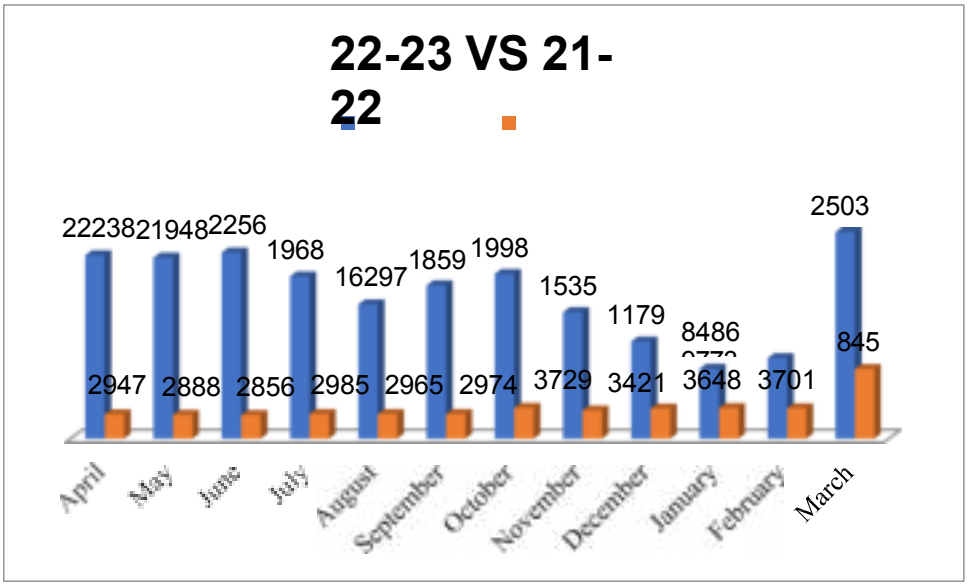
Below table shows the main fitting details in the institute building.

Energy	Count
LED	240
Fans	220
PC	301
Printer	7

Comparison of Electricity Consumption

This section presents comparison of electricity consumption. Comparison of 2022-2023 electricity consumption is done with 2021-2022 electricity data.

Month	Consumption (Kw)	Month	Consumption (Kw
Apr-22	22238	**Apr-21**	2947
May-22	21948	**May-21**	2888
Jun-22	22568	**Jun-21**	2856
Jul-22	19687	**Jul-21**	2985
Aug-22	16297	**Aug-21**	2965
Sep-22	18596	**Sep-21**	2974
Oct-22	19985	**Oct-21**	3729
Nov-22	15358	**Nov-21**	3421
Dec-22	11791	**Dec-21**	3648
Jan-23	8486	**Jan-22**	3701
Feb-23	9773	**Feb-22**	3682
Mar-23	25035	**Mar-22**	8457



Considering the consumption background the average consumption in the year 2022-2023 is 17646 units and consumption in the yare 2021-2022 is 3687.75 units. Comparing both the consumption in 2022-20323 has increased by 13959 units.

Schedule of Lab equipments Physics lab

EQUIPMENTS		Count
1	Transistor in CB Configuration	1
2	Half and Full wave Bridge rectifier with and without filters	1
3	Zener Diode as a shunt voltage regulator	1
4	LDR Characteristics	1
5	Energy Band Gap of semiconductor material using reverse biased PN junction	1
6	To study characteristics of semiconducting diode	1
7	Characteristics of LED Kit	1
8	Resistivity by four probe method	1
9	Study of Hall Effect	1
10	e/m by Thomson method	1
11	Determination of wavelength of spectral line using diffraction grating spectrometer, sodium light system	1
12	Interference of light in the thin film (Newton's Ring Dia)	1
13	Study of Photocell and determination of Planks Constant	1
14	Combine unit / kit for divergence of LASER beam and grating element of a diffraction grating using Laser Beam	1
15	CRO	1
16	Function Generator	1
17	Spirit Level	3
18	Diffraction Grating	2
19	Spectrometer Prism ED 135x25	1

20	Zener Diode characteristics kit	1
21	Ammeter D.C, 0-50 mA	2
22	Ammeter D.C, 0-30 mA	2
23	Ammeter D.C, 0-10 mA	2
24	Voltmeter D.C.0-10 V	2
25	Voltmeter D.C.0-30 V	2
26	Voltmeter D.C.0-50 V	2
27	Prism simple	1
28	Soldering Iron 25W	1
29	Soldering wire	1
30	Soldering Paste	1
31	Screw driver set 812	1
32	Screw driver set 824	1
33	Screw driver set 936	1
34	Multimeter Analog Toyatone	1
35	Sodium Vapour Lamp 35 W	1
36	Mercury Lamp with wooden box and Transformer	1
37	Transistor Characteristics in CE Mode Model : SA-111	2
38	Transistor Characteristics in CB Mode Model : SA-112	1
39	Plano convex Lens	4
40	Semiconductor Diode Characteristics Kit Model : SA-101	2
41	Banana pins 2mm	20
42	Digital Multimeter 3 ¾ Auto ranging DMM with capacitor frequency measurement Make : Meco model : 801	8

43	Magnifier lens with light	2
44	Transistor Characteristics in CB configuration ASICO Kit	2
45	Transistor Characteristics in CE configuration ASICO Kit	2
46	Zener Diode char. Kit ASICO	2
47	PN Junction Diode kit ASICO	2
48	Diffraction Grating	2
49	Half wave Full wave Refractor kit	2
50	Digital Multimeter (inter model)	2
51	Forbidden Energy Gap kit	2
52	CB, CE and CC configuration kit	2
53	Half wave Full wave Rectifier kit	2
54	20 MHz Dual Trace CRO with probe Model :ST-201 Scientech	3
55	Function Generator Model: ST-4060 Scientech	2
56	Spectrometer	1
57	Quartz Prism for double refraction	1
58	Optical Bench 1 meter	1
59	Studty of Hall Effect	1
60	Ditital Multimeter	2
61	Table Lamp	2
62	Zener Diode kit	1
63	PN Junctioin kit	1
64	Zener Diode kit	1
65	PN Junctioin kit	1

66	e/m by Thomson method Complete setup	1
67	e/m by Thomson method Complete setup	1
68	Resistivity of Semiconductor by Four Probe Method	1
69	Sodium Lamp Assembly	1
70	Travelling Microscope	1
71	Diffraction Grating	1
72	Reading Lens	3
73	Spirit Level	1
74	Eye piece	4

Chemistry Lab

EQUIPMENTS		**Count**
1	Pensky Marten Close cup Flash Point App M. No. 1013A	3
2	Red Wood Viscometer No. 1 M. No. 1022C	2
3	Red Wood Viscometer No. 2 M. No. 1024C	2
4	PH Meter with Electrode M. No. 112	1
5	Photo Electric Calorimeter M. No. 312	1
6	Digital PH Meter Make EI Model No. 111	9
7	Weighing M/c Balance Digital Cap. 300 gm Make ELDER	2
8	Ph Meter Digital EI M No. 111	2
9	Digital Conductivity Meter Make EI M No. 611	1
10	Digital Photo Calorimeter Make EI M No. 312	1
11	Red Wood Viscometer No. 1 Model No.1022 A	2
12	Red Wood Viscometer No. 2 Model No. 1024 A	2

13	Pensky Marte Close cup Flash Point Apparatus M. No.1017	2
14	Abel Close cup Flash Point App. Model No. 1003 A	2
15	Water Still Cap. 4 Lit S.S. Distillation Assembly	2
16	Hot Air Oven with Digital Indicator 18"x18" 18" Hicon	1
17	Muffle Furnace (Digital) 1100 C 4x4x9 (Hicon)	1
18	Stop Clock Esel	40
19	Spring Balance Cap. 5 kg	1
20	Spring Balance With Cap. 2kg Barum	1
21	Spring Balance Cap. 5 kg	1
22	Digital pH Meter (EI) M. No. 111	5
23	Digital Conductivity Meter (EI) M.No. 611	1
24	Digital Photoelectric Calorimeter (EI) , M.No. 312	1
25	Heating Mantle Cap 2 Lit	2
26	Redwood Viscometer No.1	5
27	Redwood Viscometer No.2	9
28	Abel Close cup Flash Point Appratus	1
29	Penskey Marten Close cup Flash Point Apparatus	8
30	Claveland Open cup Flash point Apparatus	1
31	Redwood Viscometer No.1	5
32	Claveland Open cup Flash point Apparatus	2
33	Penskey Marten close cup Flash Point Apparatus	2
34	Weighiong M/c Digital Balance 10g to 300g (Aiwa)	1
35	Stop Clock Easel	30
36	Mechanical Stirrer	2

37	Digital Gloss 45 Deg Angle Head (Model No. RSPT-20)	1
38	Heating Mantle Cap. 2 Lit	4
39	Mechanical Stirrer Mount All Purpose/ REMI :RMQ 122/R	4
40	Heating Mantle Cap 2 Lit	1
41	Heating Mental 2000ml	1
42	Heating Mantal 2000 ml	6
43	Abel Flash Point Appratus with regulator	2
44	Heating Mantle Cap 2 Lit	6
45	Weighing M/c Digital Balance Cap. 1Kg (K-Roy)	1

Electronics Devices and Circuit Lab

EQUIPMENTS		**Count**
1	Collpit Oscillator Trainer	1
2	Emitter Follower Trainer	1
3	Two stage RC Coupled Amplifier Trainer	1
4	DC Regulated power supply 0-25V	1
5	DC Regulated power supply 0-15V	1
6	Half wave & Full wave rectifier with filter	1
7	Characteristics of PN Junction Diode	1
8	Characteristics of Zener Diode	1
9	Voltage Doubler Trainer (Voltage Regulator zener diode)	1
10	Characteristics of BJT in CE Mode	1
11	Characteristics of FET	1
12	Voltage Doubler Trainer	1

13	CRO Systronics Model 6020	2

Mechanical Measurement Lab

EQUIPMENT		**Count**
1	Basic Strain Gauge Apparatus	1
2	Measurement of force and weight using Load Cell	1
3	LVDT Instrument	1
4	Speed Measurement by using Inductive Pick up	1
5	Temperature Control using Thermocouple	1
6	Rotameter Test Rig	1
7	Stroboscope	1

Concrete technology Lab

EQUIPMENTS		**Count**
	Cube mould 15 cm	
1	i) 7.5 kg to 8 kg weight	1
2	ii) 9.0 kg to 9.5 kg weight	1
3	iii) 11 kg to 11.5 kg weight	1
4	Slump Test Apparatus	1
5	Tamping Rod	1
6	Cube Mould 7.06 cm	3
7	Fine Sieve 20 cm dia 4.75 mm	1
8	Compaction Factor Apparatus	1
9	LE CHATELIER MOULD (Set of Six)	1
	Enamel Tray	

10	i) 10”x12”	1
11	ii) 18”x12”	1
12	iii) 18”x24”	1
13	Gauging Trowel	2
14	Proving Ring 10 KN	1
15	Proving Ring 25 KN	1
16	Vicat Needle Apparatus	1
17	Beam Mould 150x150x700 mm	3
18	Spring Balance Dial Type 15 cm dia Cap. 50 Kg	2
19	Flow Table Hand Operated	1
20	VEE BEE Consistometer	1
21	Sieve Shaker Gyratory 20 cm	1
22	Hot Air Oven 24”x24”x24” S.S. 3 Tray	1
23	Compression Testing Machine 1000KN (100 Tonne)	1
24	Tiles Abrasion Testing Machine	1
25	Ultrasonic Pulse Velocity Tester	1

Heat Transfer lab

EQUIPMENTS		**Count**
1	Heat Transfer in Force Convection	1
2	Heat Transfer in Natural Convection	1
3	Dropwise & Filmwise condensation App.	1
4	Thermal Conductivity of Insulating Powder	1
5	Parallel Flow/Counter Flow Heat Exchanger	1

6	Stefen Boltzman Apparatus	1
7	Thermal Conductivity of Metal Bar	1

TOM lab

EQUIPMENTS		**Count**
1	Best Indian JPTI Make CAM Analysis Apparatus	1
2	Best Indian JPTI Make Whirling of Shaft App.	1
3	Best Indian JPTI Make Motorised Gyroscope	1
4	Best Indian JPTI Make Universal Vibration App.	1
5	Best Indian JPTI Make Governor Apparatus	1
6	Static and dynamic Balancing App.	1
7	Torsion Testing Machine	1

Digital Circuit lab

EQUIPMENTS		**Count**
1	Basic Logic Gates Trainer	1
2	Demorgan's Theorem Trainer	1
3	R-S Flip flop Trainer	1
4	Demultiplexer trainer kit	1
5	Modulo N Counter	1
6	Half/Full Adder	1
7	Half/Full Subtractor	1
8	TTL Clock Generator	1
9	CRO Systronic 6020	1

10	Trainer Kit for Universal gates by using NOR and NAND Gates Model : SB-312	2
11	Demorgan's Theorem Trainer Model : SB-311	2
12	Half/Full Adder SF : 305	2
13	Half/Full Subtractor SF : 306	2
14	Basic Logic Gates Trainer Kit AET-21 By Aquila	2
15	8:1 Multiplexer Trainer Kit AET 31M By Aquila	2
16	De-Multiplexer Trainer Kit AET 31D BY Aquila	2
17	Flip-Flop Trainer kit AET-60 By Aquila	2
18	Trainer kit of Synchronous counter by Aquilla Model AET 32A	2
19	Trainer kit of Asynchronous counter by Aquilla Model AET 32	2

TV lab

EQUIPMENT		**Counts**
1	Colour TV Trainer (51cm) by Anshuman Model: XPO-COL TV	3
2	Black & White TV Trainer with 14" CRT By Mars Edpal Model: ME 1200	1
3	Antenna Trainer with 10 Antennas (50 to 860 MHz)	1
4	Colour Patttern Genertor By Signet Model: Signet 1053 Mltichannel with colour VHF-UHF Ch.2 to Ch.12 VHF, 1 KHz FM Demodulation Attenuator 20 dB	2
5	Colour Pattern Generator by Saral (Markoni)	2
6	VCR Trainer Depmstratpr by Mars Edpal Model : ME 1215	1

Microprocessor lab

EQUIPMENTS		Count
1	8085 Microprocessor Kit with 16*2 LCD Display Model XPO Kit	5
2	8086 Microprocessor Kit with 16*2 LCD Display Model XPO Kit	5
3	SMPS For Microprocessor 8085 Kit	10
4	101 Keyboard	10
5	RS 232 Serial Link /cable & PC up/down Loading Software & Cross assembler on CD	10
6	8085 Microprocessor Kit with 16*2 LCD Display Model XPO Kit	5
7	8086 Microprocessor Kit with 16*2 LCD Display Model XPO Kit	5
8	SMPS For Microprocessor 8085 Kit	10
9	101 Keyboard	10
10	RS 232 Serial Link /cable & PC up/down Loading Software & Cross assembler on CD	10
11	8051 Microcontroller Kit	1

RAC lab

EQUIPMENT		Count
1	Computerised Variable Compression Ratio Petrol Engine	1
2	Air Conditioner Trainer Duct Type	1
3	Digital Anemometer	1
4	5 Gas Analyser	1
5	24 Column Matrix Printer	1
6	Rolling Charts	38

Production technology lab

EQUIPMENT		Count
1	Floating Carriage Diameter Measuring Machine Model EDM-75	1
2	Sodium Vapour Monochromatic light unit	1
3	Specimen Set: include 4 Test surface of dia 50 mm, Optical flat 01 No. Steel flat 01 No.	1
4	Optical flat 25 mm	1
5	Optical flat 30 mm	1
6	Optical flat 50 mm	1
7	Dial Indicator Range 1mm L.C. 0.001mm	1
8	Straight Edge size 300x50x8	1
9	Straight Edge Size450x50x8	1
10	Tool Maker Microscope Model TM -50	1
11	Venire Height Gauge 12 inch	1
12	Sine Bar 100 mm	2
13	Slip Gauge set	1
14	Dial Gauge Stand	1
15	Digital Micrometre For Floating Carriage	1

Metallurgy lab

EQUIPMENT		Count
1	Impact Testing Machine for Izod & Chirpy Test	1
2	Rockwell Hardness Testing M/c	1
3	Metal Sample Box	1

4	Inclined monocular metallurgical microscope Model n56	1
5	Binocular metallurgical microscope model 57	1
6	Metallurgical Image Analyser	1
7	specimen	1 set

Fluid power lab

EQUIPMENT		**Count**
1	Centrifugal Pump Test Rig	1
2	Reynolds Apparatus	1
3	Verification of Bernoulli's Theorem	1
4	Equipment List	1
5	Rota meter Test Rig	1
6	Flow Measured by Venturimeter & Orifice meter	1

Structural analysis lab

EQUIPMENT		**Count**
1	Behaviour of Column and Truss App.	1
2	Hinged Arches	1
3	Verification of Maxwell Reciprocal Theorem	1
4	Deflection of Truss App.	1

Transportation lab

EQUIPMENT		**Count**
1	Penskey Morten Flash Point App.	1
2	Flakiness Gauge	1
3	Length Gauge	1

4	Standard Penetrometer	1
5	Ring & Ball App.	1
6	Coarse Sieve 45 cm Dia GI	14
7	Ductility Testing Machine Model EIE 040	1
8	Specific Gravity and Water Absor. Test App.	1
9	Aggregate Crushing Value App. 15 CM	1
10	C.B.R. Testing Machine	1
11	Aggregate Impact Testing Machine	1
12	Electronic Balance 10 KG /1GM	1
13	Los Angeles Abrasion Testing Machine	1

Fluid mechanics lab

EQUIPMENT		**Count**
1	Bernoullis Theorem App.	1
2	Impact of Jet App.	1
3	Orifice and Mouthpiece App.	1
4	Reynolds App.	1
5	Metacentric Height App	1
6	Notch Apparatus	1
7	Pitot Tube apparatus	1

Survey lab

EQUIPMENT		Count
1	Levelling Staff 4 mtr (compact)	3
2	Transit Vernier Theodolite	1
3	Measuring chain 30 Mtr 150 Link	3
4	Measuring chain 20 Mtr 100 Link	3
5	Ranging Rod 3 Mtr	5
6	Prismatic Compass	1
7	Surveyers Compass	1
8	Dumpy Level with Stand	3
9	Plane Table	2
10	Measuring Tape Steel 30 Mtr	3
11	Trough Compass	2

Soil lab

EQUIPMENT		Count
1	Liquid Limit Device, Hand operated	1
2	Test Sieves 20 cm dia brass frame size 425 micron	1
3	Plastic limit kit	1
4	Shrinkage Limit Apparatus	1
5	Pycnometer Brass Cone, Metal Ring & Rubber seal	1
6	Particle size determination IS Test sieve 20 cm dia brass frame without any joint 4.75 mm to 150 micron	1
7	Sieve 75 micron	1
8	Lid and Receiver for above	1

9	Permeability Apparatus	1
10	Overhead tank for above made of GI sheet	1
11	Apparatus for soil determination Core cutter with Dolly & Rammer	1
12	Sand Pouring Cylinder Large	1
13	Stop Watch (Mechanical)	5
14	Glass Thermometer 0-200 Degree	1
15	Glass Thermometer 0-50 Degree	1
16	Glass Thermometer 0-110 Degree	1
17	Moisture Cane 50x50MM	4
18	Measuring Cylinder (Glass) 100 ML	2
19	Measuring Cylinder (Glass) 250 ML	2
20	Measuring Cylinder (Glass) 500 ML	2
21	Measuring Cylinder (Glass) 1000 ML	2
22	Measuring Cylinder (Plastic) 50 ML	2
23	Measuring Cylinder (Plastic) 100 ML	2
24	Measuring Cylinder (Plastic) 250 ML	2
25	Measuring Cylinder (Plastic) 500 ML	2
26	Measuring Cylinder (Plastic) 1000 ML	2
27	Evaporating Dish 150 mm dia Porcelain	2
28	Evaporating Dish 100 mm dia Porcelain	2
29	Specific Gravity Bottle 25 ml	1
30	Specific Gravity Bottle 50 ml	1
31	Specific Gravity Bottle 100 ml	1

32	G.I. Tray 18”x24”x2” with Handles	1
33	Moisture Cane 75x50MM	4
34	Glass Rod 20 cm Long x 6 mm dia	2
35	Electronic Balance 500 gm./10mg	1
36	Electronic Balance 50 kg/1g	1
37	Proctor Needle Hydraulic Type	1

Environmental engineering lab

EQUIPMENTS		**Count**
1	Hot Air Oven 14”x14”x14” S.S.	1
2	Ph. Meter PM-100 Digital	1
3	Turbidity Meter	1
4	Sound Level Meter	1
5	Flocculate	1

Engineering geology lab

EQUIPMENTS		**Count**
1	Specimen Rocks	14
2	Specimen Minerals	18
3	Mirror Stereoscope	1
4	Transparent Geographical Globe	1
5	Bruntan Compass	1
6	Charts	9
7	Models	25

Details of PC, CPU, Keyboard and Mouse in Programming labs

Lab Name	EQUIPMENTS		Count
PROGRAMMING LAB 2	1	MONITOR	24
		CPU	24
		KEYBOARD	24
		MOUSE	24
PROGRAMMING LAB 2	2	MONITOR	60
		CPU	60
		KEYBOARD	60
		MOUSE	60
PROGRAMMING LAB 3	3	MONITOR	60
		CPU	60
		KEYBOARD	60
		MOUSE	60
DBMS LAB	4	MONITOR	24
		CPU	24
		KEYBOARD	24
		MOUSE	24
OPERATING SYSTEM LAB	5	MONITOR	24
		CPU	24
		KEYBOARD	24
		MOUSE	24
COMPUTER NETWORK LAB	6	MONITOR	16
		CPU	16
		KEYBOARD	16
		MOUSE	16

ENVIRONMENTAL & CIVIL ENGINEERING SOLUTIONS

CERTIFICATE

ENVIRONMENT AUDIT

THIS CERTIFICATE IS PROUDLY PRESENTED TO

Shri Shankarprasad Agnihotri College of Engineering, Wardha

Our team of Environmental Engineers have analyzed Environment-friendly practices followed by the Institution

Nikhil N Kamble
CEO

ECS

Seema N Kamble
Director

ACADEMIC YEAR 2022-2023

ENVIRONMENTAL & CIVIL
ENGINEERING SOLUTIONS

CERTIFICATE

GREEN AUDIT

THIS CERTIFICATE IS PROUDLY PRESENTED TO

Shri Shankarprasad Agnihotri College of Engineering, Wardha

Our team of Environmental Engineers have analyzed Green, Energy, and Environment practices followed by the Institution.

Nikhil N Kamble
CEO

ECS

Seema N Kamble
Director

ACADEMIC YEAR 2022-2023


2022-23
IAF
ISO
CERTIFICATE
ENERGY AUDIT
THIS CERTIFICATE IS PROUDLY PRESENTED TO
Shri Shankarprasad Agnihotri College of Engineering, Wardha
Our team of Environmental Engineers have analyzed Sustainable Energy practices followed by the Institution.
ECS
Nikhil N Kamble
CEO
Seema N Kamble
Director
PRINCIPAL
Shri Shankarprasad Agnihotri
College of Engineering, WARDHA