GREEN INITIATIVES AND WASTE MANAGEMENT AT CUTM

Centurion UNIVERSITY
Shaping Lives...
Empowering Communities...

Centurion University of Technology and Management
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2021-2022

ENVIRONMENT AUDIT CMMITTEE MEMBERS FROM CUTM-PKD CAMPUS

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1. INTRODUCTION

Environment Audit is a process of systematic identification, quantification, recording, reporting and analysis of components of environmental diversity of various establishments. It aims to analyze environmental practices within and outside of the concerned sites, which will have an impact on the eco-friendly ambience. Green audit can be a useful tool for a university to determine how and where they are using the most energy or water or resources; a university can then consider how to implement changes and make savings. It can also be used to determine the type and volume of waste, which can be used for a recycling project or to improve waste minimization plan. It can create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of Green impact on campus. If self-enquiry is a natural and necessary outgrowth of a quality education, it could also be stated that institutional self-enquiry is a natural and necessary outgrowth of a quality educational institution. Thus it is imperative that the college evaluate its own contributions toward a sustainable future. 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. The rapid urbanization and economic development at local, regional and global level has led to several environmental and ecological crises. On this background it becomes essential to adopt the system of the Green Campus for the institutes which will lead for sustainable development and at the same time reduce a sizable amount of atmospheric carbon-di-oxide from the environment. The National Assessment and Accreditation Council, New Delhi (NAAC) has made it mandatory that all Higher Educational Institutions should submit an annual Green Audit Report. Moreover, it is part of Corporate Social Responsibility of the Higher Educational Institutions to ensure that they contribute towards the reduction of global warming through Carbon Footprint reduction measures.

Institutional self-inquiry is a natural and necessary outgrowth of quality of higher education. Concern about environmental degradation and realization of values of environment are logical consequences of scholarly research, teaching and learning process. In its pursuit for improving environmental quality and to maintain a pristine environment for the future generation of students, Centurion University has made a self-inquiry on environmental quality of the campus with the following objectives: (i) To establish a baseline of existing environmental conditions

with focus on natural and physical environment; (ii) To understand the current practices of sustainability with regard to the use of water and energy, generation of wastes, purchase of goods, transportation, etc; (iii) To promote environmental awareness through participatory auditing process; and (iv) To create a report that document baseline data of good practices and provide future strategies and action plans towards improving environmental quality for future.

2. EXECUTIVE SUMMARY

a. Water Management As such, wise use of water is a general practice at our University. Rainwater harvesting is in practice in most of the departments.

b. Waste Management: Land filling is the general waste management strategy adopted by the University and there is no management plan for managing inorganic waste, especially plastics. Biogas plants for effectively managing organic wastes are established in facilities that produce more organic wastes such as canteen, hostels and staff quarters. The campus should be declared free from plastic carry bags and this should be put into practice strictly. However, more departments are now following green charter and started avoiding flex banners and plastic carry bags and cups for social functions and academic programmes.

c. Solar Energy Management: Total electrical consumption in a year is 850kW. At present we are in a position to generate 85kW from Solar Power Plant at the roof-top of the MBA, MDC, CRC-1 and CRC-2. By July 2020 we will be capable of generating 595kW of electricity and it serves as a model for using nonconventional energy sources for future.

d. Landscape/environment: Many departments maintain garden and the campus is greener with fair biodiversity around and gardens maintained by many departments. Absence of long-term eco-restoration programmes for replacing exotic Acacia plantations and land use and development planning remain as a lacuna.

e. Built-up Environment: In general, the built-up environment is not eco-friendly and there is a need for adopting green habitat concept in future planning of buildings.

f. Transportation: Majority of the students in the campus rely on public transport, indicating lesser carbon foot print of the student community.

g. Green Agenda in Syllabus: Green agenda form part of the curriculum in many departments and eco/nature clubs remain active for the cause of environmental protection, though it is not a common practice in all the departments in the campus.

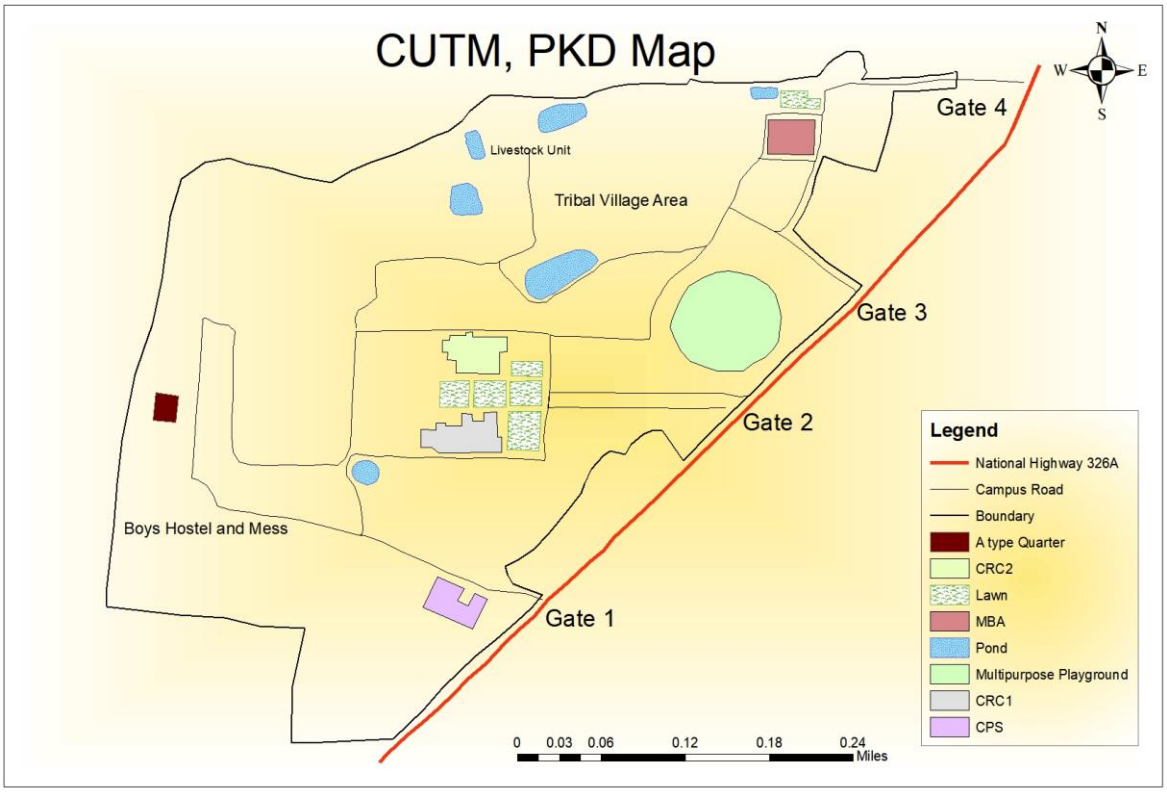
h. Water Quality: In general, is within the stipulated standards**,** though absence of coliform bacteria in all the samples tested indicates no possible contamination with sewage water.

In recent time, the Green Audit of an institution has been becoming a paramount important for self-assessment of the institution which reflects the role of the institution in mitigating the present environmental problems. The university has been putting efforts to keep our environment clean since its inception. But the auditing of this non-scholastic effort of the college has not been documented. Therefore, the purpose of the present green audit is to identify, quantify, describe and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies and standards. The main objectives of carrying out Green Audit are:

1. To map the Geographical Location of the university
2. To document the floral and faunal diversity of the university.
3. To record the meteorological parameter.
4. To document the Waste disposal system
5. To document the ambient environmental condition of air, water and noise of the university
6. To introduce and aware students to real concerns of environment and its sustainability

3. TO MAP THE GEOGRAPHICAL LOCATION OF THE UNIVERSITY:

The journey of Centurion University of Technology and Management (CUTM) began in the year 2005 by a group of ambitious academics with aspirations to provide high quality education both nationally and internationally. The first step in this direction was to take over an ailing engineering Institute, the Jagannath Institute for Technology and Management (JITM) in one of the most challenging tribal districts of Odisha and one which was considered to be a left-wing extremist affected area. Subsequently, JITM was transformed into Centurion University of Technology and Management in August 2010, through an act of Odisha Legislative Assembly. It became the First Multi-Sector State Private University in Odisha.



Mission: A globally accredited human resource center of excellence catalyzing "sustainable livelihoods" in the "less developed markets across the globe".

Vision: Provision of quality, globally accredited academic programmes in technology and management. Delivery of globally accredited employability training for less endowed segments of the population. Promotion of entrepreneurial culture and enterprise in the target areas. Facilitating improved market access to goods and financial services to the target population. Promotion of lighthouse project interventions in the target area.

4. **<u>THE FLORAL AND FAUNAL DIVERSITY OF THE UNIVERSITY</u>:** Our campus is rich of biodiversity and the details are as follows:

5. METEOROLOGICAL PARAMETERS OF CUTM-PKD (Year -2021)

AMMUAL CLIMATOLOGICAL SUMMARY

NAME : CUTM paralakhemundi CITY: STATE :

ELVE : 0 ft LAT: 18 59' 00" N LONG: 84 14' 00" E

TEMPERATURE (0C), HEAT BASE 18.3 , COOL BASE 18.3

YR	MO	MEAN MAX	MEAN MIN	MEAN	DEP. FROM NIRM	HEAT DEG DAYS	COOL DEG DAYS	HI	DATE	LOW	DATE	MAX >=32	MAX < = 0	MIN < = 0	MIN < = -18
21	1	30.9	17.0	22.6	0.0	13	142	33.4	10	11.6	5	10	0	0	0
21	2	32.0	16.0	22.3	0.0	13	88	38.5	26	12.6	3	10	0	0	0
21	3	35.2	21.3	26.1	0.0	0	94	42.4	31	16.4	4	29	0	0	0
21	4	37.3	24.7	29.8	0.0	0	262	40.8	26	21.0	4	29	0	0	0
21	5	37.1	25.6	30.2	0.0	0	330	40.9	27	22.9	5	31	0	0	0
21	6	34.0	26.4	29.5	0.0	0	168	37.8	6	23.9	30	22	0	0	0
21	7	32.4	26.0	28.7	0.0	0	184	35.2	1	24.3	20	16	0	0	0
21	8	32.9	25.4	28.4	0.0	0	201	36.3	10	23.9	27	19	0	0	0
21	9	32.1	25.2	27.6	0.0	0	207	34.9	18	24.0	28	18	0	0	0
21	10	32.0	24.3	27.3	0.0	0	225	34.8	10	20.4	26	15	0	0	0
21	11	29.4	22.0	25.1	0.0	0	142	32.8	22	17.7	9	1	0	0	0
21	12	28.2	17.0	21.7	0.0	20	117	30.7	7	9.9	22	0	0	0	0
		32.8	22.6	26.6	0.0	46	2160	42.4	MAR	9.9	DEC	200	0	0	0

PRECIPITATION (mm)

YR	MO	TOTAL	DEP. FROM NORM	MAX OBS. DAY	DATE	DAYS OF RAIN OVER .2	2	20
21	1	25.9	0.0	25.7	30	2	1	1
21	2	0.0	0.0	0	1	0	0	0
21	3	10.7	0.0	10.7	31	1	1	0
21	4	13.2	0.0	7.9	19	5	2	0
21	5	94.0	0.0	38.9	21	10	8	1
21	6	152.9	0.0	45.2	2	10	8	4
21	7	255.8	0.0	56.6	13	17	15	6
21	8	225.3	0.0	59.9	15	19	13	4
21	9	360.7	0.0	64.5	28	20	18	5
21	10	99.3	0.0	33.0	16	9	6	1
21	11	130.3	0.0	40.1	22	10	7	3
21	12	65.0	0.0	24.6	4	4	4	1
		1433.1	0.0	64.5	SEP	107	83	26

WIND SPEED (km/hr)

YR	MO	AVG.	HI	DATE	DOM DIR
21	1	1.5	24.1	28	N
21	2	1.3	30.6	21	N
21	3	0.8	30.6	13	N
21	4	2.9	54.7	14	N
21	5	3.2	69.2	2	N
21	6	1.8	45.1	2	N
21	7	1.5	38.6	4	NNW
21	8	1.7	37.0	13	N
21	9	1.8	46.7	26	NNW
21	10	1.3	38.6	3	S
21	11	1.1	24.1	24	S
21	12	1.5	43.5	1	S
		1.7	69.2	MAY	N

6. SPECIALIZED NOISE PROTECTION PRODUCTS AND TECHNIQUES:

Each of these is designed for a very specific source of noise. If there is a product or gadget that specifically addresses the kind of noise you're dealing with, it might be a more suitable solution than one of the general-purpose approaches above.

- **Quiet models of noisy products**. Certain home appliances, tools, and vehicles generate a lot of noise. Some manufacturers have developed quiet versions, models that are specially designed to emit less noise. Choose a quiet model and you can reduce noise right at the source.
- **Special gadgets and ingenious ideas**. In this category are a hodgepodge of clever devices and techniques, each of which addresses a specific source of noise.

Personal Actions to Reduce Noise: You might need to take more personal action to resolve a noise problem, especially when neighbours are the source of noise. The action might be as simple as closing a window at night to reduce the noise coming in from outdoors. Other possible actions include:

- Negotiating with your neighbours
- Taking legal action
- "Punishing" your neighbours, or the revenge approach
- Adapting your schedule or rearranging your surroundings
- Moving to a new home (a last resort!)

Some of these measures can take weeks, months, or even years to accomplish and lead to satisfying results. In the meantime, be sure to protect your sanity. One final thing to consider is whether you or someone living with you has a medical condition that affects sensitivity to sound. If so, you'll want to learn as much as you can about it so you can address it to the extent possible and find ways of compensating for it.

7. NOISE LEVEL CHART AT CUTM PKD CAMPUS *A noise level chart showing examples of sounds with dB levels ranging from 0 to 180 decibels.*

dBA	EXAMPLE	CUTM PKD Campus
0	Healthy hearing threshold	
10	A pin dropping	
20	Rustling leaves	Temple
30	Whisper	Library
40	Babbling brook	Computer lab
50	Light traffic	Mechanical lab
60	Conversational speech	Ag B.Sc. and M.Sc. Labs
70	Shower	CRC – I and CRC-II
75	Toilet flushing	
80	Alarm clock	ITI Lab
85	Passing diesel truck	Seminar Hall during Seminar
90	Squeeze toy	Civil engineering Lab
95	Inside subway car	Work shop
100	Motorcycle (riding)	
105	Sporting event	
110	Rock band	
115	Emergency vehicle siren	
120	Thunderclap	
125	Balloon popping	
130	Peak stadium crowd noise	
135	Air raid siren	
140	Jet engine at take-off	
145	Firecracker	
150	Fighter jet launch	
155	Cap gun	
160	Shotgun	
165	.357 magnum revolver	
170	Safety airbag	
175	Howitzer cannon	
180	Rocket launch	
...		
194	Sound waves become shock waves	

Most noise levels are given in dBA, which are decibels adjusted to reflect the ear's response to different frequencies of sound. Sudden, brief impulse sounds, like many of those shown at 120 dB or greater, are often given in dB (no adjustment).

8. WASTE DISPOSAL AND MANAGEMENT SYSTEM

a) Solid Waste Management

b) Watershed Management

c) Waste Water Treatment

d) Greenhouse gas (GHG) inventory

a) Indicator: Solid Waste Management

Goal: Conversion of food and vegetable waste to Biogas
Benchmark:

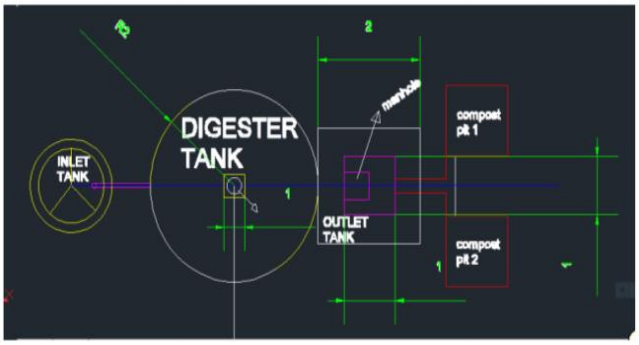
- Steps should be taken to use the food and vegetable waste as Biogas.
- The college has the complete data of food and vegetable waste from all the student mess.

Performance: The College has the complete data of the food and vegetable waste generated from the student mess. The table below shows the data of the food and vegetable waste.

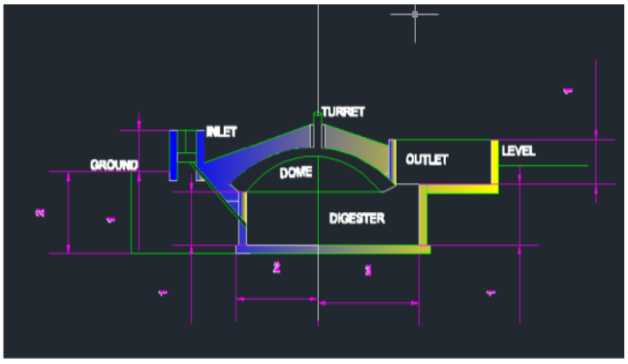
Categories	Vegetable waste (kg)	Food Waste (kg)
SOUTH MESS	1021.54	769.61
NORTH MESS	3241.42	1492.56
ITI MESS	921.49	1782.65

From the waste generated the food and vegetable waste are placed in the digester tank where the anaerobic reaction takes place to produce bio gas. Earlier there was no monitoring of the waste generated from the student mess. All the waste including food waste was dumped at one place. The college has started monitoring the food and vegetable waste generated from the student mess which can be used for the biogas generation. The college has already planned to collect the waste and construct a biogas plant inside the campus to convert the food and vegetable waste into Biogas.

Vegetable Waste



Plan of the Biogas plant



Section of the Biogas plant

Biogas model

Recommendations:

- The college should start this project as soon as possible to use waste in a proper way.
- The biogas will save 6 to 7 LPG cylinders after fermentation of 30 days.
- The digested slurry can be used in agricultural fields.
- Electricity can also be generated by using copper and zinc plates.

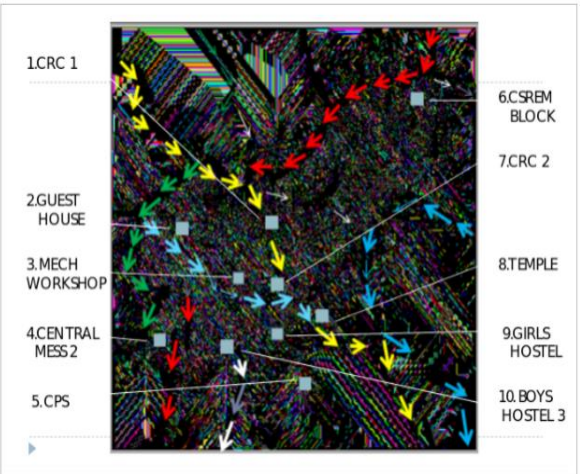
b) Indicator: Watershed Management

Goal: To control soil erosion
Benchmark:

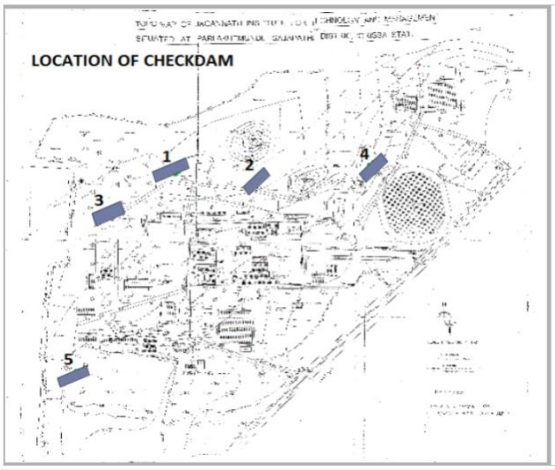
- The college should take steps towards land stabilization by way of controlling soil erosion through construction of check dams in the sloppy areas.
- This will eventually enhance the ground water resources.

Performance: There are existing drainage in the college which are provided in each road side for proper drainage of rain water. The sloppy areas in the college are identified according to the flow of drain water with the help of contour maps. The college should construct check dams in the sloppy areas to control soil erosion.

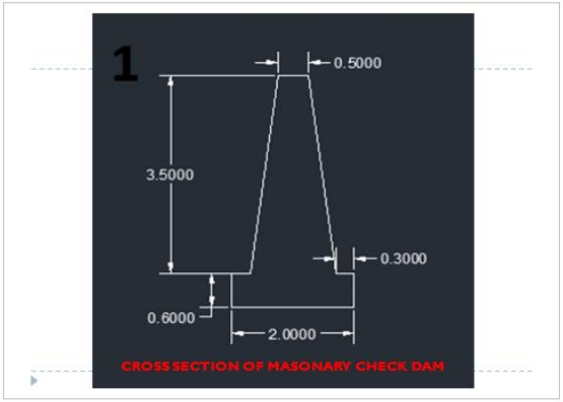
This enhances the ground water resources which can be used for the agricultural purpose of the college. In dry season the plants in the college get dried so we can water the plants by using this water. The water is not required to be treated and can be used directly for watering. This avoids the cost of treatment and is cheaper to water the plants.



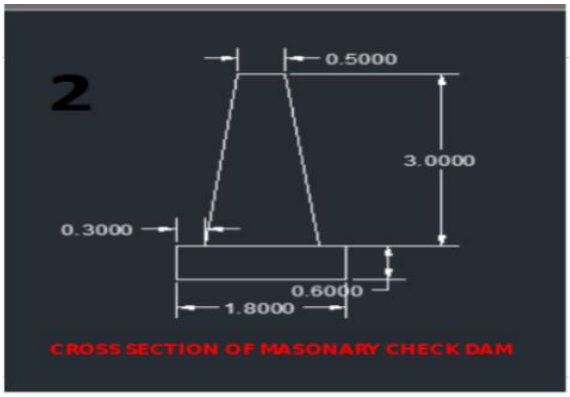
Natural Drainage network order map



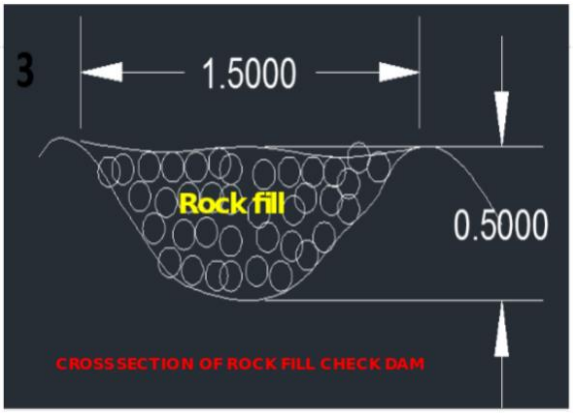
Location of check dam



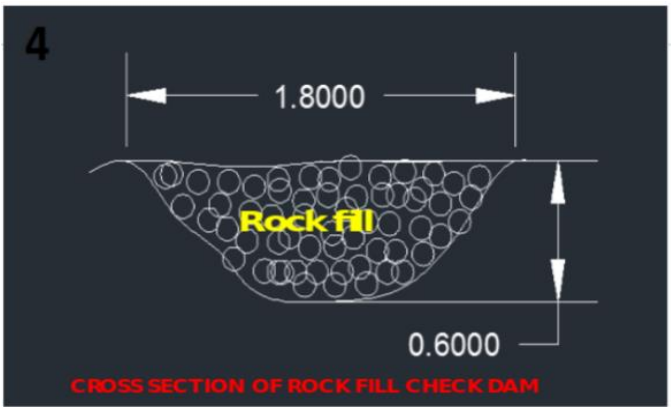
Check dam at location 1



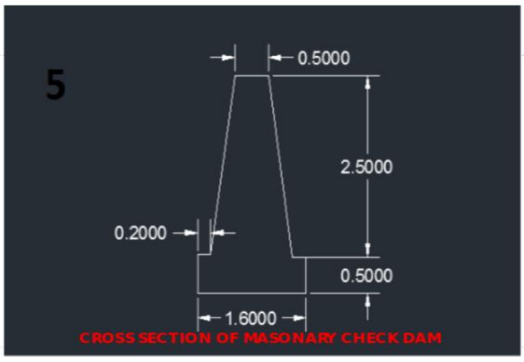
Check dam at location 2



Check dam at location 3



Check dam at location 4



Check dam at location 5

Recommendations:

- The college has now taken step to construct check dams at the sloppy areas.
- The check dams can conserve water needed for agricultural purpose.

c) Indicator: Waste Water Treatment

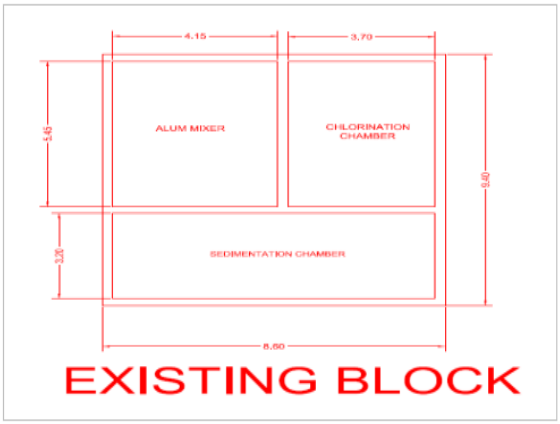
Goal: To use the waste water in an efficient way
Benchmark:

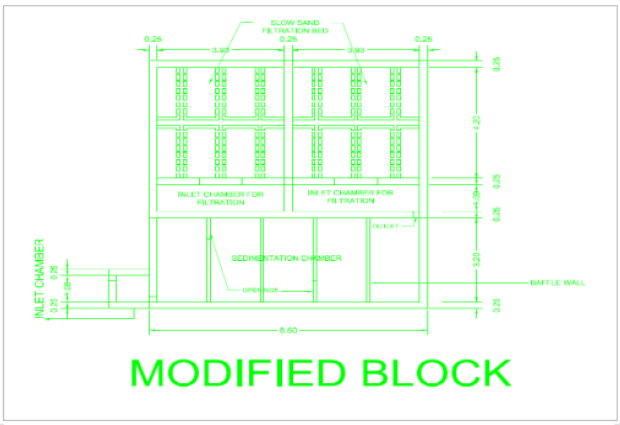
- The waste water collected from the bathrooms of the hostel will be treated to use for gardening of the plants.

Performance: The waste water of bathrooms pH value, hardness, DO and BOD does not exceed the standard values. Therefore, the college has thought of treating the waste water which are collected from the bathrooms of the hostels to treat it and to use it for gardening purposes. By this process the college want to build an eco-friendly environment. In dry season the water can be used to plant the agricultural fields in the college.

Locations	Total Hardness (ppm)	Dissolved Oxygen (mg/lit)	BOD (in %) if Fraction Ratio is 0.02	pH
Hostel – 2,4 and Mess – 2	265.3	4.14	23	7.72
Hostel – 5 and Mess – 1	432.3	1.38	23	7.02
Hostel – 3	256.8	3.22	45.65	7.80
Hostel – 1	243.9	1.84	23	7.61
Mahendra Tanaya Girls Hostel	346.7	0.92	23	7.06
ITI Hostel	171.22	2.76	46	7.21
MBA mess	321	1.84	46	6.52
MBA Girls Hostel - 1	128.4	2.3	91.65	7.15
MBA Girls Hostel – 2	149.8	5.06	46	7.33

There is an existing treatment tank in the campus which can be modified in a better way to treat the waste water. The modified plan is already given to college and it is asked to construct according to it.





The college has taken step to modify the existing treatment plant and to treat the waste water.

Recommendation:

- The treated water can be used for gardening purpose as the values does not exceed the standard values.
- Treated water can be used for the fishery.

Introduction: Colleges and Universities have broad impacts on the world around them, both negative and positive. The activities pursued by colleges can create a variety of adverse environmental impacts. But colleges are also in a unique position as educational institutions to be leaders in pursuing environmentally sustainable solutions.

Centurion University expresses its commitment to sustainability in many ways. It has taken a number of positive steps to reduce its environmental impact. But many areas remain in which substantial improvements can be made. This report serves to highlight Centurion' s many accomplishments, and to make recommendations for improving the College' s environmental sustainability.

d) Indicator: Green House Gas Inventory

Goal: Encourage full accounting of GHG emissions in all areas of campus operations.

Benchmark:

- Conduct GHG inventory for all campus options

Performance:

- The college has not conducted any official Green Audit by an external agency. But, it has adopted various measures to maintain the greeneries of the campus and it has been observed that it creates a positive impact on the beholder and helps in developing an environment-friendly attitude in one and all.
- The chemistry department is provided with a yearly report on the type and amount of emissions from the electrical generator and hostels. This report does not account for all utility use on campus, especially the off-campus buildings, which are monitored separately.

During the winter semester of 2014, centurion students administered a full report of centurion' s GHG emissions for campus utilities.

GHG inventory which included commuting to school, transportation of garbage to the landfill and wastewater and solid waste.

Recommendations:

- Actions to encourage the choice of vehicles with lower fuel consumption by staff hiring cars.
- Measures to encourage travel avoidance, including greater use of web-based or video conferencing such as the WebEx system already in place.
- REDUCE use of refrigerants in air conditioning and cooling equipment.
- Minimisation in the use of wood and coal in this campus is a serious measure adopted by the administration to reach the Carbon neutrality.
- Parking private cars outside the main campus has also helped us to reduce the carbon emission rate.

9. HERBAL GARDEN DETAILS AT CUTM-PKD Campus

SI.NO.	COMMON NAME	SCIENTIFIC NAME	FAMILY	PLANT PART USED
1.	Aloe	*Aloe vera*	Asphodelaceae	Leaf
2.	Periwinkle	*Catharanthus roseus*	Apocynaceae	Plant
3.	Stevia	*Stevia rebaudiana*	Asteraceae	Plant , leaves
4.	Aswagandha	*Withania somnifera*	Solanaceae	Roots , leaves
5.	Medicinal coleus	*Coleus forskohii*	Lilliaceae	Roots
6.	Isagbol	*Plantago ovata*	Plantaginaceae	Seed husk
7.	Tulasi	*Ocimum sanctum*	Lamiaceae	Leaves
8.	Sarpagandha	*Rauvolfia serpentina*	Apocynaceae	Root
9.	Devil pepper	*Rauvolfia tetraphylla*	Apocynaceae	Root
10.	Glory lily	*Gloriosa superba*	Colchiaceae	Seeds
11.	Gangusiuli/parijata	*Nyctanthes arbour-tristis*	Oleaceae	Flowers
12.	Sweet flag	*Acorus calamus*	Acoraceae	Rhizome
13.	Bhumiamla	*Phyllanthus amarus*	Phyllanthaceae	Whole parts
14.	Four 'o' clock	*Mirabilis jalapa*	Nyctaginaceae	Root
15.	Anantamula	*Hemidesmus indicus*	Apocynaceae	Root
16.	Gudmar	*Gymnema sylvestre*	Apocynaceae	Leaves
17.	Asthma plant	*Euphorbia hirta*	Euphorbiaceae	Leaves
18.	Aonla	*Phylanthus emblica*	Phyllanthaceae	Fruits
19.	Mugwort	*Artemisia vulgaris*	Asteraceae	Leaves
20.	Bhringraj	*Eclipta alba*	Asteracea	Leaves
21.	Turmeric	*Curcuma longa*	Zingiberaceae	Rhizome
22.	Chaksu seed	*cassia absus*	Fabaceae	Leaves , seed
23.	Hadjod	*Cissus quadrangularis*	Vitaceae	Roots , stem
24.	Aparijata	*Clitoria ternate*	Fabaceae	Root
25.	Long pepper	*Piper longum*	Piperaceae	Fruit
26.	Black pepper	*Piper nigrum*	Piperaceae	Fruit
27.	Indigo	*Indigofera tinctoria*	Fabaceae	Plant , leaves
28.	Eswarmooli	*Aristolochia indica*	Aristolochiaceae	Plant
29.	Doctor bush	*Plumbago zeylanica*	Plumbagoginaceae	Plant
30.	Malabar nut/ vasak	*Justicia adhatoda*	Acanthaceae	Leaves
31.	Bramhi	*Bacccopa monnieri*	Plantaginaceae	Whole plant
32.	Vetiver grass	*Chrysopogon zizanoides*	Poaceae	Root
33.	Guduchi	*Tinospora cordifolia*	Menispermaceae	Whole plant
34.	Datura	*Datura stramonium*	Solanaceae	Leaves
35.	Touch me not	*Mimosa pudica*	Fabaceae	Leaves
36.	Mountain knot grass	*Aerva lanata*	Amaranthaceae	Whole plant
37.	Apamaranga	*Achyranthus aspera*	Amaranthaceae	Root
38.	Air plant	*Bryophyllum pinnatum*	Crassulaceae	Leaves
39.	Crepe ginger	*Cheilocostus speciosus*	Costaceae	Rhizome
40.	Blue ginger	*Alpinia galanga*	Zingiberacea	Root , rizhome
41.	Blue porter weed	*Stachytarpheta jamecensis*	Verbenaceae	Whole plants
42.	Kalmegh	*Andrographis panniculata*	Acanthaceae	Leaves & roots
43.	Ambrette	*Abelmoschus moschatus*	Malvaceae	Seed
44.	Babachi	*Psoralea corylifolia*	Fabaceae	Seeds&plants
45.	Lemon grass	*Cymbopogon citratus*	Poaceae	Leaves
46.	Sandal wood	*Santalum album*	Santalaceae	Heart wood
47.	Durlabha tulasi	*Ocimum basillicum var. thyrsiflora*	Lamiaceae	Leaves
48.	Arakha	*Calatropis gigantea*	Asclepiadaceae	Milky juice
49.	Multivitamin plant	*Sauropus androgynous*	Phyllanthaceae	Leaves
50.	Indian peony weed	*Centalla asiatica*	Apiaceae	Leaves
51	Baël	*Aegle marmelos*	Rutaceae	Fruit
52.	Asparagus	*Asparagus officinalis*	Asparagaceae	Spears
53.	Star gooseberry	*Phyllanthus acidus*	Phyllanthaceae	Leaves, roots & fruit
54.	Pandan leaf	*Pandan amaryllifolius*	Pandanaceae	Leaves
55.	Polygonum	*Polygonum sp*	Polygonaceae	Roots, seeds
56.	Kalanchoe	*Kalanchoe lantceolata*	Crassulaceae	Leaf
57.	Gudmar	*Gymnema sylvestris*	Apocynaceae	Roots
58.	Large flower kleinia	*Notonia grandiflora*	Asteraceae	Flowers, fruits and leaf
59.	Indigo	*Indigofera tinctoria*	Fabaceae	Roots
60.	Jyothishmathi (Black oil plant)	*Celastrus paniculatus*	Celastraceae	Seed, leaf, bark and flower
61.	Longpepper	*Piper longum*	Piperaceae	Fruit
62.	Elephant crepper	*Argyrela nervosa*	Convolvulacea	Roots
63.	Pasanbhedi	*Coleus barbatus*	Lamiaceae	Root
64.	Kesaraju	*Eclipta prostrata*	Asteraceae	Stem
65.	Prasarini	*Paederia foetida*	Rubiaceae	Leaves, roots
66.	Agathi	*Sesbania grandiflora*	Fabaceae	Root and bark
67.	Arabian jasmin	*Jasminum sambac*	Oleaceae	Flower
68	Guggal	*Commiphora wightii*	Burseraceae	Whole plant
69.	Blue rattlepod	*Crotolaria verrucosa*	Fabaceae	Seed, leaf, bark and flower
70.	Indian ipecac	*Tylophora indica*	Apocynaceae	Roots
71.	Kanchan	*Bauhinia variegata*	Fabaceae	Roots
72.	Jatropa	*Jtropa curcas*	Euphorbiaceae	Seeds, leaf, bark
73.	Pomegranate	*Punica granatum*	Punicaceae	Seed, leaf, bark and flower
74.	Vitex	*Vitex negundo*	Lamiaceae	Fruit and seed
75.	Visalyakarani	*Tridex procumbence*	Asteraceae	Whole plant
76.	Ashoka	*Saraca asoca*	Fabaceae	Bark
77.	Arani	*Premna latifolia*	Lamiaceae	Root, bark
78.	Red sandal wood	*Pterocarpus santalinus*	Fabaceae	Center of the trunk
79.	Henna	*Lawsonia inermis*	Lytheraceae	Leaf
80.	China rose	*Hibiscus rosa-sinensis*	Malvaceae	Flowers, roots , leaf
81.	Bahada	*Terminalia bellirica*	Combretaceae	Seed, leaf, bark and flower
82.	Cotton	*Gossypium hirsutum*	Malvaceae	Root
83.	Bay leaf	*Cinnamomum tamala*	Lauraceae	Leaf
84.	Kamini	*Murraya exotica*	Rutaceae	Whole plant part
85.	Asian bushbeech	*Gmelina asiatica*	Verbenaceae	Seed
86.	Bharangi	*Clerodendrum serratum*	Lamiaceae	Roots and leaves

10. ORGANIC RESEARCH FARM at CUTM-PKD Campus:

1. Faculty In charge: Dr. Saurav Barman

2.**" Organic agriculture is a unique production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity, and this is accomplished by using on-farm agronomic, biological and mechanical methods in exclusion of all synthetic off-farm inputs" .**

-FAO

3. **Objectives**

a. To study the productivity, profitability, sustainability quality and input use efficiencies of different crops and cropping systems under organic farming in different agro-ecological regions.

b. To develop efficient crop and soil management options for organic farming.

c. To develop need-based cost effective new techniques for farming.

4. **Description**

There are two research plots with the following details

S.No	Research Title	Research Area	No. of Treatments	Variety
1.	Effect of levels of manures on performances of growth and yield parameters of Maize	162sqm	9	Kaveri 50
2.	Effect of levels of manures on performances of growth and yield parameters of Sunflower	126sqm	7	Sumitra SH4999

Azolla Production Unit

S.No	Variety	Size of the pit
1	Azolla microphylla	2.18m x 1.11m x 0.4m
2	Azolla pinnata	2.18m x 1.12m x 0.4m

Four chambered Vermicompost unit of Size: 3m x 1.2m x 0.8m

5. Training for Students

- Each year B.Sc.(Ag) students of MSSSoA undergo AELP programme on Organic Research Farm
- Thirty four students of B.Sc. (Ag) final year have undertook the AELP programme during 2016-17, 2017-18, 2018-19,2019-20,2020-21,2021-22.

6. **Outcome**

- To study the efficiency of FYM and Vermicompost.
- To study the yield and growth parameters of different crops taken up

7. Student' s involvement in Unit

Application of Vermiwash for Tomato Crop

Application of Agniastra for Tomato Crop

Pruning of Tomato Crop

Field preparation

Pit preparation for dragon fruit nursery

Applying poultry manure in Ber plant

8. **Trainings and Visits**

Visit of NGO's members

Visit of NSDC Official Dr. Gipson Verghese

Visit of Punjab Minister and Prof. Mukti K Mishra

DEMONSTRATION WITH OFICIALS

DEMONSTRATION TO THE FARMER

DEMONSTRATION TO THE STUDENTS

COMPOSTING UNIT AT PKD Campus:

1. **Faculty In charge:** Dr.Saurav Barman
2. **Objectives**

a.Promotion of employment opportunities and entrepreneurship development of agricultural graduates by providing knowledge and hands on training on composting.

b.To motivate, train, provide technical assistance and disseminate information on compost production to increase employment opportunities and income generation.

c. To test and verify the technologies to suit various size farms.

d. To impart training to the farmers, rural, youth and field level extension functionaries by following the principles of teaching by doing and learning by doing.

3. **Description**

The unit has one large shed containing 20 (2.6m x 1.35m each) tanks for Vermicompost and 16 small sheds (10m x 21m each) for demonstrating of different methods of compost production (NADEP, Bangalore, Coimbatore and Indore) and preparation of Organic pesticides (Panchagavya, Dasagavya, Saptagavya and Enriched Panchagavya). The facility is also having eleven tanks of 7m x 2m and 3m x 2m for the production of Azolla.

Table:1 Particulars of Different sheds used for the production of compost

S.no	Production Unit	Number	Size
1.	Cement Ring	11	0.9m x 0.6m
2.	HDPE	4	3.55m x 1.20m
3.	Sheds	16	10.7m x 3.1m

4.	Azolla Tanks a. Large b. Small	 6 11	 3.2m x 2.10m 7m x 2m

Shed cost Rs 200/sqft

4. **Training**

a. Farmers

Every month training programme on vermicompost are organized to farmers in Gajapathi district of Odisha. The number of farmers trained are

1. 2016-17 -100
2. 2017-18 -1000
3. 2018-19 -723

b. Students

- Each year B.Sc (Ag) students of MSSSoA undergo AELP programme on vermicomposting.
- Fourty five students of B.Sc(Ag) final year have undertook the AELP programme during 2016-17, 2017-18, 2018-19,2019-20,2020-21,2021-22.

Village Adoption

Vermicompost technology has been demonstrated in 60 different villages. Four villages Barlanda, Routhpur, Jhampiguda, Thotagumuda were the adopted by M.S.Swaminathan School of Agriculture.

5. a. **Output**

- The farmers numbering 1823 in nine districts of South Odisha and three districts of North Coastal Andhra Pradesh were trained for production of vermicompost. Majority of them are using this technology for vermicompost production. Besides this, the students were also trained in vermicomposting which ultimately result in popularisation of this technology among the rural people.
- Received an order of 600 tonn/year supply from Watershed Project, Phulbani, Govt of Odisha.

b. Outcome

- The farmers and students trained in vermicompost and compost production help the farmers for manure production. This helps in which decrease in cost of production and improves the soil physical and chemical properties through its use.

6. **Technical Process**

Collection of wastes and processing including shredding and separation of non-degradable material

Preparation of earthworm bed a concrete base is required to put the waste of Vermicompost preparation.Loose soil will allow the worms to go into soil and also while watering all the dissolvable nutrients go into the soil along with water.

Collection of Earthworm after vermicompost collected, sieving the compost material to separate fully composted material. The partially composted material will be again put into the vermicompost bed.

↓

Shifting the vermicompost in proper place to maintain moisture and allow the beneficial microorganisms to grow.

7. Student's involvement in Unit

Chopping of leaves using Shredrer

Release of Earthworms in the Vermicompost pit

Watering the Vermicompost pit

PACKAGING OF VERMICOMPOST IN PLASTIC BAG

SEPARATION OF EARTH WORM FROM VERMICOMPOST

SEIVING OF VERMICOMPOST

8. Trainings and Visits

Training on Vermicompost in Barlanda Village

Visit of Foreigners to the Unit

Visit of NSDC official Dr.Gipson Verghese

12. ECO-FRIENDLY BUILDING TECHNOLOGY AT CUTM-PKD Campus:

Faculty Incharge : Dr.B.Praveen
Unit Inchare(s) : L.Ravi Sanar , D.Prem Kumar

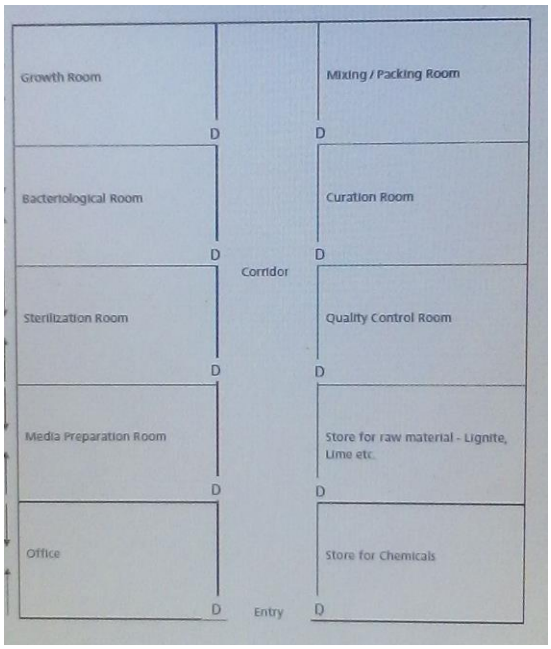
Objectives:

1. To promote professional skills, entrepreneurship, knowledge and marketing skills through meaningful hands on experience and working in project mode.
2. To build confidence through end to end approach in product development.
3. To acquire enterprise management capabilities including skills for project development and execution, accountancy, national/international marketing, etc.

Outcome: At the end of this course the student will be able to gain

1. Production procedure of different bioferilizers like *Azotobacter*, *Azospirullum*, *Rhizobium*, Phosphorus solubilizing bacteria, Phosphorus mobilizing bacteria.
2. To produce different biopesticides like *Trichoderma viridae*, Pseudomonas.

Biofertilizers are seen as an alternative technology, since the negative effect of chemical fertilizers has become well known. The use of the chemical fertilizers has led to considerable damage to environmental. Bio-fertilizers do not pollute the soil and do not disturb the ecological balance. An increasing number of farmers are using bio-fertilizers, and the many biofertilizers manufacturing units have also grown considerably. However, the market for bio-fertilizers is still not very well developed, and the bio-fertilizer industry has not grown much. Though there has been a rise in use of biofertilizers by farmers, but still its use has not spread uniformly There are many companies are producing bio fertilizers but still there is use of biofertilizers has not been widely adopted. As we know that marketing of any product there are 4 P' s price, place, promotion and product. Though All 4 are equally important but in case of biofertilizers promotion should be given more emphasis. For good promotion we need to find the media which is economical as well as higher reach.



Bio-fertilizer lab blue print as per FAO

Bio-fertilizer lab model

13. AWARENESS OF STUDENTS TO REAL CONCERNS OF ENVIRONMENT AND ITS SUSTAINABILITY THROUGH NSS AT CUTM-PKD Campus

A) TREE PLANTATION: On the prestigious occasion of NSS day, which was formally launched on 24th September, 1969, the birth centenary year of the Father of the Nation, our NSS volunteers hosted a Tree Plantation Programme inside the university campus which is inaugurated by Prof. K. Prasada Rao, Director Research & Extension, MSSSoA. Our NSS volunteers also visited to Jagannath Niketan Orphanage home-Rasoor, continuing participatory cultural, recreation programmes, motivational class and Lunch were arranged which are environmentally and socially viable programmes. The impetus is to give the students best educational experience in order to make them responsible and productive citizens of the country.

It inculcates the spirit of voluntary work among students and teachers through sustained community interaction.

Tree plantation near activity centre

Tree plantation near mahendratanaya hostel

Tree plantation by Prof. K. Prasada Rao

B) CLEANLINESS PROGRAM ON THE OCCASION OF WORLD STUDENT' S DAY:

On the Occasion of World Students Day to Commemorate the Birth Anniversary of Dr. A.P.J. Abdul Kalam, NSS launched a Cleanliness Drive. As a Responsibility of Each and Every Student and to make University A Swacch University in memory of SIR the Cleanliness drive is launched. Sir.A.P.J.Abdul Kalam believed Youth to be one of the Modern India' s Greatest Strengths. This campaign has initiated as a Massive movement of NSS Volunteers towards Cleanliness and for ensuring Hygiene, Waste management and Sanitation in places nearby Cricket playground, Gym, University entrance parking, and Quarters creating a plastic free Environment.

Cleaning near cricket ground

Cleaning outside main gate

Cleaning near B-type faculty quarters

Cleaning near C-type faculty quarters

C) NSS welcomes Fresher’ s with tree plantation

The Tree plantation drive was organized under the National Service Scheme within the campus. The NSS volunteers welcomed the freshers participating in Boot Camp for tree plantation to enable them to familiarize themselves and make a sense of responsibility with the campus environment and adjust to the new atmosphere. We urge the new students to take pride in upcoming events, being a part of an institution which is committed to impart holistic education in the best possible manner.

Tree plantation near activity centre

Tree plantation near temple

Tree plantation near girls hostel

Group photo with Freshers

D) Swacch Bharath at CUTM-PKD campus: It gives me an immense pleasure to announce that our first activity for this academic session started on the occasion of Vanmahotsav. The Swacch Bharath event was organized in university premises by NSS volunteers. The event was Flagged off by Vice Chancellor, Prof. Haribandhu Panda who actively participated in the cleanliness drive.

Guiding the students for cleanliness drive

Collection of garbage near boys hostel

Faculty taking part in cleanliness drive

Collection of garbage near girls hostel

Separating Bio degradable wastes

Collection of plastics near central mess

E) Swacch Bharath in University Premises - A Massive Cleanliness Drive:

The Swacch Bharath was done by Staff,Students, NSS volunteers in the university premises as massive movement on February 19th to make **Clean Environment** at Paralakhemundi campus. The event was inaugurated by our most respected Vice Chancellor, Prof. Haribandhu Panda and Registrar, Dr. Anita Patra, who participated in the cleanliness program as role of every educational institution to spread the importance of environment in Today' s world.

We express our thankfulness to all Deans, Faculty, Non- Teaching Staff, Students of all branches, NCC Cadets, CSR Coordinators, NSS Volunteers who participated in this massive drive of Cleanliness.

Faculty participating in cleanliness drive

Separating plastic wastes

Swacch Bharath to make Plastic free Environment on 8th February

The Swacch Bharath was done by NSS volunteers today in the university premises as massive movement to make Plastic **Free Environment** at Paralakhemundi campus. Keeping in the view that the Plastics being non-degradable, which does not break down in the soil, the following event was inaugurated by our most respected Vice Chancellor Prof. Haribandhu Panda and Registrar Dr. Anita Patra madam who participated in the cleanliness program as role of every educational institution to spread the importance of environment in Today' s world.

We express our thankfulness to Prof. Devendar Reddy (Dean MSSSoA), Prof. B.P. Mishra (Dean SoET), Prof. Durga Padhy (Deputy Registrar), Prof. A. Zaman, Prof. Sagar Maitra and Dr. SauravBarman (NSDC Coordinator) for their active participation.

Collecting Plastics near parking zone

Collection of plastics near tribal mess

Plastics collected near campus surroundings

Throwing garbage in dumping area

Tree plantation on by NSS wing: It gives us immense pleasure to inform you all that the first activity in the New Year 2018 from NSS wing is conducted today. We had with us Prof. G.C. Mishra as special guest who participated in Plantation drive and motivated the students. He oriented the NSS volunteers by notifying the importance of NSS for them as well as society and shared his past experiences with volunteers. The Tree plantation drive was done by NSS volunteers near Faculty Quarters and Mahendra Tanaya girls' hostel

" SOMEONE IS SITTING IN THE SHADE TODAY BECAUSE SOMEONE PLANTED A TREE A LONG TIME AGO"

Plantation near gram tarang

Plantation by Prof.GC. Mishra

Watering the plants

Plantation near girls hostel

F) Training on vermicomposting methods for NSS volunteers

Description

Our NSS volunteers visited Vermicompost unit and given training by Dr. Saurav Barman, Programme Coordinator, NSDC on vermicomposting methods. The main objective is to make the farmers aware on the importance of Natural Farming by conducting demonstrations by NSS volunteers in the adopted villages in upcoming days and helping the Farmers in setting up their own small vermicomposting units. As the cost of fertilizers are hitting the roof it is useful if they can effectively use their farm wastes to make manures like vermicompost.

Training the students on vermicomposting

Observing compost

Practical exposure to pits

Compost tanks

REPORT OF
ENVIRONMENTAL AUDIT
OF CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, BBSR CAMPUS, ODISHA (2020-21)

Preface

Institutional self-inquiry is a natural and necessary outgrowth of quality of higher education. Concern about environmental degradation and realization of values of environment are logical consequences of scholarly research, teaching and learning process. In its pursuit for improving environmental quality and to maintain a pristine environment for the future generation of students, Centurion University has made a self-inquiry on environmental quality of the campus with the following objectives: (i) To establish a baseline of existing environmental conditions with focus on natural and physical environment; (ii) To understand the current practices of sustainability with regard to the use of water and energy, generation of wastes, purchase of goods, transportation, etc; (iii) To promote environmental awareness through participatory auditing process; and (iv) To create a report that document baseline data of good practices and provide future strategies and action plans towards improving environmental quality for future.

This report is compiled by a committee constituted by IQAC. As there was no standard model for such an environment/green audit of campuses in the state, the committee brainstormed and evolved a questionnaire. With the help of student volunteers and faculties of respective departmrnts the major part of the data was compiled, which the committee analyzed. The remaining part which involved measurement of quality was entrusted with the Department of Environmental Sciences, Department of Chemistry and Department of Civil Engineering of Centurion University of Technology and Management, Odisha. The committee has made short term and long term suggestions to take environment protection to higher levels and it is hoped that this will receive due attention of University authorities and also all stake-holders of the University

Prof. Prashant Kumar Panigrahi
Prof. Sibakripa Bose
Dr. Atia Arzoo
Dr. Yashaswi Nayak
Dr. Rukmini Mishra

Executive Summary

a. Built-up Environment: In general, the built-up environment is eco-friendly and there is a plan for adopting more green habitat concept in future planning of buildings. Fire safety devices also installed in each and every floor of all the buildings.

b. Energy management: All across the university, we are looking to a sustainable future by working to become carbon neutral. University is taking responsibility for their environmental impact and are working to neutralize those effects. For energy conservation, university is always keen to reduce their emissions of green house gases, reduce their waste of energy, use more renewable energy and emphasize the importance of sustainable energy sources.

c. Landscape/environment: Many departments maintain garden and the campus is greener with fair biodiversity around and gardens maintained by many departments. A detailed study on floral and faunal diversity has been done.

d. Green Agenda in Syllabus: Green agenda form part of the curriculum in many departments and eco/nature clubs remain active for the cause of environmental protection. There is also one paper of Ability enhancement compulsory course of Environmental Studies for all Bachelor degree.

e. Transportation: Majority of the students and staffs in the campus rely on university bus fascilities and other transport facsilities, indicating lesser carbon foot print of the community.

f. Water Quality management: Different water quality parameters for drinking water has been analysed periodically and pollution level has been managed. Wise use of water is a general practice in University. Waste water is also treated and reutilised for gardening purposes.

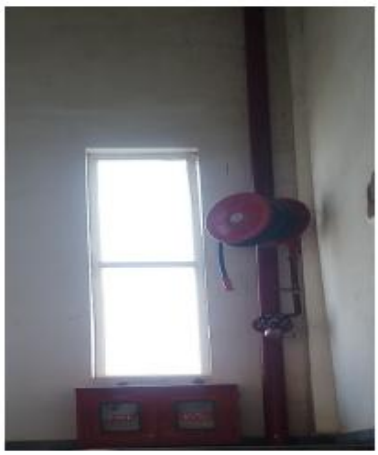
g. Waste management: Land filling is the general waste management strategy adopted by the University and there is no management plan for managing inorganic waste, especially plastics. So polythene use has been banned completely. Biogas plants for effectively managing organic wastes are established in facilities that produce more organic wastes such as canteen, hostels and staff quarters. Further, careless discarding of solid wastes is also restricted in the campus. All the departments are now following green charter and started avoiding flex banners and plastic carry bags and cups for social functions and academic programmes.

Built-up Environment

Sl. No.	Block	Building type	Ecofriendliness	Fire preventions provision	Serenity of class rooms	Ladies rest room	Provision for differently abled	Toilets: Men, Women, Differently abled	Overall remarks
1	Aryabhatta building	C	G	√	G	√	√	√	G
2	Madhusudan building	C	G	√	G	NA	√	√	G
3	Koutilya building	C	G	√	G	NA	√	√	G
4	Skill Building-1	CS	A	√	NA	√	√	√	G
5	Skill Building-2	CS	A	√	NA	√	√	√	G
6	Staff quarter	C	G	√	NA	NA		√	G
7	Ladies hostel-1	C	G	√	NA	√		√	G
8	Ladies hostel-2	C	G	√	NA	√		√	G
9	Ladies hostel-3	C	G	√	NA	√		√	G
10	Boys hostel-1	C	G	√	NA	NA		√	G
11	Boys hostel-2	C	G	√	NA	NA		√	G
12	Boys hostel-3	C	G	√	NA	NA		√	G
13	Boys hostel-4	C	G	√	NA	NA		√	G
14	Boys hostel-5	C	G	√	NA	NA		√	G
15	Boys hostel-6	C	G	√	NA	NA		√	G
16	Canteen-1	C	A	√	NA	NA		**NA**	G
17	Canteen-2	C	A	√	NA	NA		**NA**	G
18	Canteen-3	C	A	√	NA	NA		NA	G
19	Guest house	C	G	√	NA	√		√	G

NA- Not Applicable
G-Good, A-Average, P-Poor C-Concrete, H- Heritage, CS-CRC Sheet

SOME PHOTOGRAPHS SHOWING ECOFRIENDLY ENVIRONMENT


Energy Management

All across the university, we are looking to a sustainable future by working to become carbon neutral. University is taking responsibility for their environmental impact and are working to neutralize those effects. For energy conservation, university is always keen to reduce their emissions of green house gases, reduce their waste of energy, use more renewable energy and emphasize the importance of sustainable energy sources.

Steps taken for energy conservation

- Most of the conventional CFL and Halogen lights have been replaced.
- 32 KW of solar system is also being installed and integrated with the grid.
- A 8000KW grid integrated solar system is also on the process of installation.
- The solar street lights has been installed inside the campus.
- Students, faculties and staffs are always sensitised to not to waste electricity.
- University is encouraging its people to maintain the air conditioners at 25°C.
- Energy audit is carried out periodically at the campus and report findings are rectified priority-wise.

Sl. No.	Light	Watt	Nos.	Hrs.	Energy consumed (units)	Energy consumed (units) by previous fittings	Energy (units) saved	Yearly savings
1	Celling light	12	4	8	384	768	384	140160

2	Celling light	36	29	8	8352	16704	8352	3048480
3	Celling light Ring	18	82	8	11808	23616	11808	4309920
4	Celling light Ring	18	92	8	13248	26496	13248	4835520
5	LED Bulb	9	50	8	3600	7200	3600	1314000
6	LED Tubelight	60	60	12	43200	86400	43200	15768000
7	Street light	90	2	12	2160	4320	2160	788400
8	Street light	100	3	12	3600	7200	3600	1314000
9	Street light	45	4	12	2160	4320	2160	788400
					88512	**177024**	**88512**	**32306880**
								Total unit saved= 32306 **Rate per unit = 6.00** **Total amount saved = 193836.00**

SOME PHOTOGRAPHS SHOWING ENERGY MANAGEMENT

Solar Panels

Biogas plant

Landscape/environment

Many departments maintain garden and the campus is greener with fair biodiversity around and gardens maintained by many departments. A detailed study on floral and faunal diversity has been done. There are also one beautiful rose garden, medicinal plant garden and one butterfly park inside the campus mentained by the university. Faunal and floral diversity reports are given below.

REPORT ON FLORAL DIVERSITY

Flora comes from the Latin word "*Flora*", the meaning is Goddess of plants. *Floris* means flower. Floral diversity is the diversity of plants occurring in a particular region during particular time period. It also refers to the diversity of naturally available native or indigenous plants till now a total of 2, 15, 644 species of plants have been catalogued on the earth till date. It is reported that India harbours 46, 824 species including virus/bacteria and fungi species. In India, floral diversity is concentrated in four phytogeographical unique regions like Himalayas, Western Ghats, Northeast India and Andaman and Nicober Islands. Indian flora records for 11.4% of the total recorded plant species. Angiosperms are the largest plant group in India comprising of total of 17, 817 species which constitutes 38.15% of floral

diversity of the entire country followed by fungi comprising 14,698 species which is of 31.38%. High level of cryptogram (Bryophytes and Pteridophytes) diversity is also seen in the country. A total of 2,479 species of Pteridophytes and around 1265 of Bryophytes have been recorded in India. Algae and fungi have also been wide spread in India. Lichens are found in Western Ghats, Eastern and Western Himalayas and Andaman and Nicobar Islands. Most of the ferns and gymnosperms are found in cool temperate zones of the Himalayas and in the mountainous regions of southern India, especially in the Western Ghats. Indian flora represents nearly 12% of the global diversity excluding viruses. A diverse number of species of wild relatives of crop plants are also present.

Presently, considerable attention is being addressed to biological diversity of biodiversity statue which refers to the occurrence of diverse biological forms including micro-organisms, plants and animals in a particular geographical area under a set of environmental conditions. Biodiversity is the reflection of genetic variability with which the different hierarchical forms of germplasm (strains, landraces/genotypes/varieties, species, genera etc.) appear in the course of evolution. The genetic variation may exist either within the species (intra specific) to a certain extent or to a larger scale between different species (intra specific) and taxa of higher biological order. In fact, it is the ecosystem that supports the biological variability. The diverse living forms of the ecosystem are always in a state of change keeping pace with the global environment perturbations. An ecosystem is composed of both biotic and abiotic components which are quite interrelated and influences each other.

Ecosystem diversity encompasses varieties of living forms due to miscellany of niches, tropic levels and ecological processes like nutrient recycling, food chains, food webs, energy flow and role of dominant species. The present campus of Centurion University, in Bhubaneswar spread over 48 acres of land in the foothill of Barunei hills, near Jatni town; the campus is adjacent to National Institute of Science, Education and Research (NISER), Indian Institute of Technology (IIT), All India Institute of Medical Sciences (AIIMS) and Xavier University. The place is being famous as a hot spot of temples, historical monuments and archaeological remains.

Topographically, the area is an undulating lateritic land sloping towards the east. Presently the land area with vegetation cover approximately 20 acres excluding one water body covers 2.5 acres receiving waste water from the University Campus.

Block wise area under survey:

Block-1: consist of subunits – 1-10 (excluding butterfly garden) including Gate-1, Gate-2, Auditorium

building, Action learning lab and waste to wealth lab, wood engineering lab, Faculty residence, Swimming pool, Girls hostel-1 and Girls hostel-2.

Block-2: consist of the subunits- 11-20 including Girls hostel-3, Koutilya building, Madhusudan building, Aryabhatta building, Industrial training centre, Workshop (E- Rikshaw unit, Civil engineering, Electrical engineering).

Block-3: consist of the subunits 21-30 including Mechanical workshop, Advance centre of excellence for apparel textile and GTET corporation office, Inatitute of training of trainers (GTET), Multi use play ground, Basket ball court, Tennis ball court, Consumer facility cum training and learning lab (Diesel outlet), Wheel alignment training centre, Boys hostel-1 and Boys hostel-2.

Block-4: consist of subunits 31-40 including Boys hostel-3, Boys hostel-4, Boys hostel-5, Boys hostel-6, Central store, Power house, Cow shed, Water body and Butterfly garden.

LIST OF DIFFERENT KINDS OF FLORA FOUND IN THE CAMPUS

Sl. No.	Botanical name	Family	Distribution
TREES			
1.	*Acacia auriculiformis* A. Cunn. ex Benth.	Mimosaceae	B-2, B-4
2.	*Aegle marmelos* (L.) Corr.	Rutaceae	B-2
3.	*Ailanthus excelsa* Roxb.	Simaroubaceae	B-3
4.	*Albizia lebbeck* (L.) Benth.	Mimosaceae	B-3
5.	*Alstonia scholaris* (L.) R.Br.	Apocynaceae	B-2
6.	*Anacardium occidentale* L.	Anacardiaceae	B-2, B-4
7.	*Annona squamosa* L.	Annonaceae	B-2
8.	*Areca catechu* L.	Arecaceae	B-2
9.	*Artocarpus altilis (Parkinson)* Fosberg	Moraceae	B-2
10.	*Bauhinia variegata* L.	Caesalpiniaceae	B-2
11.	*Bixa orellana* L.	Bixaceae	B-2
12.	*Borassus flabellifer* L.	Arecaceae	B-2
13.	*Brya ebenus* (L.) DC.	Fabaceae	B-2

14.	*Cinammomum tamala*(Buch.-Ham.).Nees&C.H. Eberm.	Lauraceae	B-2
15.	*Cinammomum verum*J.Presl	Lauraceae	B-2
16.	*Commiphora wightii* (Arn.) Bhandari	Burseraceae	B-2
17.	*Couroupita guianensis* Aubl.	Lecythidaceae	B-2
18.	*Crataeva magna (Lour.)* DC	Capparaceae	B-2
19.	*Delonix regia* (Boj. ex Hook.) Raf.	Caesalpiniaceae	B-2, B-4
20.	*Dillenia indica* L.	Dilleniaceae	B-2,
21.	*Diospyros melanoxylon* Roxb.	Ebenaceae	B-2
22.	*Elaeis guineensis* Jacq.	Arecaceae	B-4
23.	*Eucalyptus citrodora* Hook.	Myrtaceae	B-2
24.	*Ficus benghalensis* L. *var.benghalensis*	Moraceae	B-2, B-4
25.	*Ficus elastica* L.	Moraceae	B-2
26	*Ficus racemosa* L.	Moraceae	B-4
27.	*Ficus religiosa* L.	Moraceae	B-2, B-4
28.	*Gliricidia sepium*(Jacq.) Walp.	Fabaceae	B-2
29.	*Gardenia gummifera* L.f.	Rubiaceae	B-2
30.	*Gmelina arborea* Roxb.	Verbenaceae	B-3
31.	*Haldina cordifolia* (Roxb.) Ridsale	Rubiaceae	B-2
32.	*Helictres isora* L.	Sterculiaceae	B-4
33.	*Lagerstroemia speciosa* (L.) Pers.	Lythraceae	B-1, B-2
34.	*Limonia acidissima* L.	Rutaceae	B-2
35.	*Livistona chinensis* (Jacq.) R. Br. ex Mart.	Arecaceae	B-2
36.	*Macarnga peltata* (Roxb.)Muell-Arg.	Euphorbiaceae	B-2
37.	*Magnolia champaca*(L.) Baill. ex Pierre	Magnoliaceae	B-2
38.	*Mangifera indica* L.	Anacardiaceae	B-1, B-2, B-3,B-4
39.	*Murraya paniculata*(L.) Jack	Rutaceae	B-1,B-2,B-3
40.	*Neolamarckia cadamba*(Roxb.) Bosser	Rubiaceae	B-1,B-2
41.	*Nyctanthes arbor-tristis* L.	Oleaceae	B-1, B-2, B-3,B-4
42.	*Olea europaea* L.	Oleaceae	B-2
43.	*Pimenta dioica* (L.)Merr.	Myrtaceae	B-2
44.	*Plumeria obtuse* L.	Apocynaceae	B-4
45.	*Plumeria rubra* L.	Apocynaceae	B-1, B-2, B-3,B-4
46.	*Polyalthia suberosa* (Roxb.) Thwaites	Annonaceae	B-1
47.	*Ravenala madagascariensis* Sonn.	Strelitziaceae	B-2

48.	*Roystonea regia* (Kunth) O.F.Cook	Arecaceae	B-1, B-2
49.	*Sambucus canadensis* L.	Adoxaceae	B-2
50.	*Santalum album* L.	Santalaceae	B-2
51.	*Streblus asper* Lour.	Moraceae	B-2
52.	*Syzygium caryophyllifolium* (Lam.)DC.	Myrtaceae	B-1, B-2
53.	*Syzygium cumini*(L.)Skeels	Myrtaceae	B-2
54.	*Syzygium jambos* (L.)Alston	Myrtaceae	B-2
55.	*Syzygium samarhagense* (Bl.)Merr. &Perr.	Myrtaceae	B-2
56.	*Tamarindus indica* L.	Caesalpiniaceae	B-2
57.	*Tectona grandis* L.f.	Verbenaceae	B-2
58.	*Thespesia populnea*(L.) Sol. ex Corrêa	Malvaceae	B-4
59.	*Terminalia arjuna* ((Roxb.) Wight & Arn.	Combretaceae	B-1
SHRUB			
60.	*Acalypha wilkesiana* Mull.	Euphorbiaceae	B-2
61.	*Adenium obesum*(Forssk.) Roem. & Schult	Apocynaceae	B-2
62.	*Agave Americana* L.	Agavaceae	B-2
63.	*Agave salmiana* Otto ex Salm-Dyck	Asparagaceae	B-2
64.	*Bougainvillea spectabilis* Willd.	Nyctaginaceae	B-2
65.	*Cascabela thevetia* (L.)Lippold	Apocynaceae	B-2
66.	*Cestrum nocturnum* L.	Solanaceae	B-2
67.	*Chromolaena odorata* (L.) R. King & H. Robins	Asteraceae	B-1, B-2, B-3,B-4
68.	*Citrus aurantifolia*(Christm.) Swingle	Rutaceae	B-2
69.	*Citrus grandis*(L.) Osbeck	Rutaceae	B-2
70.	*Cordyline fruticosa*(L.) A.Chev. (L.)Nees.	Agavaceae	B-2
71.	*Crossandra infundibuliformis*	Acanthaceae	B-2
72.	*Crotalaria spectabilis* Roth	Fabaceae	B-2
73.	*Cryptostegia grandiflora* R.Br.	Apocynaceae	B-1
74.	*Cuphea hyssopifolia* Kunth	Lythraceae	B-2
75.	*Desmodium pulchellum* (L.)Benth.	Fabaceae	B-4
76.	*Dracaena marginataLam. 'tricolor'*	Agavaceae	B-2
77.	*Dracena reflexa* Lam.	Agavaceae	B-2
78.	*Dracaena sanderiana* Mast.	Asparagaceae	B-2
79.	*Duranta repens* L.	Verbenaceae	B-2

80.	*Dypsis lutescens* (H.Wendl.) Beentje & J.Dransf	Arecaceae	B-2
81.	*Euphorbia milii* Des Moul.	Euphorbiaceae	B-2
82.	*Euphorbia pulcherrima* Willd. ex Klotzsch	Euphorbiaceae	B-2
83.	*Euphorbia tithymiloides* L.	Euphorbiaceae	B-2
84.	*Fargesia stricta*Hsueh & C. M. Hui, Bull.	Poaceae	B-2
85.	*Flacourtia jangomas* (Lour.)Raeusch.	Salicaceae	B-4
86.	*Gardenia carinata* Wall. ex Roxb.	Rubiaceae	B-1
87.	*Gardenia jasminoides* J.Ellis	Rubiaceae	B-2
88.	*Hamelia patens* Jacq.	Rubiaceae	B-2
89.	*Hibiscus mutabilis* L.	Malvaceae	B-1
90.	*Hibiscus rosa-sinensis* L.	Malvaceae	B-1
91.	*Hibiscus schizopetalus* (Mast.)Hook.f.	Malvaceae	B-1, B-2
92.	*Hypoestes phyllostachya* Baker	Acanthaceae	B-2
93.	*Impatiens glandulifera* Royle	Balsaminaceae	B-2
94.	*Ipomoea carnea* Jacq.	Convolvulaceae	B-1,B-4
95.	*Ixora coccinea* L.	Rubiaceae	B-2
96.	*Jasminum auriculatum* Vahl	Oleaceae	B-2
97.	*Jasminum sambac* (L.) Ait.	Oleaceae	B-2
98.	*Jatropha gossypifolia* L.	Euphorbiaceae	B-2
99.	*Lagerstroemia indica* (L.) Pers.	lythraceae	b-2
100.	*Lantana camara L. var. aculeata* (L.) Mold	verbenaceae	b-2
101.	*Lawsonia inermis* L.	lythraceae	b-2
102.	*Loropetalum chinense*(R.Br.)Oliv. var. chinense	hamamelidaceae	b-2
103.	*Malpighia coccigera* L.	malpighiaceae	B-2
104.	*Malvaviscus arboreus* Cav.	malvaceae	B-2
105.	*Melastoma malbathricum* L.	melastomataceae	B-2
106.	*Ocimum kilimandscharicum* Guerke	lamiaceae	B-2
107.	*Ocimum sanctum* L.	lamiaceae	B-1, B-2
108.	*Opuntia stricta* (Haw.) Haw. var. dillenii (Ker-Gawl.) Benson	cactaceae	B-2
109.	*Pereskia bleo* (Kunth)DC.	cactaceae	B-2
110.	*Phoenix loureiroi* Kunth	arecaceae	B-2

111.	*Phyllanthus myrtifolius* (Wight)Muller	euphorbiaceae	B-2
112.	*Plumbago auriculata* Lam.	plumbaginaceae	B-2
113.	*Polyscias filicifoliam*(C.Moore ex E.Fourn.) L.H.Bailey	araliaceae	B-2
114.	*Rauvolfia serpentina* (L.) Benth. ex Kurz	apocynaceae	B-2
115.	*Rauvolfia tetraphylla* L.	apocynaceae	B-2
116.	*Rhapis excelsa (Thunb.)* A. Henry	arecaceae	B-2
117.	*Riccinus communis* L.	euphorbiaceae	B-2
118.	*Rosa alba* L.	rosaceae	B-2
119.	*Rosa centifolia* L	rosaceae	B-2
120.	*Rosa chinenesis* Jacquin	rosaceae	B-2
121.	*Rosa damascina* Miller	rosaceae	B-2
122.	*Rosa odorata* (Andr.)Sweet var. odorata	rosaceae	B-2
123.	*Sauropus androgynus*(L.) Merr.	euphorbiaceae	B-2
124.	*Solanum torvum* Sw.	solanaceae	B-2, B-4
125.	*Sterblus taxoides* (Roth)Kurz	Moraceae	B-2
126.	*Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schult.cv.plena	apocynaceae	B-2
127.	*Tecoma stans* (L.) Kunth.	bignoniaceae	B-1, B-2
128.	*Thunbergia erecta* (Benth.)T.Anderson	acanthaceae	B-1, B-2
129.	*Vitex negundo* L.	verbenaceae	B-2
130	*Wrightia antidysenterica* (L.)R.Br.	apocynaceae	B-2
131.	*Ziziphus oenoplia* (L.) Mill.	rhamnaceae	B-4
HERB			
132.	*Abelmoschus esculentus* (L.) Moench	Malvaceae	B-1, B-2
133.	*Abelmoschus manihot* (L.) Medic subsp. Tetraphyllus	malvaceae	B-4
134.	*Aerva lanata* (L.) Juss.ex Schultes.	amaranthacea	B-1.B-2,B-3,B-4
135.	*Aerva sanguinolenta* (L.) BI.	amaranthacea	B-2
136.	*Aeschynomene aspera* L.	fabaceae	B-3,B-4
137.	*Aeschynomene indica* L.	fabaceae	B-1,B-4
138.	*Ageratum conyzoides* L.	asteraceae	B-1,B-2,B-3,B-4
139.	*Allmania nodiflora* (L.) R.Br. ex Wt.	amaranthacea	B-1,B-3,B-4
140.	*Alocasta macrorrhizos* (L.) G.Don	araceae	B-4
141.	*Aloe vera* (L.) Burm.f.	liliaceae	B-1,B-2
142.	*Alpinia galanga* (L.) Willd.	zingiberaceae	B-2

143.	*Alternanthera sessilis* (L.) R.Br. ex DC.	Amaranthacea	B-1,B-2,B-3,B-4
144.	*Alysicarpus vaginalis* (L.) DC. var. nummularifolius Miq.	fabaceae	B-1,B-2,B-3,B-4
145.	*Amaranthus caudatus* L.	amaranthacea	B-2
146.	*Amaranthus spinosus* L	amaranthacea	B-1.B-2,B-3,B-4
147.	*Amaranthus tricolor* L.	amaranthacea	B-1,B-4
148.	*Amaranthus viridis* L.	amaranthacea	B-1,B-2,B-3,B-4
149.	*Asystasia gangetica*(L.) T. Anderson	acanthaceae	B-2
150.	*Barleria cristata* L.	acanthaceae	B-4
151.	*Barleria prionitis* L.	acanthaceae	B-1,B-3,B-4
152.	*Bassia scoparia* (L.) Schrad.	amaranthacea	B-2
153.	*Biophytum sensitivum* (L.) DC.	oxalidaceae	B-1,B-2,B-3,B-4
154.	*Brassica campestris L.*	brassicaceae	B-1,B-2,B-3
155.	*Brassica napus L var. glauca* (Roxb.) Schulz	brassicaceae	B-2
156.	*Brassica oleracea* L. var.capitata	brassicaceae	B-2
157.	*Brassica oleracea* L. var.oleracea	brassicaceae	B-2
158.	*Caladium bicolor* (Aiton) Vent	araceae	B-2
159.	*Canna indica* L.	cannaceae	B-2
160.	*Capsicum annum* L.	solanaceae	B-2
161.	*Catharanthus roseus* (L.) G.Don	apocynaceae	B-1,B-2,B-3,B-4
162.	*Celosia argentea* L.	amaranthacea	B-2
163.	*Celosia cristata* L.	amaranthacea	B-2
164.	*Celosia argentea var.* plumosa	amaranthacea	B-2
165.	*Centella asiatica* (L.) Urban	apiaceae	B-2
166.	*Chamaecostus cuspidatus* (Nees & Mart.) C.Specht & D.W. Stev.	costaceae	B-2
167.	*Chenopodium album* L.	chenopodiaceae	B-4
168.	*Chrozophora rottleri* (Geisel.) Juss.	euphorbiaceae	B-3,B-4
169.	*Chrysanthemum* cinerariifolium (Trev.) Vis.	asteraceae	B-2
170.	*Cleome rutidosperna* DC.	capparaceae	B-1,B-2,B-3,B-4
171.	*Cleome viscosa* L.	capparaceae	B-1,B-2,B-3,B-4
172.	*Coldenia procumbens* L.	boraginaceae	B-1,B-2,B-3,B-4
173.	*Colocasia esculenta* (L.) Schott	araceae	B-4
174.	*Commelina benghalensis* L.	commelinaceae	B-1,B-2,B-3,B-4

175.	*Commelina erecta* L.	commelinaceae	B-1,B-2,B-3,B-4
176.	*Commelina longifolia* Lam.	commelinaceae	B-4
177.	*Commelina paludosaBlume*	commelinaceae	B-3
178.	*Coriandrum sativum* L.	apiaceae	B-2
179.	*Cosmos caudatus* Kunth	asteraceae	B-3,B-4
180.	*Curcuma amada* Roxb.	Zingiberaceae	B-1,B-2,0-3,B-4
181.	*Curcuma longa* L.	Zingiberaceae	B-2
182.	*Curcuma zedoaria* (Christm.)Rose.	Zingiberaceae	B-2
183.	*Cvanotis cristata* (L.) D.Don	Commelinaceae	B-2,B-4
184.	*Cyanotis tuberosa* (Roxb.)Schult.&Schult.f.	Commelinaceae	B-3,B-4
185.	*Cyanotis tuberosa* (Roxb.)Schult.&Schult.f.	Commelinaceae	B-3,B-4
186.	*Dentella repens* (L.) J.R. & G. Forst. var. repens	Fabaceae	B-1,B-2,B-3,B-4
187.	*Desmodium gangeticum* (L.) DC.	Fabaceae	B-2
188.	*Desmodium triflorum* (L.) DC.	Acanthaceae	B-1,B-2,B-3,B-4
189.	*Dicliptera bupleuroides* Nees	Amaranthaceae	B-1, B-2,B-3,B-4
190.	*Digera muricata*(L.) Mart	Acanthaceac	B-1,B-4
191.	*Dipteracanthus prostratus*(Poir.) Nees	Asteraceae	B-1, B-2,B-3,B-4
192.	*Eclipta prostrata* (L.) L.	Asteraceae	B-1,B-2,B-3,B-4
193.	*Emilia sonchifolia* (L.) DC.	Acanthaceae	B-1,B-2,B-3,B-4
194.	*Eranthemum capense* L.	Apiaccac	B-3,B-4
195.	*Euphorbia heterophylla* L.	Euphorbiaceae	B-3,B-4
196.	*Euphorbia hirta* L.	Euphorbiaceae	B-1,B-2,B-3,B-4
197.	*Euphorbia indica* Lam	Euphorbiaceae	B-2
198.	*Euphorbia rosea* Retz.	Euphorbiaceae	B-1,B-3
199.	*Euphorbia serpens* H.B.K	Euphorbiaceae	B-1,B-4
200.	*Euphorbia thymifolia* L.	Euphorbiaceae	B-1, B-2,B-3,B-4
201.	*Evolvulus alsinoides* (L.) L.	Convolvulaceae	B-1,B-3,B-4
202.	*Evolvulus nummularius* (L.) L.	Convolvulaceae	B-1,B-2,B-3,B-4
203.	*Evovulus sericeus* Sw.	Convolvulaceae	B-3
204.	*Foeniculuem vulgare* L.	Apiaceae	B-2,B-3
205.	*Gaillardia aristata* Pursh	Asteraceae	B-2
206.	*Gaillardia grandiflora* Hort	Asteraceae	B-2
207.	*Gomphrena celosioides* Mart,	Amaranthaceae	B-1,B-2,B-3,B-4

208.	*Gomphrena globosa* L.	Amaranthaceae	B-2
209.	*Grangea maderaspatana* (L.) Poir.	Asteraceae	B-1,B-2,B-3,B-4
210.	*Hedyotis bracheata* Miq.ex Hook.f.	Rubiaceae	B-1,B-3,B-4
211.	*Hedvotis corymbosa* (L.)lam.	Rubiaceae	B-1,B-2,B-3,B-4
212.	*Hedyotis puberula* (G.Don)Thw.	Rubiaceae	B-3
213.	*Heliconia latispatha* Benth.	Tlcliconiaceae	B-2
214.	*Heliconia rostrata* Ruiz & Pavon	Heliconiaceae	B-2
215.	*Hibiscus canabinus* L	Malvaceae	B-1
216.	*Hippeastrum amaryllis* (L.)Herb.	Amaryllidaceae	B-2
217.	*Hyptis suaveolens* (L.) Poit.	Lamiaccac	B-1,B-2,B-3,B-4
218.	*Impatiens balsamina* L.	Balsaminaceae	B-2
219.	*Indigofera linnaei* Ali	Fabaceae	B-1,B-2,B-3,B-4
220.	*Indoneesiella echioides* (L.) Sreemadh.	Acanthaceae	B-1,B-2,B-3,B-4
221.	*Justicia betonica* L.	Acanthaceae	B-3,B-4
222.	*Justicia japonica* Thunb.	Acanthaccac	B-2,B-3
223.	*Justicia quinqueangularis* Koen. ex Roxb.	Acanthaceae	B-1,B-4
224.	*Kalanchoe blossfeldiana* Poelln.	Crassulaceae	B-2
225.	*Kalanchoe pinnata* (Lam.) Pers.	Crassulaccae	B-2
226.	*Laportea interrupta* (L.) Chew	Urticaceae	B-1,B-2,B-3,B-4
227.	*Leucas aspera* (Willd.) Link	Lamiaceae	B-3,B-4
228.	*Leucas cephalotes* (Roth) Spreng.	Lamiaceae	B-1,B-4
229.	*Leucas indica* (L.) R.Br.cx Vatke	Lamiaceae	B-4
230.	*Lindernia ciliata* (Colsm.)Pennell	Scrophulariaceae	B-1,B-2,B-3,B-4
231.	*Lindshot.onaviyouero* (L.) F.v.Muell	Scrophulariaceae	B-1,B-2,B-3,B-4
232.	*Lippia javanica* (Burm.f.)Spreng.	Verbenacea	B-4
233.	*Lobelia alsinoides* Lam.	Lobeliaceae	B-1,B-4
234.	*Lobularia maritima* (L.)Desv.	Brassicaceae	B-3
235.	*Ludwigia perennis* L.	Onagraceae	B-1,B-3,B-4
236.	*Malachra capitata* (L.)L.	Malvaceae	B-3
237.	*Maranta arundinacea* L.	Marantaceae	B-2
238.	*Martynia annua* L.	Martyniaceae	B-4
239.	*Mazus pumilus* (Brum.f.) Steenis	Scrophulariaceae	B-2,B-4
240.	*Mecardonia procumbens* (Mill.) Small	Scrophulariaceae	B-1,B-3,B-4
241.	*Melochia corchorifolia* L.	Sterculiaceae	B-3,B-4
242.	*Mentha arvensis* L.	Lamiaceae	B-2

243.	*Mentha piperita* L.	Lamiaceae	B-2
244.	*Mentha spicata* L.	Lamiaceae	B-2
245.	*Merremia hederacea* (Burm.f.)Hall.f.	Convolvulaceae	B-4
246.	*Microccocca mercurialis* (L.) Benth.	Euphorbiaceae	B-1,B-2,B-3,B-4
247.	*Mimosa pudica* L.	Mimosaceae	B-1,B-2,B-3,B-4
248.	*Mirabilis jalapa* L.	Nyctaginaceae	B-2
249.	*Mitracarpus villosus* (Sw.) DC.	Rubiaceae	B-1,B-2,B-3,B-4
250.	*Mollugo pentaphylla* L.	Molluginaceae	B-1,B-2,B-3,B-4
251.	*Murdannia nodiflora* (L.)Brenan	Commelinaceae	B-1,B-2,B-3,B-4
252.	*Murdannia spirata* (L.) Brueck.	Commelinaceae	B-1,B-3,B-4
253.	*Musa acuminata var.* rubra	Musaccae	B-2
254.	*Musa paradisiaca* L.	Musaceae	B-2
255.	*Ocimum canum* Sims.	Lamiaceae	B-4
256.	*Origanum majorana* L.	Lamiaceae	B-2
257.	*Oxalis corniculata* L.	Oxalidaceae	B-1,B-2,B-3,B-4
258.	*Oxalis debilis* Kunth	Oxalidaceae	B-2
259.	*Oxalis triangularis* A.St.-Hil.	Oxalidaceae	B-2
260.	*Panadnus amarylifolius* Roxb.	Pandanaceae	B-2
261.	*Parthenium hysterophorus* L.	Asteraceae	B-1,B-2,B-3,B-4
262.	*Peperomia pellucida* Kunth	Piperaceae	B-1,B-3,B-4
263.	*Peristrophe paniculata* (Forssk.) Brummitt	Acanthaceae	B-1,B-3,B-4
264.	*Persicaria virginiana* (L.)Gaertn.	Polygonaceae	B-2
265.	*Petunia hybrid* Juss.	Solanaceae	B-2
266.	*Phaulopsis imbricata* (Forssk.) Sw.	Acanthaceae	B-3,B-4
267.	*Phyla nodiflora* (L.) Greene	Verbenaceae	B-4
268.	*Phyllanthus fraternus* Webster	Euphorbiaceae	B-1,B-2,B-3,B-4
269.	*Phyllanthus virgatus* Forst.f	Euphorbiaceae	B-1,B-3,B-4
270.	*Physalis longifolia Nutt.* var longifolia	Solanaceae	B-3
271.	*Physalis minima* L.	Solanaceae	B-4
272.	*Polygala arvensis* L.	Polygalaceae	B-3,B-4
273.	*Polygonum barbatum* L.	Polygonaceae	B-3,B-4
274.	*Portulaca oleracea* L. var. oleracea	Portulaceae	B-1,B-2,B-3,B-4
275.	*Portulaca pilosa* L. subsp. grandiflora (Hook.) Geesink	Portulaceae	B-2

276.	*Portulaca quadrifida* L.	Portulaceae	B-1,B-2,B-3,B-4
277.	*Portulaca umbraticola* Kunth	Portulaceae	B-2
278.	*Ruellia brittoniana* Leonard	Acanthaceae	B-2
279.	*Sansevieria trifasciata* Prain.	Asparagceae	B-2
280.	*Scadoxus multiflorus* (Martyn) Raf.	Amaryllidaceae	B-2
281.	*Scoparia dulcis* L.	Scrophulariaceae	B-1,B-2,B-3,B-4
282.	*Sebastiania chamalea* (L.) Muell.-Arg.	Euphorbiaceae	B-2,B-4
283.	*Senna occidentalis* (L.) Link	Caesalpiniaceae	B-2,B-4
284.	*Sesamum orientale* L.	Pedaliaceae	B-3,B-4
285.	*Solanum tuberosum* L.	Solanaceae	B-2
286.	*Solanum virginianum* L.	Solanaceae	B-4
287.	*Spathiphyllum cochlearispathum* (Liebm.) Engl.	Araceae	B-2
288.	*Spermacoce articularis* L.f.	Rubiaceae	B-1,3-2,B-3,B-4
289.	*Spermacocoe exilis* (L.O.Williams)C.D. Adams	Rubiaceae	B-1,B-2,B-3,B-4
290.	*Theriophonum minuatum* (Willd.)Bail	Araceae	B-2
291.	*Tithonia diversifolia* (Hemsl)A.Gray	Asteraceae	B-1,B-2
292.	*Tradescantia zebrine* (Schinz)D.R Hunt	Commelinaceae	B-2
293.	*Tribulus terrestris* L.	Zygophyllaceae	B-2,B-4
294.	*Tridax procumbens* L.	Asteraceae	B-1,B-2,B-3,B-4
295.	*Triumfetta pentandra A.*Rich	Sterculiaceae	B-1,B-4
296.	*Triumfetta rhomboidea* Jasq.	Sterculiaceae	B-3,B-4
297.	*Turnera ulmifolia* L.	Turneraceae	B-2
298.	*Uraria picta* (Jacq.)Desv.ex DC.	Fabaceae	B-2
299.	*Urena lobata L. subsp. sinuata* (L.) Borssum var. sinuate	Malvaceae	B-1,B-3,B-4
300.	*Vernonia cinerea* (L.) Less.	Asteraceae	B-1,B-2,B-3,B-4
301.	*Waltheria indica* L. var. indica	Sterculiaceae	B-3,B-4
302.	*Wedelia chinensis* (Osbeck) Merr.	Asteraceae	B-2
303.	*Withania somnifera* (L.)Dunal	Solanaceae	B-2
304.	*Xanthium indicum* Koenig	Asteraceae	B-3,B-4
305.	*Xanthosoma robustum* Schott.	Araceae	B-1
306.	*Zephyranthes candida* (Lindl.)Herb.	Amaryllidaceae	B-2
307.	*Zephyranthes rosea*(Lindl.)	Amaryllidaceae	B-2
308.	*Zinnia elegans* Jack.	Asteraceae	B-2

309.	*Zornia diphylla* (L.) Pers.	Fabaceae	B-3,B-4
310.	*Zornia gibbosa* Spanoghe	Fabaceae	B-3,B-4
HYDROPHYTES			
311.	*Alisma plantago-aquatica* L.	Alismataceae	B-2
312.	*Ceratophyllum demersum* L.	Ceratophyllaccae	B-2
313.	*Eichhornia crassipes*(Mart.) Solms-Laub.	Pontederiaceae	B-4
314.	*Hydrilla verticillata* (L.f.) Royle	Hydrocharitaceae	B-2
315.	*Lemna perpusila* Tor.	Lemnaecae	B-2,B-4
316.	*Monochoria hastata* Solms-Laub.	Pontederiaceae	B-4
317.	*Monochoria vaginalis* (Burm.f.) Presl	Pontederiaceae	B-4
318.	*Nelumbo nucifera* Gaertn.	Nelumbonaceae	B-2
319.	*Nuphar pumila*(Timm) DC.	Nymphaeaccae	B-2
320.	*Nymphaea mexicana* Zucc.	Nymphaeaccae	B-2
321.	*Nymphaea nouchali* Burm.f.	Nymphaeaceae	B-2
322.	*Nymphaea pubescens* Willd.	Nymphaeaceae	B-2
323.	*Nymphoides hydrophila* (Lour.)Kuntze	Nymphaeaceae	B-2
324.	*Nymphoides indica* (L.) Kuntze	Menyanthaceae	B-2
325.	*Pistia stratiotes* L.	Araceae	B-4
326.	*Potamogeton nodosus* Poir.	Potamogetonaceae	B-2
327.	*Spirodela polyrhiza* (L.) Schleiden	Lemnaceae	B-4
328.	*Typha angustifolia* L.	Typhaceae	B-2
CLIMBER			
329.	*Abrus precatorius* L.	Fabaceae	B-4
330.	*Aganosma caryophyllata* (Roxb. ex Sims) G.Don	Apocynaceae	B-2
331.	*Allamanda blanchetti* A.DC.	Apocynaceae	B-2
332.	*Antigonon leptopus* Hook. & Arn.	Polygonaceae	B-4
333.	*Argeyria nervosa*(Burm.f.) Bojer	Convolvulaceae	B-2
334.	*Artabotrys hexapetalus*(L.f) Bandari	Annonaceae	B-2
335.	*Asparagus racemosus* Willd.	Asparagaceae	B-2
336.	*Atylosia scarabaeoides* (L.) Benth.	Fabaceae	B-3,B-4
337.	*Basella alba* L.	Basellaceae	B-2
338.	*Campsis radicans* Seem.	Bignoniaceae	B-2
339.	*Cayratia pedata Wall.)* Gagnep.	Vitaceae	B-3,B-4

340.	*Cayratia trifolia* (L.) Domin	Vitaceae	B-1,B-3,B-4
341.	*Coccinia grandis* (L.) Voigt	Cucurbitaceae	B-3,B-4
342.	*Cocculus hirsutus*(L.) Diels	Cucurbitaceae	B-3,B-4
343.	*Cucumis melo* L.	Cucurbitaceae	B-2
344.	*Cucumis sativus* L.	Cucurbitaceae	B-2
345.	*Cucurbita maxima* Duchesne	Cucurbitaceae	B-2
346.	*Cuscuta reflexa* Roxb.	Cuscutaceae	B-4
347.	*Dioscorea alata* L.	Dioscoreaceae	B-2
348.	*Diplocyclos palmatus*(L.) C.Jeffrey	Cucurbitaceae	B-4
349.	*Epipremnum aureum*(Linden & André) G.S.Bunting	Araceae	B-2
350.	*Ichnocarpus frutescens* (L.) W.T.Aiton	Apocynaceae	B-2
351.	*Ipomoea obscura* Ker.-Gawl.	Convolvulaceae	B-4
352.	*Ipomoea pes-tigridis*L.	Convolvulaceae	B-1,B-4
353.	*Ipomoea quamoclit* L.	Convolvulaceae	B-3
354.	*Ipomoea sepiaria Koenig* ex Roxb.	Convolvulaceae	B-3,B-4
355.	*Luffa acutangula*(L.) Roxb.	Convolvulaceae	B-2
356.	*Luffa aegyptiaca* Mill.	Cucurbitaceae	B-4
357.	*Mansoa alliacea* Gentry	Bignoniaceae	B-2
357.	*Passiflora incarnata* L	Passifloraceae	B-2
358.	*Passiflora vitifolia* Kunth	Passifloraceae	B-2
359.	*Piper betel* L	Piperaceae	B-2
360.	*Piper longum* L.	Piperaceae	B-2
361.	*Podranea ricasoliana*(Tanf.) Sprague	Bignoniaceae	B-2
362.	*Pyrostegia venusta* (Ker.Gawl.)Miers	Bignoniaceae	B-2
363.	*Quisqualis indica* L.	Combretaceac	B-2
364.	*Rhaphidophora decisirva* (Roxb.) Schott	Araceae	B-2
365.	*Stephania japonica* (Thunb.) Miers	Menispermaceae	B-3
366.	*Syngonium podophyllum* Schott	Araceae	B-2
367.	*Thunbergia fragrans* Roxb.	Acanthaceae	B-2
368.	*Thunbergia grandiflora* (Roxb.ex Rottl.)Roxb.	Acanthaceae	B-1,B-2
369.	*Tinospora cordifolia*(Thunb.) Miers	Menispermaceae	B-2
370.	*Trichosanthes cucumerina* L.	Cucurbitaceae	B-2
371.	*Typhonium trilobatum (*L.) Schott	Araceae	B-2

372.	*Vernonia elliptica* DC.	Asteraceae	B-1,B-2
373.	*Vitis vinifera* L.	Vitaceae	B-2
EPIPHYTES			
375.	*Vanda tesselata* (Roxb.) Hook.cx G.Don	Rubiaceae	B-2
376.	*Dendrobium ursula* Strenge	Passifloraceae	B-2
GRASS			
377.	*Aristida setacea* Rctz.	Passifloraceae	B-1,B-2,B-3,B-4
378.	*Bambusa arundinacea* (Retz.) Willd.	Apocynaceae	B-2
379.	*Bambusa vulgaris Schrad.* Ex J.C.Wendl.	Asclepidaceae	B-2
380.	*Bothriochloa pertusa* (L.) A. Camus	Verbenaceae	B-1,B-2,B-3,B-4
381.	*Brachiaria distachya* (L.) Stapf	Araceae	B-1,B-2,B-3,B-4
382.	*Brachiaria mutica* (Forssk.) Stapf	Piperaceae	B-4
383.	*Brachiaria ramosa* (L.) Stapf	Piperaceae	B-1,B-3,B-4
384.	*Chloris barbata* Sw.	Bignoniaceae	B-1,B-2,B-3,B-4
385.	*Chrysopogon aciculatus* (Retz.) Trin.	Bignoniaceae	B-1,B-4
386.	*Cynodon dactylon* (L.) Pers.	Combretaceac	B-1,B-2,B-3,B-4
387.	*Cyperus brevifolius* (Rottb.) Hassk.	Araceae	B-1,B-4
388.	*Cyperus compactus* Retz.	Menispermaceae	B-4
389.	*Cyperus difformis* L.	Araceae	B-1,B-3,B-4
390.	*Cyperus halpan* L.	Acanthaceae	B-1,B-3
391.	*Cyperus imbricatus* Retz.	Acanthaceae	B-4
392.	*Cyperus iria* L.	Menispermaceae	B-1,B-4
393.	*Cyperus triceps* Endl.	Cyperaceae	B-1,B-3,B-4
394.	*Dactyloctenium aegypticum* (L.) P.Beauv.	Poaceae	B-1,B-2,B-3,B-4
395.	*Digitaria abludens* (Roem. & Schult.) Veldk.	Poaceae	B-3
396.	*Digitaria ciliaris* (Retz.) Koeler	Poaceae	B-1,B-2,B-3,B-4
397.	*Echinochloa colona (*L.) Link	Poaceae	B-1,B-2,B-3,B-4
398.	*Eleusine indica (*L.) Gaertn.	Poaceae	B-1,B-2,B-3,B-4
399.	*Elusine coracana (*L.)Gaertn	Poaceae	B-2
400.	*Eragrostis ciliaris* (L.) R.Br.	Poaceae	B-3
401.	*Eragrostis ciliata* Roxb. Nees	Poaceae	B-1,B-2,B-3,B-4
402.	*Eragrostis unioloides* (Retz.) Nees ex Steud.	Poaceae	B-1,B-2,B-3,B-4
403.	*Eriochloa procera* (Retz.)Hubbard	Poaceae	B-1,B-2,B-3,B-4

404.	*Paspalum scrobiculatum* L.	Poaceae	B-2,B-3
405.	*Paspalum vaginatum* Sw.	Poaceae	B-1,B-3
406.	*Pennisetum pedicellatum* Trin.	Poaceae	B-1,B-3,B-4
407.	*Pennisetum purpureum* Schumach	Poaceae	B-3,B-4
408.	*Perotis indica* (L.) Kuntz	Poaceae	B-3,B-4
409.	*Pogonantherum crinitum*(Thunb.) Kunth	Poaceae	B-2
410.	*Sachharum officinarum* L.	Poaceae	B-2
411.	*Setaria pumila* (Poir.) Roem. & Schult.	Poaceae	B-1,B-3,B-4
412.	*Setaria verticillata* (L.) P.Beauv.	Poaceae	B-1,B-4
413.	*Sorghum vulgare* L.	Poaceae	B-2
414.	*Zea mays* L.	Poaceae	B-2
GYMNOSPERM			
415.	*Araucaria columnaris* (Forst.f.) Hook.	Araucariaceae	B-2
416.	*Cycas revoluta* Thunb.	Cycadaceae	B-2
417.	*Juniperus communis* L.	Cupressaceae	B-2
418.	*Pinus roxburghii* Sargent	Pinaceae	B-2
419.	*Podocarpus nerefolius* D.Don	Podocarpaceae	B-2
420.	*Platycladus orientalis* (L.) Franco	Cupressaceae	B-2
PTERIDOPHYTES			
421.	*Adiantum incisum* Forssk.	Adiantaceae	B-4
422.	*Adiantum phillipense* L.	Adiantaceae	B-1,B-2,B-3,B-4
423.	*Ampelopteris prolifera* (Retz.) Copel.	Thelypteridaceae	B-2,B-4
424.	*Nephrolepis exaltata*(L.) Schott	Nephrolepidaceae	B-2
425.	*Phymatosorus membranifolius* (R.Br.)S.G. Lu	Polypodiaceae	B-2
426.	*Pteris vittata* L.	Pteridaceae	B-1,B-2,B-3,B-4
427.	*Salvinia cuculata* Roxb.	Salviniaceae	B-4
428.	*Salvinia molesta* D.S. Mitch	Salviniaceae	B-4
429.	*Selaginella ciliaris*(Retz.) Spring	Selaginellaceae	B-4
BRYOPHYTES			
430.	*Barbula calycinaSchwägr*	Pottiaceae	B-2,B-4
431.	*Marchantia polymorpha* L.	Marchantiaceae	B-1,B-4
432.	*Riccia beyrichiana* Hampe ex Lehm	Ricciaceae	B-3,B-4
433.	*Trichostomum crispulumBruch*	Pottiaceae	B-2
MUSHROOMS			

434.	*Agaricus bisporous* (J.E.Lange) Emil.J.Imbact	Agaricaceae	B-2
435.	*Agaricus compestris* L.	Agaricaceae	B-4
436.	*Amanita multisquamosa* Peck	Amanitaceae	B-4
437.	*Amylostereum laevigatum* (Fr.) Boidin	Amylostereaceae	B-4
438.	*Dacryopinax spathularia* Schweien & G.W.Martin	Dacrymycetaceae	B-4
439.	*Deconia coprophila*(Bull.) P. Karst.	Strophariaceae	B-4
440.	*Entoloma unicolar* (Perk) Hesler	Entolomataceae	B-4
441.	*Ganoderma lucidum* (Curtis) P. Carst.	Ganotodermaceae	B-4
442.	*Lactarius alnicola* A.H. Smith	Russulaceae	B-4
443.	*Marasmius rotula*(Scop.) Fr.	Marasmiaceae	B-1
444.	*Protostropharia semiglobata* (Batsch) Redhead, Moncalvo & Vilgays	Strophariaceae	B-4
445.	*Psilocybe cubensis* (Earle) Singer	Hymenogastraceae	B-1
446.	*Terana caerulea* (Lam.) Kuntze	Phanerochaetaceae	B-4
447.	*Termitomyces eurrhizus* (Berk & Broome)	Lyophyllaceae	B-4
448.	*Termitomyces heimii* Natarajan	Lyophyllaceae	B-4
449.	*Termitomyces microcarpus* (Berk. & Broome) R. Heim	Lyophyllaceae	B-4
450.	*Xylaria longipes Nitschke*	Xylariaceae	B-4
LICHEN			
451.	*Chrysothrix chlorina*(Ach.) J.R. Laundon	Chrysothricaceae	B-4
452.	*Cryptothecea scripta* G. Thor	Arthoniaceae	B-4
453.	*Graphis scripta* (L.) Ach.	Graphidaceae	B-1,B-2,B-3,B-4

Green Agenda in Syllabus

Sl. No.	Department/School	Environmental education Syllabus	Green research	Green Clubs	Animal Experiments	Ethics committee?	Extention related to Environment
1	Physics	√	√	√		√	√
2	Chemistry	√	√	√		√	√
3	Botany	√	√	√		√	√
4	Zoology	√	√	√	√	√	√
5	Mathematics	√		√		√	
6	IT	√		√		√	√
7	Biochemistry	√	√	√		√	
8	CTIS	√		√		√	
9	Microbiology	√	√	√	√	√	√
10	Biotechnology	√	√	√	√	√	√
11	Paramedics	√	√	√	√	√	√
12	SoET	√		√		√	√
13	SoVET	√		√		√	√
14	SoMS	√		√		√	√

Green agenda form part of the curriculum in many departments and eco/nature clubs remain active for the cause of environmental protection. There is also one paper of Ability enhancement compulsory course of Environmental Studies for all Bachelor degree.

N.B: There is a single ethical commitee for University.

Transportation

Majority of the students and staffs in the campus rely on university bus fascilities and other transport facsilities, indicating lesser carbon foot print of the community. Details of transportation are given below:

Sl. No.	Vehicle type	Number of vehicles
1	Bus	16
2	Four wheeler provided by university	10
3	Four wheelers used as personal transport	35
4	Two wheelers	510
5	Bicycles	220
6	E-Vehicles	5

For avoiding environmental pollution inside campus, all the vehicles are parked near the gate. From gate, battery vehicles are provided for transportation. We also have modern pathways.

Water Quality management

Different water quality parameters for drinking water has been analysed periodically and pollution level has been managed. Wise use of water is a general practice in University. Waste water is also treated and reutilised for gardening purposes.

Sl. No.	Block	Wise use of water	Water leakage repair	Use of water purification	Rain Harvest	Use of water cooler	Test of water parameters	Water use per day in litre	Water storage	Water tank cleaning	Water management practices
1	Aryabhatta building	√	√	√	√	√	√	10000	√	√	√
2	Madhusudan building	√	√	√	√	√	√	10000	√	√	√
3	Koutilya building	√	√	√	√	√	√	10000	√	√	√
4	Skill building-1	√	√	√	√	√	√	5000	√	√	√
5	Skill building-2	√	√	√	√	√	√	5000	√	√	√
6	Staff quarter	√	√	√	√	√	√	25000	√	√	√
7	Ladies hostel-1	√	√	√	√	√	√	25000	√	√	√
8	Ladies hostel-2	√	√	√	√	√	√	25000	√	√	√
9	Ladies hostel-3	√	√	√	√	√	√	25000	√	√	√
10	Boys hostel-1	√	√	√	√	√	√	25000	√	√	√
11	Boys hostel-2	√	√	√	√	√	√	25000	√	√	√
12	Boys hostel-3	√	√	√	√	√	√	25000	√	√	√
13	Boys hostel-4	√	√	√	√	√	√	25000	√	√	√
14	Boys hostel-5	√	√	√	√	√	√	25000	√	√	√
15	Boys hostel-6	√	√	√	√	√	√	25000	√	√	√
16	Canteen-1	√	√	√	√	√	√	10000	√	√	√
17	Canteen-2	√	√	√	√	√	√	10000	√	√	√
18	Canteen-3	√	√	√	√	√	√	10000	√	√	√

N.B. Rain water from all the buildings are collected for recharging ground water and stored in effluent pond for future use in gardening purposes.

DRINKING WATER QUALITY MINITORING REPORT

The university actively works in the field of sustainable community development through its various social responsibility initiatives. This university is having different types of laboratory facility where different types of chemicals and other hazardous materials are used for different experiments. So there

is need to monitor the drinking water quality before its consumption.

AIMS AND OBJECTIVES

- Drinking water quality monitoring programs aim to support provision of safe drinking water by informing water quality management.

- To reduce human health and the environmental problem

MATERIALS AND METHODOLOGY

Collection of water samples:

Water samples were collected from different sampling sites in clean sterilized bottles of 2 to 5l volume before incubated at 27°C (Richards, 1954 and Tata, 1987).

Analysis of physico-chemical parameters of water:

For laboratory experiment the waste water samples were collected from different sites of selected mining areas and different physico-chemical parameters like pH, electrical conductivity, total dissolved solids and different elemental content were analyzed. The physico-chemical characteristics of the water samples were analyzed by following the procedures recommended by APHA (1995).

i). Estimation of pH (Electrometric method): pH of water samples were measured by immersing electrode into the beaker containing sample and reading on the dial was recorded.

ii). Electrical conductivity (Conductivity Cell Potentiometric): The conductivity cell was rinsed with at least three portions of 0.01M KCl solution. The resistance of a fourth portion was measured and the temperature was noted. The temperature compensation dial was adjusted to 0.0191°C and with the probe KCl solution, the meter was adjusted to read 141.2 ms/m. The cell was rinsed with one or more portions of sample. The temperature of the sample was adjusted to 25°Cbefore conductivity of the sample was noted.

iii). Total dissolved solids (Gravimetric): A clean and dry 100 ml beaker was taken and its initial weight was noted. 50 ml of water sample was filtered to the beaker and was kept in the heating mantle at 100°C till the whole amount of water evaporated. Then the final weight of the beaker with residue was taken. The difference gives the total amount of dissolved solid present in the water sample.

Calculation: ` $\text{TDS (mg/l)} = \frac{(A-B)\times 1000}{ml\ of\ sample\ taken}$

Where, TDS = Total dissolved solid, A = Weight of beaker + Weight of residue in mg, B = Weight of beaker

iii). Total suspended solids (Gravimetric): 50 ml of water sample was taken in a clean and dry 100 ml beaker. Initial weight of a filter paper was taken. The water sample was filtered to the beaker and the filter paper was kept in the oven till the whole amount of water evaporated. Then the final weight of the filter paper with residue was taken. The difference gives the total amount of suspended solid present in the water sample.

Calculation: $\text{TSS (mg/l)} = \frac{(A-B)\times 1000}{ml\ of\ sample\ taken}$

Where, TSS = Total suspended solid, A = (Weight of filter paper + Weight of residue) in mg

B = Weight of the filter paper

iv) Total solids (Calculation from TSS and TDS): The amount of the total solid present in water sample was calculated by adding the value of TSS with TDS.

v) Analysis of elemental content present in water samples: Water samples water collected from the study site and elemental content were analysed by using X-Ray Fluoroscence.

Statistical analysis and presentation of data : All the experiments were done in triplicates and the data presented in the figures are the means of three independent experiments. The data were analyzed statistically and standard errors of mean (SEM) were given wherever required.

SAMPLING EVENT DETAILS

Sampling site-1	
Water body	: Water purifier
Location	:Aryabhatta building, CUTM, BBSR Campus
Date	:02/12/2020
Starting time of sampling	:9:45 A.M.
Ending time of sampling	:9:48 A.M.
Sampling and analysis team	: 1. Nitish Saxena, Student 2. Aditya Narayan Barik, Student 3. Ekaparna Nayak, Student 4. Nikita Ekka, Student

Sampling site-2	
Water body	: Water purifier
Location	: M.D. building, CUTM, BBSR Campus

Date	:02/12/2020
Starting time of sampling	:10:05 A.M.
Ending time of sampling	:10:09 A.M.
Sampling and analysis team	: 1. Nitish Saxena, Student 2. Aditya Narayan Barik, Student 3. Ekaparna Nayak, Student 4. Nikita Ekka, Student

Sampling site-3	
Water body	: Water purifier
Location	: Kautilya building, CUTM, BBSR Campus
Date	:02/12/2020
Starting time of sampling	:10:22 A.M.
Ending time of sampling	:10:25 A.M.
Sampling and analysis team	:1 . Nitish Saxena, Student 2. Aditya Narayan Barik, Student 3. Ekaparna Nayak, Student 4. Nikita Ekka, Student
Sampling site-4	
Water body	: Water purifier
Location	:Skill building, CUTM, BBSR Campus
Date	:02/12/2020
Starting time of sampling	:2:05 P.M.
Ending time of sampling	:2:08 P.M.
Sampling and analysis team	: 1. Nitish Saxena, Student 2. Aditya Narayan Barik, Student 3. Ekaparna Nayak, Student 4. Nikita Ekka, Student

Sampling site-5	
Water body	: Water purifier
Location	: Girls Hostel-1, CUTM, BBSR Campus
Date	:03/12/2020

Starting time of sampling	:2:25 P.M.
Ending time of sampling	:2:29 P.M.
Sampling and analysis team	: 1. Nitish Saxena, Student 2. Aditya Narayan Barik, Student 3. Ekaparna Nayak, Student 4. Nikita Ekka, Student

Sampling site-6	
Water body	: Water purifier
Location	: Girls Hostel-2, CUTM, BBSR Campus
Date	:03/12/2020
Starting time of sampling	:2:36 P.M.
Ending time of sampling	:2:38 P.M.
Sampling and analysis team	: 1. Nitish Saxena, Student 2. Aditya Narayan Barik, Student 3. Ekaparna Nayak, Student 4. Nikita Ekka, Student

Sampling site-7	
Water body	: Water purifier
Location	: Girls Hostel-3, CUTM, BBSR Campus
Date	:03/12/2020
Starting time of sampling	:2:48 P.M.
Ending time of sampling	:2:51 P.M.
Sampling and analysis team	: 1.Nitish Saxena, Student 2. Aditya Narayan Barik, Student 3. Ekaparna Nayak, Student 4. Nikita Ekka, Student

Sampling site-8	
Water body	: Water purifier
Location	: Boys Hostel-1, CUTM, BBSR Campus
Date	:03/12/2020

Starting time of sampling	:2:28 P.M.
Ending time of sampling	:2:32 P.M.
Sampling and analysis team	: 1. Nitish Saxena, Student 2. Aditya Narayan Barik, Student 3. Ekaparna Nayak, Student 4. Nikita Ekka, Student

Sampling site-9	
Water body	: Water purifier
Location	: Boys Hostel-2, CUTM, BBSR Campus
Date	:03/12/2020
Starting time of sampling	:2:45 P.M.
Ending time of sampling	:2:48 P .M.
Sampling and analysis team	: 1. Nitish Saxena, Student 2. Aditya Narayan Barik, Student 3. Ekaparna Nayak, Student 4. Nikita Ekka, Student

Sampling site-10	
Water body	: Water purifier
Location	: Boys Hostel-3, CUTM, BBSR Campus
Date	:03/12/2020
Starting time of sampling	:2:57 P.M.
Ending time of sampling	:2:59 P.M.
Sampling and analysis team	: 1. Nitish Saxena, Student 2. Aditya Narayan Barik, Student 3. Ekaparna Nayak, Student 4. Nikita Ekka, Student

Sampling site-11	
Water body	: Water purifier
Location	: Boys Hostel-4, CUTM, BBSR Campus
Date	:03/12/2020

Starting time of sampling	:03:11 P.M.
Ending time of sampling	:03:14 P.M.
Sampling and analysis team	: 1. Nitish Saxena, Student 2. Aditya Narayan Barik, Student 3. Ekaparna Nayak, Student 4. Nikita Ekka, Student

Sampling site-12	
Water body	: Water purifier
Location	: Boys Hostel-5, CUTM, BBSR Campus
Date	:03/12/2020
Starting time of sampling	:3:23 P.M.
Ending time of sampling	:3:25 P.M.
Sampling and analysis team	: 1. Nitish Saxena, Student 2. Aditya Narayan Barik, Student 3. Ekaparna Nayak, Student 4. Nikita Ekka, Student

Sampling site-13	
Water body	: Water purifier
Location	: Boys Hostel-6, CUTM, BBSR Campus
Date	:03/12/2020
Starting time of sampling	:3:45 P.M.
Ending time of sampling	:3:48 P.M.
Sampling and analysis team	: 1.Nitish Saxena, Student 2. Aditya Narayan Barik, Student 3. Ekaparna Nayak, Student 4. Nikita Ekka, Student

Sampling site-14	
Water body	: Water purifier
Location	: Staff quarter, CUTM, BBSR Campus

Date	:05/12/2020
Starting time of sampling	:2:06 P.M.
Ending time of sampling	:2:08 P.M.
Sampling and analysis team	: 1. Nitish Saxena, Student 2. Aditya Narayan Barik, Student 3. Ekaparna Nayak, Student 4. Nikita Ekka, Student

Sampling site-15	
Water body	: Water purifier
Location	: Boys hostel canteen, CUTM, BBSR Campus
Date	:05/12/2020
Starting time of sampling	:2:47 P.M.
Ending time of sampling	:2:49 P.M.
Sampling and analysis team	: 1. Nitish Saxena, Student 2. Aditya Narayan Barik, Student 3. Ekaparna Nayak, Student 4. Nikita Ekka, Student

OBSERVATION

Table-1: Physicochemical parameters of different drinking water samples

Sl. No	Parameters	Unit	Permissible limti	Sample-1	Sample-2	Sample-3
1	pH	---	6.5-8.5	6.6	6.6	6.5
2	Electrical conductivity	mho/cm	2.25	0.238	0.302	0.224
3	Total suspended solid	mg/l	NS	0.126	0.212	0.139
4	Total dissolved solid	mg/l	500	0.024	0.032	0.044
5	Total solid	mg/l	----	0.150	0.244	0.183
6	Silicon	Ppm	2	00	00	00
7	Phosphorus	Ppm	5	539.6	529.1	524.9
8	Chlorine	Ppm	250	157.9	122.1	143.7
9	Calcium	Ppm	75	168.2	163.9	165.1
10	Iron	Ppm	0.3	14.3	14.6	13.2
11	Cobalt	Ppm	NS	00	00	00
12	Tin	Ppm	NS	42.4	42.3	00
13	Europium	Ppm	NS	13.0	00	12.0
14	Erbium	Ppm	NS	00	74.4	00
15	Chromium	Ppm	0.1	00	00	00
16	Nickel	Ppm	0.02	00	00	00

17	Cadmium	Ppm	0.005	00	00	00
18	Lead	Ppm	0.01	00	00	00
19	Copper	Ppm	1.5	00	00	00
20	Water	%		99.906	99.905	99.914

Table-2: Physicochemical parameters of different drinking water samples

Sl. No	Parameters	Unit	Permissible limti	Sample-4	Sample-5	Sample-6
1	pH	---	6.5-8.5	6.4	6.6	6.7
2	Electrical conductivity	mho/cm	2.25	0.468	0.248	0.266
3	Total suspended solid	mg/l	NS	0.986	0.352	0.514
4	Total dissolved solid	mg/l	500	0.282	0.054	0.032
5	Total solid	mg/l	----	1.268	0.406	0.546
6	Silicon	Ppm	2	00	00	00
7	Phosphorus	Ppm	5	528.6	538.1	556.0
8	Chlorine	Ppm	250	220.8	186.7	248.6
9	Calcium	Ppm	75	165.4	170.0	165.5
10	Iron	Ppm	0.3	12.8	19.3	15
11	Cobalt	Ppm	NS	00	00	00
12	Tin	Ppm	NS	40.64	41.2	42.9
13	Europium	Ppm	NS	12.8	00	00
14	Erbium	Ppm	NS	00	74.3	73.5
15	Chromium	Ppm	0.1	00	5.1	00
16	Nickel	Ppm	0.02	00	00	00
17	Cadmium	Ppm	0.005	00	00	00
18	Lead	Ppm	0.01	00	00	00
19	Copper	Ppm	1.5	00	00	00
20	Water	**%**		99.846	99.897	99.886

Table-3: Physicochemical parameters of different drinking water samples

Sl. No	Parameters	Unit	Permissible limti	Sample-7	Sample-8	Sample-9
1	pH	---	6.5-8.5	6.7	6.4	6.5
2	Electrical conductivity	mho/cm	2.25	0.346	0.398	0.324
3	Total suspended solid	mg/l	NS	1.042	0.984	0.646
4	Total dissolved solid	mg/l	500	0.048	0.136	0.062
5	Total solid	mg/l	----	1.090	1.110	0.708
6	Silicon	Ppm	2	00	291.1	00
7	Phosphorus	Ppm	5	568.2	594.7	559.0
8	Chlorine	Ppm	250	120.4	191.4	250.06
9	Calcium	Ppm	75	172.4	183.1	165.5
10	Iron	Ppm	0.3	14.2	13.3	15.0
11	Cobalt	Ppm	NS	00	00	00
12	Tin	Ppm	NS	42.6	57.3	42.9
13	Europium	Ppm	NS	00	00	00
14	Erbium	Ppm	NS	00	00	73.5

15	Chromium	Ppm	0.1	00	4.6	00
16	Nickel	Ppm	0.02	00	00	00
17	Cadmium	Ppm	0.005	00	00	00
18	Lead	Ppm	0.01	00	00	00
19	Copper	Ppm	1.5	00	00	00
20	Water			99.842	99.866	99.889

Table-4: Physicochemical parameters of different drinking water samples

Sl. No	Parameters	Unit	Permissible limti	Sample-10	Sample-11	Sample-12
1	pH	---	6.5-8.5	6.3	6.6	6.4
2	Electrical conductivity	mho/cm	2.25	0.478	0.362	0.336
3	Total suspended solid	mg/l	NS	1.086	0.908	0.844
4	Total dissolved solid	mg/l	500	0.144	0.262	0.106
5	Total solid	mg/l	----	1.230	1.170	0.950
6	Silicon	Ppm	2	235.0	00	00
7	Phosphorus	Ppm	5	554.4	529.1	556.6
8	Chlorine	Ppm	250	199.1	122.1	205.1
9	Calcium	Ppm	75	188.0	163.9	170.3
10	Iron	Ppm	0.3	9.5	14.6	00
11	Cobalt	Ppm	NS	00	00	00
12	Tin	Ppm	NS	42.3	42.3	45.1
13	Europium	Ppm	NS	00	00	00
14	Erbium	Ppm	NS	73.6	74.4	53.9
15	Chromium	Ppm	0.1	00	00	00
16	Nickel	Ppm	0.02	00	00	00
17	Cadmium	Ppm	0.005	00	00	00
18	Lead	Ppm	0.01	00	00	00
19	Copper	Ppm	1.5	00	00	00
20	Water	**%**		99.867	99.905	99.892

Table-5: Physicochemical parameters of different drinking water samples

Sl. No	Parameters	Unit	Permissible limti	Sample-13	Sample-14	Sample-15
1	pH	---	6.5-8.5	6.4	6.6	6.3
2	Electrical conductivity	mho/cm	2.25	0.342	0.338	0.422
3	Total suspended solid	mg/l	NS	1.082	0.868	0.948
4	Total dissolved solid	mg/l	500	0.058	0.036	0.102
5	Total solid	mg/l	----	1.140	0.904	1.050
6	Silicon	Ppm	2	00	00	00
7	Phosphorus	Ppm	5	529.1	569.42	536.44
8	Chlorine	Ppm	250	122.1	208.44	136.4
9	Calcium	Ppm	75	163.9	146.76	108.36
10	Iron	Ppm	0.3	14.6	8.98	12.46
11	Cobalt	Ppm	NS	00	00	00
12	Tin	Ppm	NS	42.3	48.64	44.22

13	Europium	Ppm	NS	00	00	12.4
14	Erbium	Ppm	NS	74.4	00	72.8
15	Chromium	Ppm	0.1	00	00	00
16	Nickel	Ppm	0.02	00	00	00
17	Cadmium	Ppm	0.005	00	00	00
18	Lead	Ppm	0.01	00	00	00
19	Copper	Ppm	1.5	00	00	00
20	Water	**%**		99.05	99.864	99.828

Values of three replicates ± SEM

CONCLUSSION

After summarizing the results of tests conducted in 2020 and comparing them with the maximum permissible limit recommended by WHO and BIS water quality standard, It was observed that No water samples contained any harmful heavy metals and no such parameters exceeded the permissible. So the water quality of drinking water is considered as good.

SOME PHOTOGRAPHS SHOWING WATER MANAGEMENT

Waste management

Do's and Don'ts

Do's and Don'ts DO

Collect waste, rubbish and debris within the school and dispose as per set frequency.
Dispose all waste as per guidelines.

Keep all equipment clean; do not allow a build-up of wastes.
Oversee contractors to ensure that correct procedures are followed and SOP guidelines are complied with.
Impose Penalty on defaulters for littering/spitting/open urinating within the university premises or near the boundary walls
Conduct surprise inspections of the schools to ensure a clean, hygienic and healthy environment for members and staff.
Involve students and staff in such a manner that they voluntarily contribute towards cleanliness.

DON'T

DO NOT let waste and trash accumulate within the premises.
DO NOT dispose waste outside or near parking lots, playground, drainage, swimming pool, ditches or any other location where they can damage the environment.
DO NOT let equipment get damaged or rusted; replace if unsuitable for further use.
DO NOT let contractors conduct maintenance in conflict with proper procedures and guidelines; monitor closely.
DO NOT allow littering, spitting, open urination or any other practices that affect the cleanliness and aesthetics of the premises.
DO NOT allow accumulation of unnecessary wastes anywhere.

DO NOT overcharge students in the name providing cleaner and hygienic surroundings.

WASTE MANAGEMENT

Sl. No.	Block	Food/Organic waste/day	Non plastic dry waste/day	Plastic, Thermocol/day	E-Waste	Management of organic waste	Management of E-waste	Collection of waste for management	Waste management practices
1	Aryabhatta building	L	L	L	N	Organic wastes are collected from all the sites and managed	E-wastes are collected from all the sites and managed	All kinds of wastes are collected and managed	Waste management practices adopted properly
2	Madhusudan building	L	L	L	N				
3	Koutilya building	L	L	L	N				
4	Skill building-1	L	H	L	L				
5	Skill building-2	L	H	L	L				
6	Staff quarter	M	M	L	L				
7	Ladies hostel-1	M	M	L	L				
8	Ladies hostel-2	M	M	L	L				
9	Ladies hostel-3	M	M	L	L				
10	Boys hostel-1	M	M	L	L				
11	Boys hostel-2	M	M	L	L				
12	Boys hostel-3	M	M	L	L				
13	Boys hostel-4	M	M	L	L				
14	Boys hostel-5	M	M	L	L				
15	Boys hostel-6	M	M	L	L				
16	Canteen-1	H	M	L	N				
17	Canteen-2	H	M	L	N				

18	Canteen-3	H	M	L	N				
19	Guest house	M	L	L	N				

H-High
M-Medium
L-Low
N-Nil

SOME PHOTOGRAPHS SHOWING WASTE MANAGEMENT

Collection of waste

Composting unit

ENVIRONMENTAL AUDITING POLICY

OF

CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, ODISHA

Executive Summary

A nation's growth starts from its educational institutions, where the ecology is thought as a prime factor of development associated with environment. A clean and healthy environment aids effective learning and provides a conducive learning environment. Educational institutions now a day are becoming more sensitive to environmental factors and more concepts are being introduced to make them eco-friendly. To preserve the environment within the campus, various viewpoints are applied by the several educational institutes to solve their environmental problems such as promotion of the energy savings, recycle of waste, water reduction, water harvesting etc.. The activities pursued by university can also create a variety of adverse environmental impacts.

Environmental auditing is a process whereby an organisation's environmental performance is tested against its environmental policies and objectives. Environmental audit is defined as an official examination of the effects a university has on the environment. As a part of such practice, internal environmental audit is conducted to evaluate the actual scenario at the campus. Environmental audit can be a useful tool for a university to determine how and where they are using the most energy or water or resources; the college can then consider how to implement changes and make savings. It can also be used to determine the type and volume of waste, which can be used for a recycling project or to improve waste minimization plan. Green auditing and the implementation of mitigation measures is a win-win situation for all the college, the learners and the planet. It can also create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of Green impact on campus. Green auditing promote financial savings through reduction of resource use. It gives an opportunity for the development of ownership, personal and social responsibility for the students and teachers. If self enquiry is a natural and necessary outgrowth of a quality education, it could also be stated that institutional self enquiry is a natural and necessary outgrowth of a quality educational institution. Thus it is imperative that the university evaluate its own contributions toward a sustainable future. 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. In Centurion University of Technology and Management, Odisha the audit process involved initial interviews with management to clarify policies, activities, records and the cooperation of staff and students in the implementation of mitigation measures.

This was followed by staff and student interviews, collection of data through the questionnaire, review of records, observation of practices and observable outcomes. In addition, the approach ensured that the management and staff are active participants in the green auditing process in the college. The baseline data prepared for the university will be a useful tool for campus greening, resource management, planning of future projects, and a document for implementation of sustainable development of the college. Existing data will allow the college to compare its programmes and operations with those of peer institutions, identify areas in need of improvement, and prioritize the implementation of future projects. We expect that the management will be committed to implement the green audit recommendations. We are happy to submit this Environmental audit report to the Centurion University

of Technology and Management authorities.

Pre-Audit Stage

A pre-audit meeting provided an opportunity to reinforce the scope and objectives of the audit and discussions were held on the practicalities associated with the audit. This meeting is an important prerequisite for the environmental audit because it is the first opportunity to meet the auditee and deal with any concerns. The meeting provides an opportunity to gather information that the audit team can study before arriving on the site. The audit protocol and audit plan was handed over at this meeting and discussed in advance of the audit itself. In University pre-audit meeting was conducted successfully and necessary documents were collected directly from the university before the initiation of the audit processes. Actual planning of audit processes were discussed in the pre-audit meeting. Audit team was also selected in this meeting with the help of staff and the university management. The audit protocol and audit plan were handed over at this meeting and discussed in advance of the audit itself. The audit team worked together, under the leadership of the lead auditor, to ensure completion within the brief and scope of the audit.

i. Management's Commitment

The Management of the university has shown the commitment towards the green auditing during the pre-audit meeting. They were ready to encourage all green activities. It was decided to promote all activities that are environment friendly such as awareness programs on the environment, campus farming, planting more trees on the campus etc., after the green auditing. The management of the college was willing to formulate policies based on green auditing report.

ii. Scope and Goals of Environmental Auditing

A clean and healthy environment aids effective learning and provides a conducive learning environment. There are various efforts around the world to address environmental education issues. Environmental Audit is the most efficient and ecological way to manage environmental problems. It is a kind of professional care which is the responsibility of each individual who are the part of economical, financial, social, environmental factor. It is necessary to conduct environmental audit in cuniversity campus because students become aware of the environmental audit, its advantages to save the planet and they become good citizen of our country. Thus Environmental audit becomes necessary at the university level. A very simple indigenized system has been devised to monitor the environmental performance of Centurion University of Technology and Management, Odisha. It comes with a series of questions to be answered on a regular basis. This innovative scheme is user friendly and totally voluntary. The aim of this is to help the institution to set environmental examples for the community, and to educate the young learners.

iii- Benefits of the Green Auditing

- More efficient resource management
- To provide basis for improved sustainability
- To create a green campus
- To enable waste management through reduction of waste generation, solid- waste and water recycling
- To create plastic free campus and evolve health consciousness among the stakeholders
- Recognize the cost saving methods through waste minimizing and managing
- Point out the prevailing and forthcoming complications
- Authenticate conformity with the implemented laws
- Empower the organizations to frame a better environmental performance
- Enhance the alertness for environmental guidelines and duties
- Impart environmental education through systematic environmental management approach and Improving environmental standards
- Benchmarking for environmental protection initiatives
- Financial savings through a reduction in resource use
- Development of ownership, personal and social responsibility for the College and its environment
- Enhancement of university profile
- Developing an environmental ethic and value systems in youngsters.
- Green auditing should become a valuable tool in the management and monitoring of environmental and sustainable development programs of the college.

Target Areas of Environmental Auditing

Environmental audit forms part of a resource management process. Although they are individual events, the real value of environmental audits is the fact that they are carried out, at defined intervals, and their results can illustrate improvement or change over time. Eco-campus concept mainly focuses on the efficient use of energy and water; minimize waste generation or pollution and also economic efficiency. All these indicators are assessed in process of "Environmental Auditing of educational institute". Eco-campus focuses on the reduction of contribution to emissions, procure a cost effective and secure supply of energy, encourage and enhance energy use conservation, promotes personal action, reduce the institute's energy and water consumption, reduce wastes to landfill, and integrate environmental considerations into all contracts and services considered to have significant environmental impacts. Target areas included in this green auditing are water, energy, waste, green campus and carbon footprint.

- **Auditing for Water Management**

Water is a natural resource; all living matters depend on water. While freely available in many natural environments, in human settlements potable (drinkable) water is less readily available. We need to use water wisely to ensure that drinkable water is available for all, now and in the future. A small drip from

a leaky tap can waste more than 180 liters of water to a day; that is a lot of water to waste - enough to flush the toilet eight times! Aquifer depletion and water contamination are taking place at unprecedented rates. It is therefore essential that any environmentally responsible institution should examine its water use practices. Water auditing is conducted for the evaluation of facilities of raw water intake and determining the facilities for water treatment and reuse. The concerned auditor investigates the relevant method that can be adopted and implemented to balance the demand and supply of water. It is therefore essential that any environmentally responsible institution examine its water use practices.

Auditing for Energy Management

Energy cannot be seen, but we know it is there because we can see its effects in the forms of heat, light and power. This indicator addresses energy consumption, energy sources, energy monitoring, lighting, appliances, and vehicles. Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment. An old incandescent bulb uses approximately 60W to 100W while an energy efficient light emitting diode (LED) uses only less than 10 W. Energy auditing deals with the conservation and methods to reduce its consumption related to environmental degradation. It is therefore essential that any environmentally responsible institution examine its energy use practices.

Auditing for Waste Management

Pollution from waste is aesthetically unpleasing and results in large amounts of litter in our communities which can cause health problems. Plastic bags and discarded ropes and strings can be very dangerous to birds and other animals. This indicator addresses waste production and disposal, plastic waste, paper waste, food waste, and recycling. Solid waste can be divided into two categories: general waste and hazardous waste. General wastes include what is usually thrown away in homes and schools such as garbage, paper, tins and glass bottles. Hazardous waste is waste that is likely to be a threat to health or the environment like cleaning chemicals and petrol. Unscientific landfills may contain harmful contaminants that leach into soil and water supplies, and produce greenhouse gases contributing to global climate change. Furthermore, solid waste often includes wasted material resources that could otherwise be channeled into better service through recycling, repair, and reuse. Thus the minimization of solid waste is essential to a sustainable college. The auditor diagnoses the prevailing waste disposal policies and suggests the best way to combat the problems. It is therefore essential that any environmentally responsible institution examine its waste processing practices.

Auditing for Green Campus Management

Unfortunately, biodiversity is facing serious threats from habitat loss, pollution, over consumption and invasive species. Species are disappearing at an alarming rate and each loss affects nature’s delicate balance and our quality of life. Without this variability in the living world, ecological systems and functions would break down, with detrimental consequences for all forms of life, including human beings. Newly planted and existing trees decrease the amount of carbon dioxide in the atmosphere.

Trees play an important ecological role within the urban environment, as well as support improved public health and provide aesthetic benefits to cities. In one year, a single mature tree will absorb up to 48 pounds of carbon dioxide from the atmosphere, and release it as oxygen. The amount of oxygen that a single tree produces is enough to provide one day's supply of oxygen for people. So while you are busy studying and working on earning those good grades, all the trees on campus are also working hard to make the air cleaner for us. Trees on our campus impact our mental health as well; studies have shown that trees greatly reduce stress, which a huge deal is considering many students are under some amount of stress.

Auditing for Carbon Footprint

Commutation of stakeholders has an impact on the environment through the emission of greenhouse gases into the atmosphere consequent to burning of fossil fuels (such as petrol). The most common greenhouse gases are carbon dioxide, water vapour, methane, nitrous oxide and ozone. Of all the greenhouse gases, carbon dioxide is the most prominent greenhouse gas, comprising 402 ppm of the Earth's atmosphere. The release of carbon dioxide gas into the Earth's atmosphere through human activities is commonly known as carbon emissions.

An important aspect of doing an audit is to be able to measure your impact so that we can determine better ways to manage the impact. In addition to the water, waste, energy and biodiversity audits we can also determine what our carbon footprint is, based on the amount of carbon emissions created. One aspect is to consider the distance and method traveled between home and college every day. It undertakes the measure of bulk of carbon dioxide equivalents exhaled by the organization through which the carbon accounting is done. It is necessary to know how much the organization is contributing towards sustainable development. It is therefore essential that any environmentally responsible institution examine its carbon footprint.

CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT

STANDARD OPERATING PROCEDURE FOR ENVIRONMENTAL AUDITING

Background

Inappropriate hygiene behavior due to poor sanitation, water scarcity, and inferior water quality is disastrous for human being of all age-groups and is a major cause of mortality for all. As students as well as staffs spend long hours in university, so these conditions are also detrimental to their health. All the aspects of the university i. e. the physical environment and cleanliness routines affect students. In lack of: limited ventilation, proper hand-washing facilities, and where toilets are in disrepair their growth can both physically and mentally be hampered. Too often, universities are places where people catch infection and fall ill. So it is needed for all universities, to be well-maintained and clean, to move towards the larger goal of a healthy, unpolluted environment.

Objectives

For uniform cleanliness guidelines it is essential to have a standard operating procedure to ensure that the university maintain set standards of cleanliness and ecofriendly zone in their respective premises.

The purpose of this SOP is to improve current cleanliness level in the university and involve students as well as all the staffs as change makers. The primary way to achieve the same is through inculcating good sanitation and hygiene practices amongst the staff and students. University offers an opportunity to engage students, research scholars and community in general, either through knowledge dissemination via students or through direct involvement and demonstration at universities through different awareness programmes. Students are quick Standard Operating Procedures. Learners and adapt their behaviour more easily than adults; hence, they can be readily available change makers.

This SOP also targets to ensure proper environment management through different processes like recycling and processing of waste, and establish systems in the university for cleanliness. An assessment framework has also been defined in this document which can help the concerned university to improve its cleanliness maintenance processes and achieve a greater level of cleanliness than the existing ones.

Any amendments to the procedures based upon requirement should be identified and incorporated as per the requirement. This document serves as the base document.

The Standard Operating Procedures are set out in a detailed format to cover the issues required to implement environment friendly zone in university premises. The purpose of the audit was to ensure that the practices followed in the campus are in accordance with the Green Policy adopted by the institution. The criteria, methods and recommendations used in the audit were based on the identified risks. The methodology includes: preparation and filling up of questionnaire, physical inspection of the campus, observation and review of the document, interviewing responsible persons and data analysis,

measurements and recommendations.

Methodology of Environmental Auditing

The methodology adopted for this audit was a three step process comprising of:

1. Data Collection – In preliminary data collection phase, exhaustive data collection was performed using different tools such as observation, survey communicating with responsible persons and measurements.
Following steps were taken for data collection:

- The team went to each department, centres, Library, canteen etc.
- Data about the general information was collected by observation and interview.
- The power consumption of appliances was recorded by taking an average value in some cases.

2. **Data Analysis** - Detailed analysis of data collected include : calculation of energy consumption, analysis of latest electricity bill of the campus, understanding the tariff plan provided by the Electricity Board. Data related to water usages were also analyzed using appropriate methodology.

3. Recommendation – On the basis of results of data analysis and observations, some steps for reducing power and water consumption were recommended. Proper treatments for waste were also suggested. Use of fossil fuels has to be reduced for the sake of community health. The above target areas particular to the University was evaluated through questionnaire circulated among the students for data collection. Five categories of questionnaires were distributed.

The formats of these are given below.

Water Management

1. List uses of water in university premises.
2. What are the sources of water?
3. How does university store water?
4. Quantity of water stored in overhead water tank? (in liters)
5. Quantity of water pumped every day? (in liters)
6. If there is water wastage, specify why.
7. How can the wastage be prevented / stopped?
8. Locate the point of entry of water and point of exit of waste water.
9. Where does waste water come from?
10. Where does the waste water go?
11. What are the uses of waste water?
12. What happens to the water used in your labs? Whether it gets mixed with ground water?
13. Is there any treatment for the lab water?

14. Whether green chemistry methods are practiced in your labs?
15. Write down four ways that could reduce the amount of water used in your college.
16. No. of water coolers. Amount of water used per day? (in liters)
17. No. of water taps. Amount of water used per day?
18. Amount of water used per day.
19. Total use of water in each hostel?
20. At the end of the period, compile a table to show how many litres of water have been used in the college for each purpose
21. Is there any water used for agricultural purposes?
22. Does your university harvest rain water?
23. How many of the taps are leaky? Amount of water lost per day?
24. Are there signs reminding people to turn off the water? Yes / No
25. Is there any waterless toilets? _____
26. How many water fountains are there? _____
27. Is drip irrigation used to water plants outside? YES/NO
28. Is there any water management plan in the college?
29. Are there any water saving techniques followed in your college? What are they?
30. Please share Some IDEA for how your college could save more water.

Auditing for Energy Management

1. List ways that you use energy in your University. (Electricity, electric stove, kettle, microwave, LPG, firewood, Petrol, diesel and others).
2. Electricity bill amount for the last year
3. Amount paid for LPG cylinders for last one year
4. Weight of firewood used per month and amount of money spent? Also mention the amount spent for petrol/diesel/ others for generators?
5. Are there any energy saving methods employed in your University ? If yes, please specify. If no, suggest some.
6. How much money does your college spend on energy such as electricity, gas, firewood, etc. in a month.(Record monthly for the year 2016).
7. How many CFL bulbs has your University installed? Mention use (Hours used/day for how many days in a month)
8. Energy used by each bulb per month? (for example- 60 watt bulb x 4hours x number of bulbs = kwh).
9. How many LED bulbs are used? Mention the use (Hours used/day for how many days in a month)
10. Energy used by each bulb per month? (kwh).
11. How many incandescent (tungsten) bulbs have installed? Mentions use (Hours used/day for how many days in a month)
12. Energy used by each bulb per month? (kwh).
13. How many fans are installed college? Mention use (Hours used/day for how many days in a month)
14. Energy used by each fan per month? (kwh)

15. How many air conditioners are installed college? Mention use (Hours used/day, for how many days in a month)
16. Energy used by each air conditioner per month? (kwh).
17. How many electrical equipments including weighing balance are installed your college? Mention the use (Hours used/day for how many days in a month)
18. Energy used by each electrical equipment per month? (kwh).
19. How many computers are there in your college? Mention the use (Hours used/day for how many days in a month)
20. Energy used by each computer per month? (kwh)
21. How many photocopiers are installed? Mention use (Hours used/day for how many days in a month).
22. How many cooling apparatus are installed? Mention use(Hours used/day for how many days in a month)
23. Energy used by each cooling apparatus per month? (kwh) Mention use (Hours used/day for how many days in a month)
24. Energy used by each photocopier per month? (kwh) Mention the use (Hours used/day for how many days in a month)how many inverters your college installed? Mentions use (Hours used/day for how many days in a month)
25. Energy used by each inverter per month? (kwh)
26. How many electrical equipment are used in different labs of your college? Mention the use (Hours used/day for how many days in a month)
27. Energy used by each equipment per month? (kwh)
28. How many heaters are used in the canteen of your college ? Mention the use (Hours used/day for how many days in a month)
29. Energy used by each heater per month? (kwh)
30. No of street lights in your college?
31. Energy used by each street light per month? (kwh)
32. No of TV in your university and hostels?
33. Energy used by each TV per month? (kwh)
34. Any other item that uses energy (Please write the energy used per month) Mention the use (Hours used/day for how many days in a month)
35. Are any alternative energy sources/nonconventional energy sources employed / installed in your college? (photovoltaic cells for solar energy, windmill, energy efficient stoves, etc.,) Specify.
36. Do you run “switch off” drills at college?
37. Are your computers and other equipment put on power-saving mode?
38. Does your machinery (TV, AC, Computer, weighing balance, printers, etc.) run on standby mode most of the time? If yes, how many hours?
39. What are the energy conservation methods adapted by your college?
40. How many boards displayed for saving energy awareness?
41. How much ash is collected after burning fire wood per day in the canteen?
42. Write a note on the methods/practices/adaptations by which you can reduce the energy use in your college campus in future.

Auditing For Green Campus Management

1. Is there a garden in your University? Area?
2. Do students spend time in the garden?
3. List the plants in the garden, with approx. numbers of each species.
4. Suggest plants for your campus. (Trees, vegetables, herbs, etc.)
5. List the species planted by the students, with numbers.
6. Whether you have displayed scientific names of the trees in the campus?
7. Is there any plantations in your campus? If yes specify area and type of plantation.
8. Is there any vegetable garden in your college? If yes how much area?
9. Is there any medicinal garden in your college? If yes how much area?
10. What are the vegetables cultivated in your vegetable garden? (Mention the quantity of harvest in each season)
11. How much water is used in the vegetable garden and other gardens? (Mention the source and quantity of water used).
12. Who is in charge of gardens in your college?
13. Are you using any type of recycled water in your garden?
14. List the name and quantity of pesticides and fertilizers used in your gardens?
15. Whether you are doing organic farming in your college? How?
16. Do you have any composting pit? If yes What are you doing with the compost generated?
17. What do you doing with the vegetables harvested? Do you have any student market?
18. Is there any botanical garden in your campus? If yes give the details of campus flora.
19. Give the number and names of the medicinal plants in your college campus.
20. Any threatened plant species planted/conserved?
21. Is there a nature club in your college? If yes what are their activities?
22. Is there any arboretum in your college? If yes details of the trees planted.
23. Is there any fruit yielding plants in your college? If yes details of the trees planted.
24. Is there any groves in your college? If yes details of the trees planted.
25. Is there any irrigation system in your college?
26. What is the type of vegetation in the surrounding area of the college?
27. What are the nature awareness programmes conducted in the campus?
28. What is the involvement of students in the green cover maintenance?
29. What is the total area of the campus under tree cover? Or under tree canopy?
30. Share your IDEAS for further improvement of green cover.

Auditing for Carbon Footprint

1. What is the total strength of students and teachers in your College?
2. Total Number of vehicles used by the stakeholders of the college. (per day)
3. No. of cycles used
4. No. of two wheelers used (average distance travelled and quantity of fuel and amount used per day)
5. No. of cars used (average distance travelled and quantity of fuel and amount used per day)
6. No. persons using common (public) transportation (average distance travelled and quantity of fuel

and amount used per day)
7. No. of persons using college conveyance by the students, non teaching staff and teachers (average distance travelled and quantity of fuel and amount used per day)
8. Suggest the methods to reduce the quantity of use of fuel used by the stakeholders/ students/ teachers/ non teaching staff of the college.

Waste management

Develop, implement, and maintain the Waste Management Program.

Assist departments in complying with the program by providing them with waste consultation, waste minimization concepts, and proper containers for chemical waste collection, on an as needed basis.

Remove properly labeled, containerized, and sealed hazardous waste from generation locations (i.e. laboratories, shops, maintenance areas).

Provide off-site hazardous waste disposal to all generators at university via Hazardous Waste Contractor.

Assist departments with the redistribution of useable materials.

Periodically audit facilities for hazardous waste management compliance.

Maintain all documentation required by the EPA regarding waste determinations, inspections, contingency plans, manifests, transportation, storage, and final disposal.

Offer hazardous waste management training to appropriate faculty, staff, and students.

Departments / Units
Follow procedures to ensure effective compliance with the Waste Management Program.
Consult with EH&S prior to implementation of department specific procedures to prevent confusion or compliance issues.
Provide Environmental Health and Safety with notification prior to implementing changes that increase or reduce waste streams.
Ensure that all appropriate personnel strictly adhere to the Waste Management Program.
Ensure that employees working with hazardous waste attend initial training and annual refresher on the Waste Management Program and emergency procedures.

Maintain training records for current and past employees.

Generators (Faculty, Staff, Student, Researcher, etc.)
Understand the hazards of the chemicals you work with. Make informed decisions based on that understanding.

Complete training on proper waste management.

Comply with hazardous materials procedures and protocols, whether written or oral, while performing assigned duties.

Become familiar and comply with University's Waste Management Program.

Assessments & Inspections

Self-Evaluation

Three broad parameters infrastructure availability, maintenance of university premises and equipment, and feedback from students, staff and faculty members – are being proposed here for assessing / rating schools on overall cleanliness. The parameters for these ratings may also be utilized for conducting self-evaluation by the concerned authority to identify areas of improvement and intervention.

Gap Assessment

Apart from self-evaluation as described above, a periodic assessment of infrastructure gaps is also essential in order to maintain the standards of sanitation and cleanliness in the university premises.

Periodic Inspection

Daily inspection

To be conducted by: Direct supervisor of the Maintenance Staff

S.No.	Area and Activity
1.	Check if the university premises have been swept/cleaned and waste removed appropriately.
2.	Check if the playground/basketball courts have been adequately swept and cleaned.
3.	Check if corridors inside the university have been regularly cleaned.
4.	Check if the canteen is maintaining adequate standards of cleanliness and hygiene.
5.	Check if all the dustbins have been emptied and cleaned.
6.	Check if activity rooms, swimming pool are cleaned every day.
7.	Check if towels, swimming costumes etc. are being cleaned after one use.
6.	Check that the garbage is being collected and disposed regularly.
7.	Check that all stairs/ Lifts have been properly cleaned.
8.	Ensure that there are no open sewers, gutters, damaged drain pipes, sewage blockages; and if there are, address them immediately.
9.	Check if cleaning and scrubbing of toilets along with their wash basins, sanitary fittings, glasses and mirrors and toilet floors has been done.
10.	Check if toilets are clean and dry, and all fixtures (light bulbs, wash basin, exhaust fans) are functional.
11.	Check if cleaning and disinfecting of all vitreous fixtures including toilet bowls, urinals, sinks, toilet seats, containers etc. has been done properly. Check below water level and under rims including areas at hinges and cistern handles. Check if restock of toiletries, including liquid hand soap, toilet paper, air freshener, and sanitary cubes and naphthalene balls in toilets has been done.
12.	Check if one maintenance staff is present in front of every common toilet.
13.	Check whether mowing, hedge clipping has been done and waste from the ground has been adequately removed.
14.	Check if construction, renovation waste has been adequately disposed.

15. Check if any kind of water logging is present at hand washing, utensil washing areas in canteen, lab sinks and toilets.
16. Check whether dusting of general storage, desks and benches and toy/book storage for has been done.

Weekly Inspection

To be conducted by: Representative of Sanitary Committee (by turns)

S.No.	Area and Activity
1.	Check all daily reports since past week for compliance. Check all items as outlined in daily inspection report during weekly inspection as well.
2.	Check past 3 weekly reports for areas identified for improvement/corrections and check if the same have been addressed.
3.	Check for any damages in the premises and ensure that they are addressed.
4.	Check for cleaning of electrical fittings and ensure they are in good, working condition.
5.	Check if there are potholes or spaces where stagnant water is collecting and immediately address them.
6.	Inspect drinking water fountains/taps and ensure they have been cleaned.

Monthly inspection

To be conducted by: Management

S.No.	Area and Activity
1.	Check all daily and weekly reports since last month for compliance. Check all items as outlined in daily and weekly inspection report during monthly inspection as well.
2.	Check past 3 monthly reports for areas identified for improvement/corrections and check if same have been addressed.
3.	Conduct self-evaluation and Identify areas of improvement and delineate action items.
4.	Conduct infrastructure gap assessment (as outlined previously in this document) and identify action items (can be done quarterly as well, depending on need).
5.	Check all major infrastructural items and fittings to ensure they are in good condition.
6.	Check if all buildings, roads, boundary walls, entry-exit points; fittings, fixtures in toilets and grounds are in good condition.
7.	Check roster/daily register of cleaning staff to see that the deployment is adequate and timely.

Quarterly inspection

To be conducted by: Management

S.No.	Area and Activity
1.	Thorough cleaning of the roof, water outlets, checking for cracks, coping, chhajja etc. Checking and repairing of leaky roofs
2.	Check the water tank thoroughly for leakage etc. Seal it with water proof cement or sealant and clean it at regular intervals.
3.	In case of an underground tank, check if the cover and the brim of the tank are intact and sufficiently raised from the surrounding ground level.
4.	Check for leveling and cleaning of open university ground.

5.	Checking of electrical lines and earthing (if applicable).
6.	Check, if all the fans, tube lights are dusted properly.
7.	Check if coolers (if any) and water tank cleaned properly. Change pads; check all electrical systems and earthing.
8.	Check the functioning of hinges, bolts and other hardware of all doors and windows.
9.	Check if drinking water is safe as per WHO Guidelines for Drinking-water Quality or national standards and acceptance levels concerning chemical and radiological parameters.

Annual Inspection (After Summer Vacations)

To be conducted by: Management

S.No.	**Area and Activity**
1.	Check past 2 quarterly reports for areas identified for improvement/corrections and check if same have been addressed.
2.	Check for the need of any structural repair or plastering.
3.	Check for thorough cleaning of sewage and waste water lines.
4.	Check for Associated painting work.
5.	Check for cleaning of septic tanks and leach pits (if applicable).
6.	Check whether any electrical repair is required.
7.	Check if any sort of training and capacity building of the staff is required.

Review of Documents and Records

Documents such as admission registers, registers of electricity and water charge remittance, furniture register, laboratory equipment registers, purchase register, audited statements, and office registers were examined and data were collected. College calendars, college magazines, annual report of the college and NAAC self-assessment reports, UGC report etc. were also verified as part of data collection.

Review of Policies

Discussions were made with the college management regarding their policies on environmental management. Future plans of the college were also discussed. The management would formulate a revised environment /green policy for the college in the light of green auditing. The purpose of the green audit was to ensure that the practices followed in the campus are to be in accordance with the Green Policy adopted by the institution.

Interviews

In order to collect information for green auditing different audit groups interviewed office staff, Principal, teaching and non-teaching staff, students, parents and other stakeholders of the college. Discussions were also made with the office bearers to clarify doubts regarding certain points.

Site inspection

College and its premises were visited and analyzed by the audit-teams several times to gather information. Campus trees were counted and identified. Vegetable garden, banana garden, play

grounds, canteen, library, office rooms and parking grounds were also visited to collect data. Number and type of vehicles used by the stakeholders were counted and fuel consumption for each vehicle was verified with the user. Number of LPG cylinders used in labs, canteen and hostel kitchen were also counted. Leakage of a few water taps were noticed during the site inspection.

Post Audit Stage

The base of any environmental audit is that its findings are supported by documents and verifiable information. The audit process seeks, on a sampled basis, to track past actions, activities, events, and procedures to ensure that they are carried out according to systems requirements and in the correct manner. Environmental audits form a part of a process. Although they are individual events, the real value of environmental audits is the fact that they are carried out, at defined intervals, and their results can illustrate improvement or change over time. Although environmental audits are carried out using policies, procedures, documented systems and objectives as a test, there is always an element of subjectivity in an audit. The essence of any Environmental audit is to find out how well the environmental organisation, environmental management and environmental equipment are performing. Each of the three components are crucial in ensuring that the organisation’s environmental performance meets the goals set in its green policy. The individual functioning and the success of integration will all play a role in the degree of success or failure of the organisation’s environmental performance.