REPORT OF
ENVIRONMENTAL AUDIT
OF CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, BOLANGIR CAMPUS, ODISHA (2021-22)

2021-22

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 aquestionnaire. With the help of student volunteers and faculties of respective departmrnts the major partof 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

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SCHOOL OF APPLIED SCIENCES
CUTM
CENTURION UNIVERSITY OF TECHNOLOGY & MANAGEMENT

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. 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	Academic building-1	C	G	√	G	√	√	√	G
2	Academic building-2	C	G	√	G	√	√	√	G
3	Central Mess	Asb	A	√	NA	**NA**	√	√	A
4	Mini Market	C	A	√	NA	**NA**	√	√	G
5	Staff quarter	C	G	√	NA	√	√	√	G

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

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.

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. Faunal and floral diversity reports are given below.

REPORT ON FLORAL AND FAUNAL DIVERSITY

The Campus although located in the heart of the city maintains its greenery. Survey conducted by the faculty members of Zoology and Botany department identified about 113 plant species of various genera. Most of the recorded species have medicinal importance.

Pictures of some of the floral elements are given. The Campus maintains its own nursery to cultivate various other useful medicinal plants. This floral diversity provides a conducive ambience to wide gamut of faunal elements to be present in the campus. This includes a rich diversity of insects including butterflies, ants, wasps, birds and mammals.

Floral diversity:

Sl.No.	Scientific Name	Family	Common name
1	*Mangifera indica*	Anacardiaceae	Mango
2	*Delonix Regia*	Fabaceae	Royal Poinciana
3	*Dalbergia Sissoo*	Fabaceae	North Indian Rosewood
4	*Hyophorbe lagenicaulis*	Arecaceae	Bottle Palm
5	*Azadirachta indica*	Meliaceae	Neem
6	*Polyalthia longifolia*	Annonaceae	False Ashoka
7	*Diospyros melanoxylon*	Ebenaceae	Tendu
8	*Diospyros malabarica*	Ebenaceae	Malabar Ebony
9	*Phyllanthus emblica*	Phyllanthaceae	Indian Gooseberry
10	*Phyllanthus acidus*	Phyllanthaceae	Malay Gooseberry
11	*Areca palm*	Arecaceae	Golden Cane Palm
12	*Psidium guajava*	Myrtaceae	Guava

13	*Butea monosperma*	Fabaceae	Plash Flower
14	*Senna siamea*	Fabaceae	Kassod Tree
15	*Samanea saman*	Fabaceae	Monkeypod Tree
16	*Ficus racemosa*	Moraceae	Gular
17	*Ficus benghalensis*	Moraceae	Banyan
18	*Ficus religiosa*	Moraceae	Pippala Tree
19	*Millettia pinnata*	Fabaceae	Indian Beech
20	*Ziziphus jujube*	Rhamnaceae	Common Jujube
21	*Ziziphus mauritiana*	Rhamnaceae	Chinese Apple
22	*Ziziphus oenoplia*	Rhamnaceae	Wild Jujube
23	*Cascabela thevetia*	Apocynaceae	Yellow Oleander
24	*Citrus lemon*	Rutaceae	Lemon
25	*Citrus reticulate*	Rutaceae	Mandarin Orange
26	*Trema orientale*	Cannabaceae	Pigeon Wood
27	*Syzygium samarangense*	Myrtaceae	Java Apple
28	*Syzygium cumini*	Myrtaceae	Jamun
29	*Malus domestica*	Rosaceae	Apple
30	*Carica papaya*	Caricaceae	Papaw
31	*Cinnamomum tamala*	Lauraceae	Tejapatta
32	*Cinnamomum verum*	Lauraceae	Cinnamon
33	*Manilkara zapota*	Sapotaceae	Chiku
34	*Anacardium occidentale*	Anacardiaceae	Cashew Nut
35	*Annona squamosa*	Annonaceae	Annona Squamosal
36	*Mimusops elengi*	Sapotaceae	Spanish Cherry

37	*Murraya koenigii*	Rutaceae	Curry Leaf Tree
38	*Gmelina arborea*	Verbenaceae	Khamer
39	*Leucaena leucocephala*	Fabaceae	White Leadtree
40	*Peltophorum pterocarpum*	Caesalpiniaceae	Copperpod
41	*Cocos nucifera*	Arecaceae	Coconut Palm
42	*Terminalia arjuna*	Combretaceae	Arjun Tree
43	*Acacia nilotica*	Mimosaceae	Babool
44	*Putranjiva Roxburghii*	Putranjivaceae	Kuduru
45	*Nyctanthes arbor-tristis*	Oleaceae	Night-Flowering Jasmine
46	*Elaeocarpus*	Elaeocarpaceae	Indian Olive
47	*Bougainvillea*	Nyctaginaceae	Paper Flower
48	*Saccharum officinarum*	Poaceae	Sugarcane
49	*Nerium Indicum*	Apocynaceae	Nerium
50	*Citrus maxima*	Rutaceae	Pomelo
HOTICULTURE PLANT			
1	*Plumeria alba*	Apocynaceae	White Frangipani
2	*Plumeria rubra*	Apocynaceae	Red Frangipani
3	*Bryophyllum inophyllum*	Crassulaceae	Life Plant
4	*Ocimum tenuiflorum*	Lamiaceae	Holy Basil
5	*Catharanthus roseus*	Apocynaceae	Rose Periwinkle
6	*Mentha spicata*	Lamiaceae	Pudina
7	*Codiaeum variegatum*	Euphorbiaceae	Croton
8	*Zingiber officinale*	Zingiberaceae	Ginger
9	*Curcuma longa*	Zingiberaceae	Turmeric
10	*Piper betle.*	Betel Pepper	Piperaceae

11	*Ocimum kilimandscharicum*	Lamiaceae	Hoary Basil
12	*Nelumbo nucifera*	Nymphaeaceae	Indian Lotus
13	*Cycas circinalis*	Cycadaceae	Queen Sago
14	*Justicia adhatoda*	Acanthaceae	Malabar Nut
15	*Punica granatum*	Lythraceae	Pomegranate
16	*Coffea Arabica*	Rubiaceae	Coffee
17	*Chrysanthemum*	Asteraceae	Indian Chrysanthemum
18	*Rosa rubiginosa*	Rosaceae	Sweet Briar
19	*Tabernaemontana divaricate*	Apocynaceae	East Indian Rosebay
20	*Cucurbita pepo*	Cucurbitaceae	Pumpkin
21	*Passiflora incarnate*	Passifloraceae.	Passion Vines
22	*Ixora coccinea*	Rubiaceae	Scarlet Jungle Flame
23	*Lemon cypress*	Cupressaceae	Lemon Pine
24	*Solanum melongena*	Solanaceae	Brinjal
25	*Cyamopsis tetragonoloba*	Fabaceae	Cluster Bean
26	*Momordica charantia*	Cucurbitaceae	Bitter Gourd
27	*Coccinia grandis*	Cucurbitaceae	Ivy Gourd

Faunal Diversity

Birds

Sl.No	Common name	Zoological name	Conservation status (IUCN)
1	Jungle babbler	*Turdoides striata*	Least Concern
2	Red vented bulbul	*Pycnonotus cafer*	Least Concern
3	Red whiskered bulbul	*Pycnonotus jocosus*	Least Concern

4	Black drongo	*Dicrurus macrocercus*	Least Concern
5	Purple sunbird	*Cinnyris asiaticus*	Least Concern
6	Lesser coucal	*Centropus bengalensis*	Least Concern
7	Little green bee eater	*Merops orientalis*	Least Concern
8	Spotted dove	*Spilopelia chinensis*	Least Concern
9	Indian robin	*Saxicoloides fulicatus*	Least Concern
10	Oriental Magpie robin	*Copsychus saularis*	Least Concern
11	Common tailor bird	*Orthotomus sutorius*	Least Concern
12	Shikra	*Accipiter badius*	Least Concern
13	Alexandrine parakeet	*Psittacula eupatria*	Least Concern
14	Golden oriole	*Oriolus oriolus*	Least Concern
15	Paddy field pipit	*Anthus rufulus*	Least Concern
16	Black kite	*Milvus migrans*	Least Concern
17	Blue rock pigeon	*Columba livia*	Least Concern
18	Pond heron	*Ardeola grayii*	Least Concern
19	Cattle egret	*Bubulcus ibis*	Least Concern
20	Common iora	*Aegithina tiphia*	Least Concern
21	Common crow	*Corvus splendens*	Least Concern
22	Peafowl	*Pavo cristatus*	Least Concern
23	Ashy prinia	*Prinia socialis*	Least Concern
24	Twany flanked prinia	*Prinia subflava*	Least Concern
25	Black hooded oriole	*Oriolus xanthornus*	Least Concern
26	Common hawk-cuckoo	*Hierococcyx varius*	Least Concern

Reptiles

Sl no	Common name	Zoological name	Conservation status
1	Rat snake	*Ptyas mucosa*	Least concern
2	Common krait	*Bungarus caeruleus*	Least concern
3	Banded Kukri snake	*Oligodon arnensis*	Least concern
4	Bronze back tree	*Dendrelaphis tristis*	Least concern

	snake		
5	Common garden lizard	*Calotes versicolor*	Least concern
6	Fan throated lizard	*Sitana ponticeriana*	Least concern
7	Bark gecko	*Hemidactylus leschenaultii*	Least concern
8	Spotted house gecko	*Hemidactylus brookii*	Least concern

Amphibians

Sl no	Common name	Zoological name	Conservation status
1	Skittering frog	*Euphlyctis cyanophlyctis*	Least concern
2	Common Indian toad	*Duttaphrynus melanostictus*	Least concern
3	Indian tree frog	*Polypedates maculatus*	Least concern

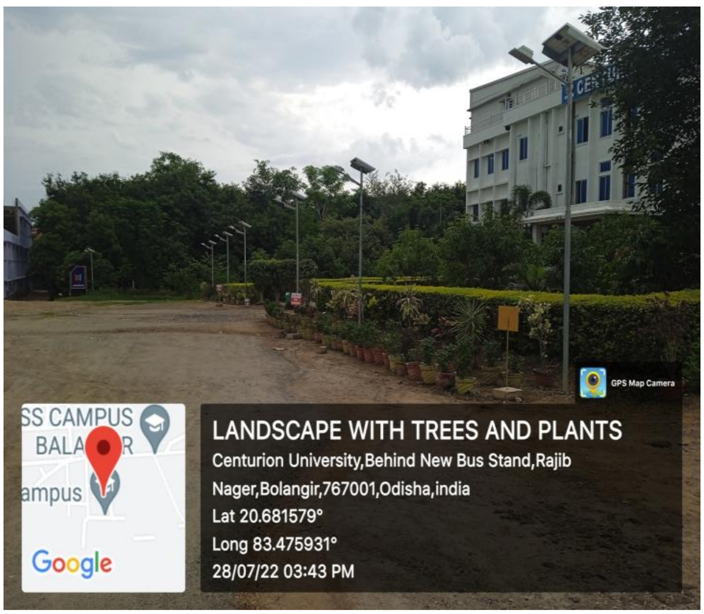
Mammals

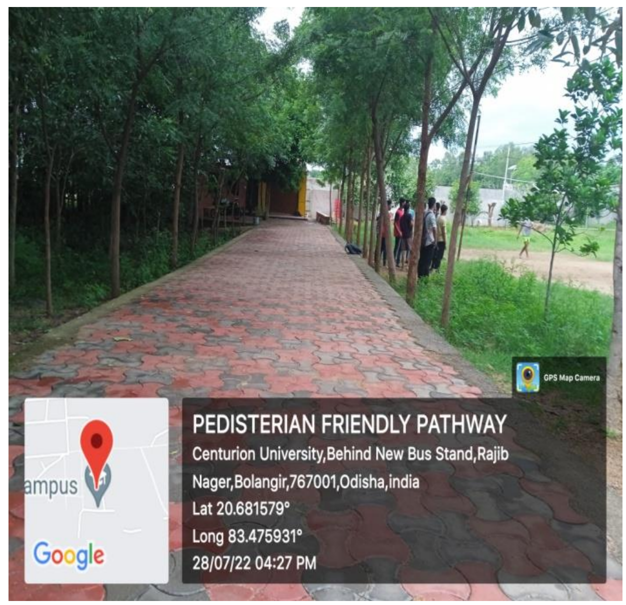
Sl no	Common name	Zoological name	Conservation status
1	Dog	*Canis lupus familiaris*	Data deficient
2	Cat	*Felis catus*	Data deficient

Invertebrates

Sl no	Common name	Zoological name	Conservation status
1	Freshwater pearl	*Margaritifera*	Endangered

	mussel	*margaritifera*	
2	Earthworm	*Eisenia fetida*	Data deficient
3	Honey bee	*Apis mellifera*	Data deficient
4	Lemon pansy butterfly	*Junonia lemonias*	Least concern
5	Common grass yellow butterfly	*Eurema hecabe*	Least concern
6	Plain tiger butterfly	*Danaus chrysippus*	Least concern





Green Agenda in Syllabus

Sl.	Department/School	Environmental	Green	Green Clubs	Animal	Ethics	Extention

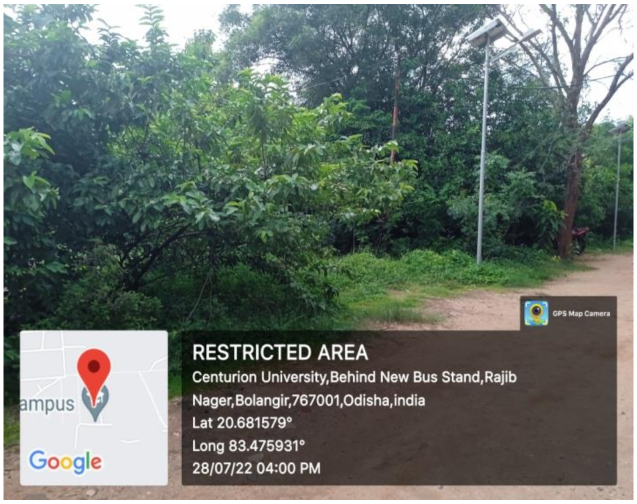
No.		education Syllabus	research		Experiments	committee?	related to Environment
1	Physics	√	√	√		√	√
2	Chemistry	√	√	√		√	√
3	Botany	√	√	√		√	√
4	Zoology	√	√	√	√	√	√
5	Mathematics	√		√		√	
6	IT	√		√		√	√
7	BCA	√	√	√		√	
8	B.Pharm	√		√	√	√	
9	D. Pharm	√	√	√	√	√	√

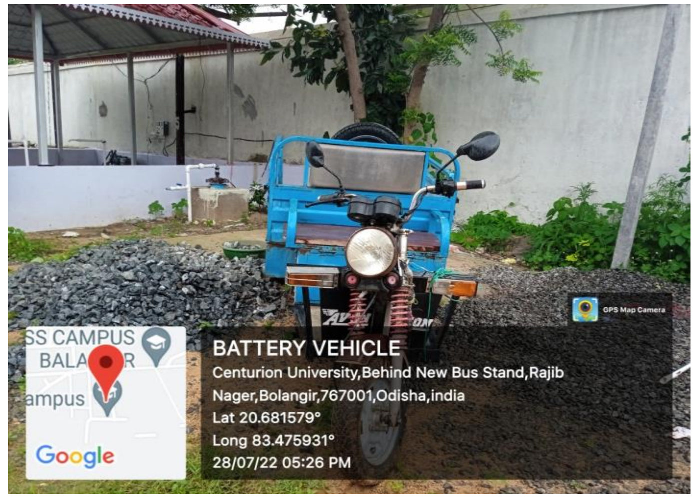
Green agenda form part of the curriculum in many departments and eco/nature clubs remain active for the cause of environmental protection. There is also one paper of Ability enhancement compulsory course of Environmental Studies for all Bachelor degree.

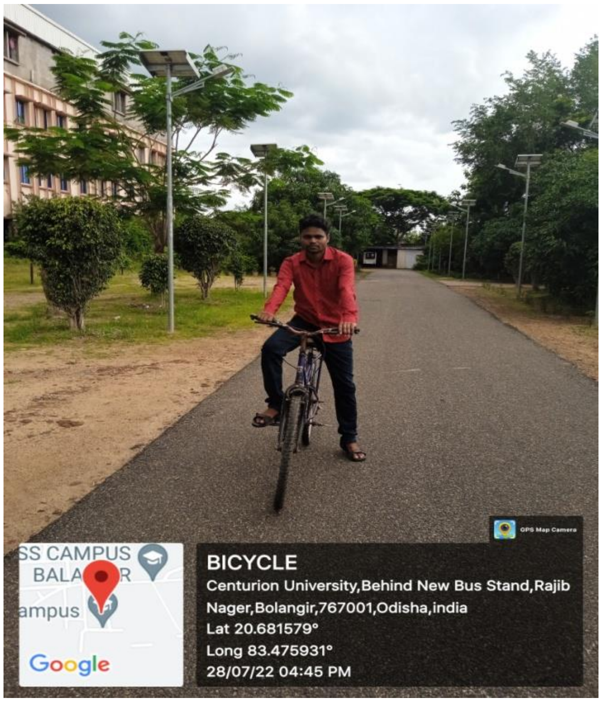
N.B: There is a single ethical commitee for University.

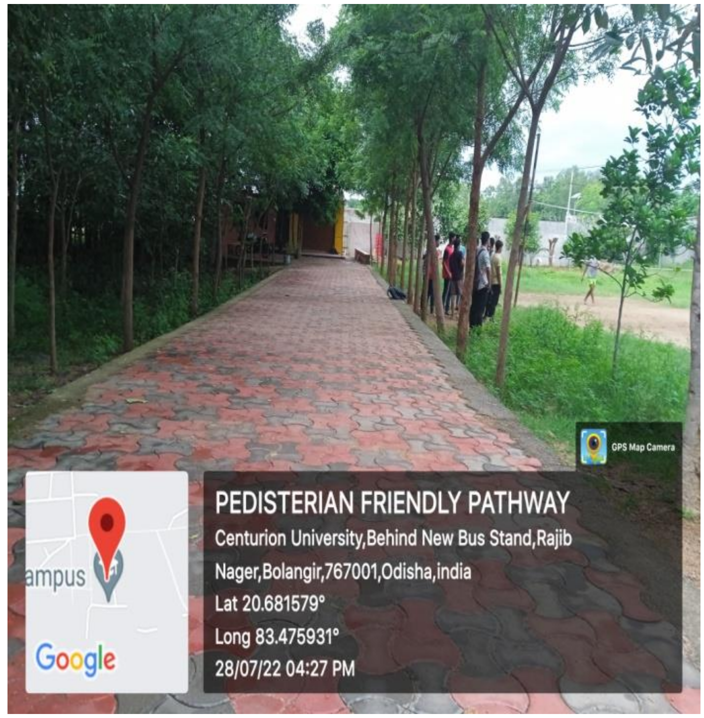
Transportation

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. 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.

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: 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.

TEST REPORT

Laboratory: Ecology laboratory, School of Applied Sciences
Centurion university of Technology and Management,
Bolangir Campus, Bolangir, Odisha-767001

Date of Receipt: 06.08.2022 Date of test performed: 05.08.2022

Sample particulars: Ground water

Test Parameters required: Physio-chemical parameters

Sample collected by: Students Sample ID: CUTMBOL/EL/2022/14

S. No.	Parameters	Unit	Test method	Value
1	pH		pH meter	7.8
2	Electrical conductivity	μmhos/cm	Refracto meter ERS 10	1014
3	Total Dissolved solid (TDS)	ppm	TDS meter	346
4	Total suspended solid	ppm	Gravimetric method	0.05
5	Hardness	mg/L	Titrimetric method	700
6	Alkalinity	mg/L	Titrimetric method	580
7	Turbidity	NTU	Turbidity meter	0.008
8	Dissolve Oxygen content (DO)	ppm	Winkler method	8.6
9	BOD	ppm	Calculated from DO value	0.8
10	COD	ppm	Colorimetric method	10.2

6/8/22
(Analysis Signatory)

6.8.2022
(Laboratory In-charge)

CUTM - BOLANGIR CAMPUS * BOLANGIR *

6/8/22
(Authorized Signatory)
Head of the Department
School of Applied Sciences
Centurion University
Bolangir

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.

After summarizing the results of tests conducted in 2021-22 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.

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	Academic building-1	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	Academic building-2	L	L	L	N				
3	Central Mess	H	L	L	N				
4	Mini Market	L	H	L	L				
5	Staff quarter	M	H	L	L				

H-High

M-Medium

L-Low

N-Nil

- Solid waste management

solid-waste management, the collecting, treating, and disposing of solid material that is discarded because it has served its purpose or is no longer useful. Improper disposal of municipal solid waste can create unsanitary conditions, and these conditions in turn can lead to pollution of the environment and to outbreaks of vector-borne disease—that is, diseases spread by rodents and insects. The tasks of solid-waste management present complex technical challenges. They also pose a wide variety of administrative, economic, and social problems that must be managed and solved.
We hand over the Non-Biodegradeble to Balangir Municipality Corporation but we are using solid biodegradable waste in vemicompost unit.

- Liquid waste management

Liquid waste management is a method to prevent the discharge of pollutants to the watercourses, through the collection and proper disposal of hazardous liquid materials. Liquid waste is a major problem in the world, due to approximately 71% of the Earth's surface being covered in water. According to the Environmental Protection Agency (EPA), liquid waste is defined as any waste material that passes. The main producers of liquid waste are animals and human beings as natural excretion of waste is flushed into sewage and waste lines.

We use liquid waste in different area and decompose it out side the Centurion University Campus, Balangir.

SOME PHOTOGRAPHS SHOWING WASTE MANAGEMENT

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SAVE PLANET BUY ORGANIC
GPS Map Camera
Balangir, Odisha, India
vermicomposting unit CUTM,Balangir
Lat 20.671018°
Long 83.468118°
21/07/22 03:29 PM
Google

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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
20	School of Maritime studies	C	G	√	G	√	√	√	G

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

SOME PHOTOGRAPHS SHOWING ECOFRIENDLY ENVIRONMENT

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.

FLORAL DIVERSIT OF CUTM

Flora and fauna are very important for human existence. The flora liberates oxygen which is consumed by the fauna for respiratory activities and that in turns liberates carbon dioxide consumed by the flora for photosynthesis in a cyclic manner. The exploration of vegetation abundance of an area gives right comprehension of bio-assets for the people. Though diverse forms of plants ranging from lower to higher groups inhabit in the Centurion University Bhubaneswar campus, still some of the rare, endangered and threatened plant (RET) species have been planted in our University's campus premises in the recovery plans of action for restoring the RET (rare/endangered/threatened) category plant species in the plantation programme. It is interesting to note that the campus is having 09 RET category plants. A scientific documentation on floral diversity of the campus has been initiated and completed in a form of book entitled "Floral Diversity" of Centurion University of Technology and Management, Bhubaneswar Campus" in the year 2018. A total of 625 plant species of plant belonging to 430 genera and 152 families were recorded during the survey. Among the families Poaceae is rated as the largest represented by 31 species, followed by Fabaceae with 28 species, Asteraceae and Acanthaceae. Cyperus is considered as the most prominent genus represented. The number of plant species has been increased to 641 in 2021.The location as well as the scintillating beauty of Campus is unique with rare collection of species including ornamental flowering plants. This includes a varieties of roses, hibiscus, bougainvillea along with aquatic species, xerophytic varieties, climbers and also newly introduced and lesser known species with economic and medicinal value. Besides the ornamental flowering plants, other beautiful foliage air purifying plants such as Ficus, Bamboo species, *Aloe vera* L., and *Areca* palm, known to be effective at cleansing airborne formaldehyde, xylene, toluene and benzene are also found. The campus is rich in diverse species composition and these plant species are known for their medicinal values. Few important plant species are such as *Commiphora wightii* (Arn.) Bhandari belonging to family Burseraceae commonly called as Guggul, Devadhupa in Odia and Indian Bdellium in English. The gum resin of this plant is known as guggul which is used for arthritis, lowering high cholesterol and atherosclerosis, acne and other skin diseases. *Saraca asoca* (Roxb.) de Wilde, belonging to family Fabaceae, known as Ashoka in Odia. The leaf extracts of Ashoka plant is used in treatment of menstrual pain, uterine disorders and diabetics. *Couroupita guianensis* Aubl. belonging to family Lecythidaceae is commonly called as Canon ball tree, nagachampa or naga keshar in Odia. This plant is used to treat various ailments such as common cold, stomachache, skin diseases, malaria and toothache. *Piper longum* L. (Pippali in Odia and Long pepper in english), family Piperaceae, is used to treat chronic bronchitis, constipation, cholera, hepatitis, diarrhea, cholera and respiratory infections. *Thunbergia grandiflora* L. a climbing plant, belonging to family Acanthaceae commonly known as blue sky flower and in Odia is known as neela lata. The leaves of this plant are used as a remedy against snakebite.

Area of study

The entire campus covers an area of about 45 acres including one water body (Fig. 1). The campus has been divided into 4 blocks for extensive survey namely Block - 1, 2, 3 and 4; each block consists of a number of sub sectors.

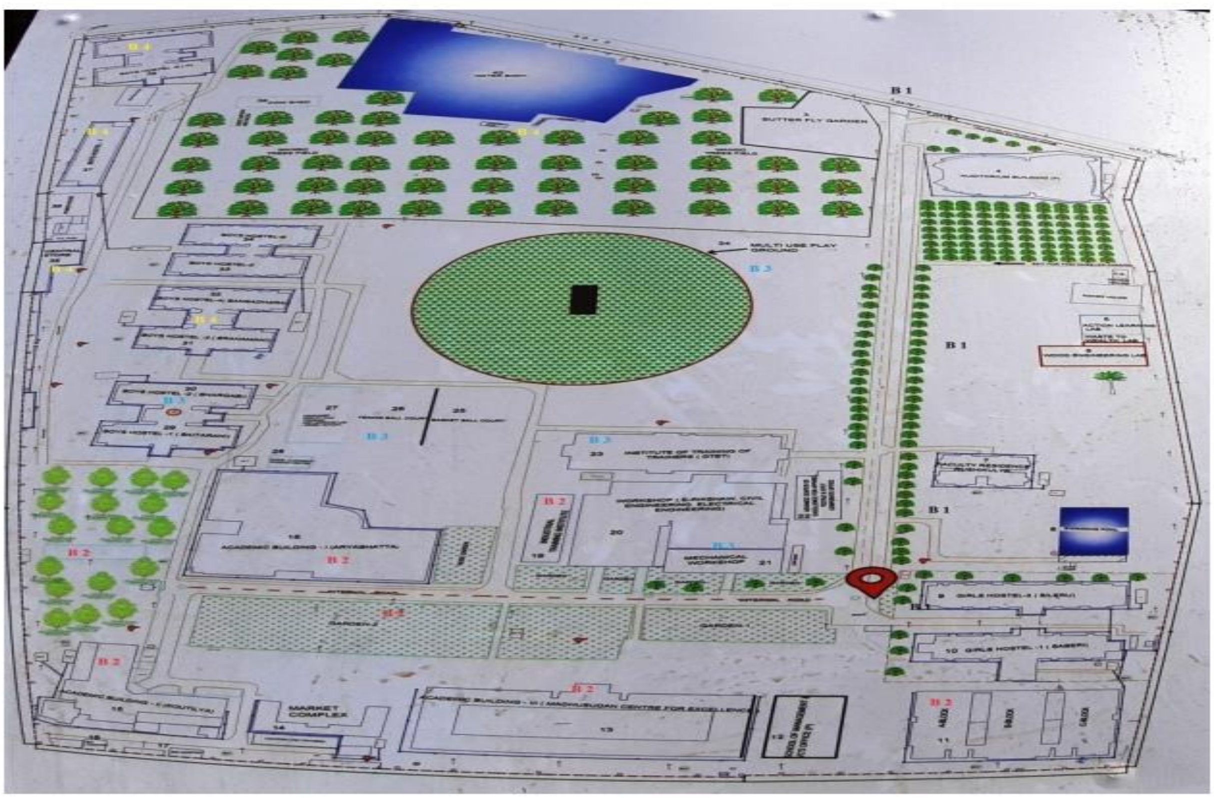


Fig 1: Map of the Centurion University, Bhubaneswar campus

Block wise Area under survey

Block -1 consist of the 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 (Rusikulya), Swimming Pool, Girls hostel-1 and Girls hostel-2.

Block - 2consist of the subunits -11-20 including Girls hostel-3, School of Management & VC"S office (P), Academic building-3 (Madhusudan centre for excellence), Marketcomplex, Academic building-2 (Koutilya), Bio compost 1, Bio compost 2, Academic building-1 (Aryabhatta), 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, Institute of training of trainers (GTET), Multi use playground, Basket ball court, Tennis ball court, Consumer facility cum training and learning lab (Diesel outlet), Wheel alignment training centre, Boys hostel-1 (Baitarani) and Boys hostel-2 (Bhargabi).

Block - 4 consist of the subunits - 31-40 including Boys hostel-3 (Brahamni), Boys hostel-4 (Bansadhara), Boys hostel-5, Boys hostel-6, Central store, Power house, Boys hostel-7, Boys hostel-8 (P), Cowshed, Water body and Butterfly garden.

Table 1: List of Plants found in Centurion University, 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.	*Artocarpus heterophyllus* Lam.	Moraceae	B-2
11.	*Averrhoa carambola* L.	Averrhoaceae	B-2
12.	*Azadirachta indica* A. Juss.	Meliaceae	B-2, B-3, B-4
13.	*Bauhinia acuminata* L.	Caesalpiniaceae	B-2
14.	*Bauhinia variegata* L.	Caesalpiniaceae	B-2
15.	*Bixa orellana* L.	Bixaceae	B-2
16.	*Borassus flabellifer* L.	Arecaceae	B-2
17.	*Brya ebenus* (L.) DC.	Fabaceae	B-2
18.	*Cinammomum tamala*(Buch.-Ham.) T.Nees&C.H. Eberm.	Lauraceae	B-2
19.	*Cinammomum verum*J.Presl	Lauraceae	B-2
20	*Clitoria arborea* Benth.	Fabaceae	B-1
21.	*Cocos nucifera* L.	Arecaceae	B-1, B-2
22.	*Coffea arabica* L.	Rubiaceae	B-2
23.	*Commiphora wightii* (Arn.) Bhandari	Burseraceae	B-2
24.	*Couroupita guianensis* Aubl.	Lecythidaceae	B-2
25.	*Crataeva magna* (Lour.) DC	Capparaceae	B-2
26.	*Delonix regia* (Boj. ex Hook.) Raf.	Caesalpiniaceae	B-2, B-4
27.	*Dillenia indica* L.	Dilleniaceae	B-2,
28.	*Diospyros melanoxylon*Roxb.	Ebenaceae	B-2
29.	*Elaeis guineensis* Jacq.	Arecaceae	B-4
30.	*Eucalyptus citrodora* Hook.	Myrtaceae	B-2
31.	*Ficus benghalensis*L. var. *benghalensis*	Moraceae	B-2, B-4
32.	*Ficus elastica* L.	Moraceae	B-2
33.	*Ficus racemosa* L.	Moraceae	B-4
34.	*Ficus religiosa* L.	Moraceae	B-2, B-4
35.	*Gliricidia sepium*(Jacq.)Walp.	Fabaceae	B-2
36.	*Gardeniagummifera* L.f.	Rubiaceae	B-2
37.	*Gmelina arborea* Roxb.	Verbenaceae	B-3
38.	*Haldina cordifolia* (Roxb.) Ridsale	Rubiaceae	B-2
39.	*Helictres isora* L.	Sterculiaceae	B-4

40.	*Hibiscus tiliaceus* L.	Malvaceae	B-2
41.	*Hylandia dockrillii*Airy Shaw	Euphorbiaceae	B-2
42.	*Lagerstroemia speciosa* (L.)Pers.	Lythraceae	B-1, B-2
43.	*Lannea coromandelica* (Houtt.) Merr.	Anacardiaceae	B-2
44.	*Leucaena leucocephala* (Lam.) de Wit	Fabaceae	B-2,B-3
45.	*Licuala peltata* Rooxb.ex Buch.-Ham.	Arecaceae	B-2
46.	*Limonia acidissima* L.	Rutaceae	B-2
47.	*Livistona chinensis* (Jacq.) R.Br. ex Mart.	Arecaceae	B-2
48.	*Macarnga peltata* (Roxb.)Muell-Arg.	Euphorbiaceae	B-2
49.	*Magnolia champaca* (L.) Baill. ex Pierre	Magnoliaceae	B-2
50.	*Mangifera indica* L.	Anacardiaceae	B-1,B-2,B-3,B-4
51.	*Manilkara zapota* (L.) P.Royen	Sapotaceae	B-1
52.	*Melaleuca citrine* (Curtis) Dum.Cours.	Lythraceae	B-2
53.	*Mesua ferea* L.	Clusiaceae	B-2
54.	*Millettia pinnata* (L.) Panigrahi	Fabaceae	B-2,B-3
55.	*Millingtonia hortensis* L.f.	Bignoniaceae	B-2
56.	*Mimusops elengi* L.	Sapotaceae	B-2,B-3
57.	*Mitragyna parviflora* (Roxb.) Korth	Rubiaceae	B-3
58.	*Morinda pubescens* Sm.	Rubiaceae	B-2,B-3
59.	*Moringa oleifera* Lam.	Moringaceae	B-2
60.	*Muntingia calabura* L.	Muntingiaceae	B-1,B-2
61.	*Murraya koengii* (L.) Sprenge	Rutaceae	B-2
62.	*Murraya paniculata*(L.) Jack	Rutaceae	B-1,B-2,B-3
63.	*Neolamarckia cadamba* (Roxb.) Bosser	Rubiaceae	B-1,B-2
64.	*Nyctanthes arbor-tristis* L.	Oleaceae	B-1,B-2,B-3,B-4
65.	*Olea europaea* L.	Oleaceae	B-2
66.	*Peltophorum pterocarpum* (DC.) K.Heyne	Caesalpiniaceae	B-2,B-4
67.	*Phoenix sylvestris* (L.) Roxb.	Arecaceae	B-3
68.	*Phyllanthus acidus* (L.) Skeels	Euphorbiaceae	B-2
69.	*Phyllanthus emblica* L.	Euphorbiaceae	B-2
70.	*Pimenta dioica* (L.)Merr.	Myrtaceae	B-2
71.	*Plumeria obtuse* L.	Apocynaceae	B-4

72.	*Plumeria rubra* L.	Apocynaceae	B-1,B-2,B-3,B-4
73.	*Polyalthia longifolia* Sonn.	Annonaceae	B-1,B-2,B-3,B-4
74.	*Polyalthia suberosa* (Roxb.) Thwaites	Annonaceae	B-1
75.	*Prosopis cineraria* (L.) Druce	Mimosaceae	B-2
76.	*Psidium guajava* L.	Myrtaceae	B-1,B-2
77.	*Pterocarpus santalinus* L.f.	Fabaceae	B-2
78.	*Pterospermum acerifolium* (L.) Willd.	Sterculiaceae	B-2
79.	*Punica granatum* L.	Punicaceae	B-2
80.	*Radermachera yunanensis* C. Y. Wu	Bignoniaceae	B-2
81.	*Ravenala madagascariensis* Sonn.	Strelitziaceae	B-2
82.	*Roystonea regia* (Kunth) O.F.Cook	Arecaceae	B-1,B-2
83.	*Sambucus canadensis* L.	Adoxaceae	B-2
84.	*Sapindus saponaria* L.	Sapindaceae	B-1
85.	*Santalum album* L.	Santalaceae	B-2
86.	*Saraca asoca* (Roxb.) Willd.	Caesalpiniaceae	B-2
87.	*Senna auricualata* (L.) Roxb.	Caesalpiniaceae	B-2
88.	*Senna siamea* (Lam.) H.S. Irwin & Barneby	Caesalpiniaceae	B-2
89.	*Sesbania grandiflora* (L.) Poiret	Fabaceae	B-2
90.	*Simarouba glauca* DC.	Simaroubaceae	B-4
91.	*Spathodea campanulata* P. Beauv.	Bignoniaceae	B-2,B-4
92.	*Spondias pinnata* (L.f.) Kurz	Anacardiaceae	B-2
93.	*Streblus asper* Lour.	Moraceae	B-2
94.	*Syzygium caryophyllifolium* (Lam.)DC.	Myrtaceae	B-2
95.	*Syzygium cumini* (L.)Skeels	Myrtaceae	B-1,B-2
96.	*Syzygium jambos* (L.)Alston	Myrtaceae	B-2
97.	*Syzygium samarhagense* (Bl.)Merr. &Perr.	Myrtaceae	B-2
98.	*Tamarindus indica* L.	Caesalpiniaceae	B-2
99.	*Tectona grandis* L.f.	Verbenaceae	B-2
100.	*Thespesia populnea* (L.) Sol. ex Corrêa	Malvaceae	B-4
101.	*Terminalia arjuna* (Roxb.) Wight & Arn.	Combretaceae	B-1
102.	*Terminalia bellerica* (Gaertn.) Roxb.	Combretaceae	B-1
103.	*Terminalia catappa* L.	Combretaceae	B-2

104.	*Terminalia chebula* Retz.	Combretaceae	B-1
105.	*Ziziphus mauritiana* Lam.	Rhamnaceae	B-1,B-2,B-3,B-4
SHRUBS			
106.	*Acalypha wilkesiana* Mull. -Arg.	Euphorbiaceae	B-2
107.	*Adenium obesum* (Forssk.) Roem. & Schult.	Apocynaceae	B-2
108.	*Agave Americana* L.	Agavaceae	B-2
109.	*Agave salmiana* Otto ex Salm-Dyck	Asparagaceae	B-2
110.	*Allamanda schottii* Hook.	Apocynaceae	B-2
111.	*Arachnothryx leucophylla* (Kunth) Planch.	Rubiaceae	B-2
112.	*Aucuba japonica* Thunb.	Garryaceae	B-2
113.	*Bougainvillea spectabilis* Willd.	Nyctaginaceae	B-2
114.	*Bougainvillea glabra* var. alba white	Nyctanginaceae	B-2
115.	*Caesalpinia pulcherrima* (L.) Sw.	Caesalpiniaceae	B-2
116.	*Cajanus cajan* (L.) Millsp.	Fabaceae	B-4
117.	*Calliandra haematocephala* Hassk.	Mimosaceae	B-3
118.	*Calotropis gigantea* (Ait.) R.Br	Asclepiadaceae	B-1,B-2,B-3,B-4
119.	*Carica papaya* L.	Caricaceae	B-2,B-3
120.	*Carissa spinarum* L.	Apocynaceae	B-3
121.	*Cascabela thevetia* (L.)Lippold	Apocynaceae	B-2
122.	*Cestrum nocturnum* L.	Solanaceae	B-2
123.	*Chromolaena odorata* (L.) R.King & H.Robins	Asteraceae	B-1,B-2,B-3,B-4
124.	*Citrus aurantifolia* (Christm.) Swingle	Rutaceae	B-2
125.	*Citrus grandis* (L.) Osbeck	Rutaceae	B-2
126.	*Clerodendrum indicum* (L.)Kuntze	Verbenaceae	B-2
127.	*Clerodendrum inerme* (L.) Gaertn.	Verbenaceae	B-2,B-4
128.	*Clerodendrum viscosum* Vent.	Verbenaceae	B-2,B-4
129.	*Codiaeum variegatum* (L.) Juss.	Euphorbiaceae	B-2
130.	*Coprosma repens* A.Rich.	Rubiaceae	B-2
131.	*Cordyline fruticosa* (L.) A.Chev.	Agavaceae	B-2
132.	*Crossandra infundibuliformis* (L.)Nees.	Acanthaceae	B-2
133.	*Crotalaria spectabilis* Roth	Fabaceae	B-2

134.	*Cryptostegia grandiflora* R.Br.	Apocynaceae	B-1
135.	*Cuphea hyssopifolia* Kunth	Lythraceae	B-2
136.	*Desmodium pulchellum* (L.)Benth.	Fabaceae	B-4
137.	*Dracaena marginata* Lam. *'tricolor'*	Agavaceae	B-2
138.	*Dracena reflexa* Lam.	Agavaceae	B-2
139.	*Dracaena sanderiana* Mast.	Asparagaceae	B-2
140.	*Duranta repens* L.	Verbenaceae	B-2
141.	*Dypsis lutescens* (H.Wendl.) Beentje & J.Dransf	Arecaceae	B-2
142.	*Euphorbia milii* Des Moul.	Euphorbiaceae	B-2
143.	*Euphorbia pulcherrima* Willd. ex Klotzsch	Euphorbiaceae	B-2
144.	*Euphorbia tithymiloides* L.	Euphorbiaceae	B-2
145.	*Fargesia stricta* Hsueh & C. M. Hui, Bull.	Poaceae	B-2
146.	*Flacourtia jangomas* (Lour.)Raeusch.	Salicaceae	B-4
147.	*Gardenia carinata* Wall. ex Roxb.	Rubiaceae	B-1
148.	*Gardenia jasminoides* J.Ellis	Rubiaceae	B-2
149.	*Glycosmis pentaphylla* (Retz.) DC.	Rutaceae	B-1,B-4
150.	*Graptophyllum pictum* (L.)Griff.	Acanthaceae	B-2
151.	*Hamelia patens* Jacq.	Rubiaceae	B-2
152.	*Hibiscus mutabilis* L.	Malvaceae	B-1
153.	*Hibiscus rosa-sinensis* L.	Malvaceae	B-1
154.	*Hibiscus schizopetalus* (Mast.)Hook.f.	Malvaceae	B-1,B-2
155.	*Hypoestes phyllostachya* Baker	Acanthaceae	B-2
156.	*Impatiens glandulifera* Royle	Balsaminaceae	B-2
157.	*Ipomoea carnea* Jacq.	Convolvulaceae	B-1,B-4
158.	*Ixora coccinea* L.	Rubiaceae	B-2
159.	*Ixora finlaysoniana* L. var. dwarf white	Rubiaceae	B-1
160.	*Jasminum auriculatum* Vahl	Oleaceae	B-2
161.	*Jasminum sambac* (L.) Ait.	Oleaceae	B-2
162.	*Jatropha gossypifolia* L.	Euphorbiaceae	B-2
163.	*Jatropha integerrima* Jacq.	Euphorbiaceae	B-2
164.	*Justicia adhatoda* L.	Acanthaceae	B-2
165.	*Justicia gendarussa* Brum.f.	Acanthaceae	B-2,B-4
166.	*Kopsia fruticosa* (Roxb.)A.DC.	Apocynaceae	B-2

167.	*Lagerstroemia indica* (L.)Pers.	Lythraceae	B-2
168.	*Lantana camara* L. var. *aculeata* (L.) Mold.	Verbenaceae	B-2
169.	*Lantana involucrata* L.	Verbenaceae	B-1
170.	*Lantana montevidensis* (Spreng.) Briq.	Verbenaceae	B-1
171.	*Lantana camara* L. var. new gold (L.) Mold.	Verbenaceae	B-2
172.	*Lantana urticoides* Hayek	Verbenaceae	B-1
173.	*Lawsonia inermis* L.	Lythraceae	B-2
174.	*Loropetalum chinense* (R.Br.)Oliv. var. *chinense*	Hamamelidaceae	B-2
175.	*Malpighia coccigera* L.	Malpighiaceae	B-2
176.	*Malvaviscus arboreus* Cav.	Malvaceae	B-2
177.	*Melastoma malbathricum* L.	Melastomataceae	B-2
178.	*Mussanda erythrophylla* Schumach. & amp; Thonn.	Rubiaceae	B-2
179.	*Mussaenda frondosa* L.	Rubiaceae	B-2
180.	*Mussaenda phillipica* A.Rich.	Rubiaceae	B-2
181.	*Nerium oleander* L.	Apocynaceae	B-2
182.	*Ocimum basilicum* L.	Lamiaceae	B-2
183.	*Ocimum gratissimum* L.	Lamiaceae	B-2
184.	*Ocimum kilimandscharicum* Guerke	Lamiaceae	B-2
185.	*Ocimum sanctum* L.	Lamiaceae	B-1,B-2
186.	*Opuntia stricta* (Haw.) Haw. var. *dillenii* (Ker-Gawl.) Benson	Cactaceae	B-2
187.	*Pereskia bleo* (Kunth)DC.	Cactaceae	B-2

188.	*Phoenix loureiroi* Kunth	Arecaceae	B-2
189.	*Phyllanthus myrtifolius* (Wight)Muller	Euphorbiaceae	B-2
190.	*Plumbago auriculata* Lam.	Plumbaginaceae	B-2
191.	*Polyscias filicifolia* (C.Moore ex E.Fourn.) L.H.Bailey	Araliaceae	B-2
192.	*Rauvolfia serpentina* (L.) Benth. ex Kurz	Apocynaceae	B-2
193.	*Rauvolfia tetraphylla* L.	Apocynaceae	B-2
194.	*Rhapis excelsa* (Thunb.) A.Henry	Arecaceae	B-2
195.	*Riccinus communis* L.	Euphorbiaceae	B-1,B-2,B-3,B-4
196.	*Rosa alba* L.	Rosaceae	B-2
197.	*Rosa centifolia* L.	Rosaceae	B-2
198.	*Rosa chinenesis* Jacquin	Rosaceae	B-2
199.	*Rosa damascina* Miller	Rosaceae	B-2
200.	*Rosa fortuneana* Lindley	Rosaceae	B-2
201.	*Rosa gallica* L.var.*complicata*	Rosaceae	B-2
202.	*Rosa gallica* var. *officinalis*	Rosaceae	B-2
203.	*Rosa indica* L.	Rosaceae	B-2
204.	*Rosa odorata* (Andr.)Sweet var. odorata	Rosaceae	B-2
205.	*Sauropus androgynus* (L.) Merr.	Euphorbiaceae	B-2
206.	*Solanum torvum* Sw.	Solanaceae	B-2,B-4
207.	*Sterblus taxoides* (Roth)Kurz	Moraceae	B-2
208.	*Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schult.cv.plena	Apocynaceae	B-2
209.	*Tecoma stans* (L.) Kunth.	Bignoniaceae	B-1,B-2
210.	*Thunbergia erecta* (Benth.)T.Anderson	Acanthaceae	B-1,B-2
211.	*Vitex negundo* L.	Verbenaceae	B-2
212.	*Wrightia antidysenterica* (L.)R.Br.	Apocynaceae	B-2
213.	*Ziziphus oenoplia* (L.) Mill.	Rhamnaceae	B-4

HERBS			
214.	*Abelmoschus esculentus* (L.)Moench	Malvaceae	B-1,B-2
215.	*Abelmoschus manihot* (L.) Medic subsp. *tetraphyllus*	Malvaceae	B-4
216.	*Abelmoschus moschatus* Medic.	Malvaceae	B-1,B-4
217.	*Abutilon indicum* (L.) Sweet	Malvaceae	B-1,B-2,B-3,B-4
218.	*Acalypha indica* L.	Euphorbiaceae	B-1,B-2,B-3,B-4
219.	*Achyranthes aspera* L.	Amaranthacae	B-1,B-2,B-3,B-4
220.	*Acorus calamus* L.	Araceae	B-2
221.	*Aerva javanica* (Burm.f.) Shult.	Amaranthaceae	B-4
222.	*Aerva lanata* (L.) Juss.ex Schultes.	Amaratnhaceae	B-1,B-2,B-3,B-4
223.	*Aerva sanguinolenta* (L.) Bl.	Amaranthaceae	B-2
224.	*Aeschynomene aspera* L.	Fabaceae	B-3,B-4
225.	*Aeschynomene indica* L.	Fabaceae	B-1,B-4
226.	*Ageratum conyzoides* L.	Asteraceae	B-1,B-2,B-3,B-4
227.	*Allmania nodiflora* (L.) R.Br. ex Wt.	Amaranthaceae	B-1,B-3,B-4
228.	*Alocasia macrorrhizos* (L.) G.Don	Araceae	B-4
229.	*Aloe vera* (L.) Burm.f.	Liliaceae	B-1,B-2
230.	*Alpinia galanga* (L.)Willd.	Zingiberaceae	B-2
231.	*Alpinia nutans* K.Schum.	Zingiberaceae	B-2
232.	*Alpinia purpurata* K.Schum.	Zingiberaceae	B-2
233.	*Alternanthera bettzickiana* (Regel) G.Nicholson	Amaranthaceae	B-2
234.	*Alternanthera paronychioides* St.	Amaranthaceae	B-1,B-2,B-3,B-4
235.	*Alternanthera philoxeroides* (C. Martius)	Amaranthaceae	B-1,B-2,B-3,B-4

	Grisebach		
236.	*Alternanthera sessilis* (L.) R.Br. ex DC.	Amaranthaceae	B-1,B-2,B-3,B-4
237.	*Alysicarpus vaginalis* (L.) DC. var. *nummularifolius* Miq.	Fabaceae	B-1,B-2,B-3,B-4
238.	*Amaranthus caudatus* L.	Amaranthaceae	B-2
239.	*Amaranthus spinosus* L.	Amaranthaceae	B-1,B-2,B-3,B-4
240.	*Amaranthus tricolor* L.	Amaranthaceae	B-1,B-4
241.	*Amaranthus viridis* L.	Amaranthaceae	B-1,B-2,B-3,B-4
242.	*Ammannia baccifera* L.	Lythraceae	B-1,B-2,B-3,B-4
243.	*Ammannia multiflora* Roxb.	Lythraceae	B-4
244.	*Ananas comosus* (L.)Merr.	Bromeliaceae	B-2
245.	*Andrographis paniculata* (Brum.f.) Wall. ex Nees	Acanthaceae	B-1,B-2,B-3,B-4
246.	*Angelonia salicarifolia* Humb.&Bonpl.	Scrophulariaceae	B-2
247.	*Anisochilus carnosus* (L.f.) Wall.	Lamiaceae	B-1,B-3
248.	*Anisomeles indica* (L.) Kuntze	Lamiaceae	B-1,B-4
249.	*Argemone mexicana* L.	Papaveraceae	B-1,B-2,B-3,B-4
250.	*Artemisia absinthium* L.	Asteraceae	B-2
251.	*Asparagus densiflorus* (Kunth)Jessop	Asparaceae	B-2
252.	*Aster indamellus* Griers.	Asteraceae	B-2
253.	*Asystasia gangetica* (L.) T. Anderson	Acanthaceae	B-2
254.	*Barleria cristata* L.	Acanthaceae	B-4
255.	*Barleria prionitis* L.	Acanthaceae	B-1,B-3,B-4
256.	*Bassia scoparia* (L.) Schrad.	Amaranthaceae	B-2
257.	*Biophytum sensitivum* (L.) DC.	Oxalidaceae	B-1,B-2,B-3,B-4

258.	*Blepharis maderaspatensis* (L.) Heyne ex Roth	Acanthaceae	B-1,B-2,B-3,B-4
259.	*Blumea lacera* (Burm.f.) DC.	Asteraceae	B-1,B-2,B-3,B-4
260.	*Boerhavia diffusa* L.	Nyctaginaceae	B-1, B-2,B-3,B-4
261.	*Boerhavia erecta* L.	Nyctaginaceae	B-1
262.	*Brassica campestris* L.	Brassicaceae	B-1,B-2,B-3
263.	*Brassica napus* L. var. *glauca* (Roxb.) Schulz	Brassicaceae	B-2
264.	*Brassica oleracea* L. var.*capitata*	Brassicaceae	B-2
265.	*Brassica oleracea* L. var.*oleracea*	Brassicaceae	B-2
266.	*Caladium bicolor* (Aiton) Vent.	Araceae	B-2
267.	*Canna indica* L.	Cannaceae	B-2
268.	*Capsicum annum* L.	Solanaceae	B-2
269.	*Catharanthus roseus* (L.) G.Don	Apocynaceae	B-2
270.	*Celosia argentea* L.	Amaranthaceae	B-1,B-2,B-3,B-4
271.	*Celosia cristata* L.	Amaranthaceae	B-2
272.	*Celosia argentea* var. *plumosa*	Amaranthaceae	B-2
273.	*Centella asiatica* (L.) Urban	Apiaceae	B-2
274.	*Chamaecostus cuspidatus* (Nees & Mart.) C.Specht & D.W. Stev.	Costaceae	B-2
275.	*Chenopodium album* L.	Chenopodiaceae	B-4
276.	*Chrozophora rottleri* (Geisel.) Juss.	Euphorbiaceae	B-3,B-4
277.	*Chrysanthemum cinerariifolium* (Trev.) Vis.	Asteraceae	B-2
278.	*Cleome rutidosperna* DC.	Capparaceae	B-1,B-2,B-3,B-4
279.	*Cleome viscosa* L.	Capparaceae	B-1,B-2,B-3,B-4

280.	*Coldenia procumbens* L.	Boraginaceae	B-1,B-2,B-3,B-4
281.	*Colocasia esculenta* (L.) Schott	Araceae	B-4
282.	*Commelina benghalensis* L.	Commelinaceae	B-1,B-2,B-3,B-4
283.	*Commelina erecta* L.	Commelinaceae	B-1,B-2,B-3,B-4
284.	*Commelina longifolia* Lam.	Commelinaceae	B-4
285.	*Commelina paludosa* Blume	Commelinaceae	B-3
286.	*Coriandrum sativum* L.	Apiaceae	B-2
287.	*Cosmos caudatus* Kunth	Asteraceae	B-3,B-4
288.	*Costus speciosus* (Koenig) Sm.	Costaceae	B-4
289.	*Crinum asiaticum* L.	Liliaceae	B-2
290.	*Crotalaria pallida* Ait.	Fabaceae	B-1,B-2,B-3,B-4
291.	*Crotalaria prostrata* L.	Fabaceae	B-4
292.	*Crotalaria verrucosa* L.	Fabaceae	B-4
293.	*Croton bonplandianus* Baill	Fabaceae	B-1,B-2,B-3,B-4
294.	*Curcuma amada* Roxb.	Zingiberaceae	B-1,B-2,B-3,B-4
295.	*Curcuma longa* L.	Zingiberaceae	B-2
296.	*Curcuma zedoaria* (Christm.)Rosc.	Zingiberaceae	B-2
297.	*Cyanotis cristata* (L.) D.Don	Commelinaceae	B-2,B-4
298.	*Cyanotis tuberosa* (Roxb.)Schult.&Schult.f.	Commelinaceae	B-3,B-4
299.	*Cynodon dactylon* (L.) Pers.	Poaceae	B-1,B-2,B-3,B-4
300.	*Dentella repens* (L.) J.R. & G. Forst. var. *repens*	Rubiaceae	B-1,B-2,B-3,B-4
301.	*Desmodium gangeticum* (L.) DC.	Fabaceae	B-2

302.	*Desmodium triflorum* (L.) DC.	Fabaceae	B-1,B-2,B-3,B-4
303.	*Dianthus caryophyllus* L.	Caryophyllaceae	B-1
304.	*Dicliptera bupleuroides* Nees	Acanthaceae	B-1,B-2,B-3,B-4
305.	*Digera muricata* (L.) Mart	Amaranthaceae	B-1,B-4
306.	*Dipteracanthus prostratus* (Poir.) Nees	Acanthaceae	B-1,B-2,B-3,B-4
307.	*Eclipta prostrata* (L.) L.	Asteraceae	B-1,B-2,B-3,B-4
308.	*Emilia sonchifolia* (L.) DC.	Asteraceae	B-1,B-2,B-3,B-4
309.	*Eranthemum capense* L.	Acanthaceae	B-3,B-4
310.	*Eryngium foetidum* L.	Apiaceae	B-1,B-2,B-3,B-4
311.	*Euphorbia heterophylla* L.	Euphorbiaceae	B-3,B-4
312.	*Euphorbia hirta* L.	Euphorbiaceae	B-1,B-2,B-3,B-4
313.	*Euphorbia indica* Lam.	Euphorbiaceae	B-2
314.	*Euphorbia rosea* Retz.	Euphorbiaceae	B-1,B-3
315.	*Euphorbia serpens* H.B.K	Euphorbiaceae	B-1,B-4
316.	*Euphorbia thymifolia* L.	Euphorbiaceae	B-1,B-2,B-3,B-4
317.	*Evolvulus alsinoides* (L.) L.	Convolvulaceae	B-1,B-3,B-4
318.	*Evolvulus nummularius* (L.) L.	Convolvulaceae	B-1,B-2,B-3,B-4
319.	*Evovulus sericeus* Sw.	Convolvulaceae	B-3
320.	*Foeniculuem vulgare* L.	Apiaceae	B-2,B-3
321.	*Gaillardia aristata* Pursh	Asteraceae	B-2
322.	*Gaillardia grandiflora* Hort	Asteraceae	B-2
323.	*Gerbera jamesonii* Bolus	Asteraceae	B-1
324.	*Glinus oppositifolius* (L.) A.DC.	Molluginaceae	B-1, B-2,B-3,B-4
325.	*Globba marantina* L.	Zingiberaceae	B-2
326.	*Gnaphalium polycaulon* Pers.	Asteraceae	B-1,B-2,B-3,B-4
327.	*Gomphrena celosioides* Mart.	Amaranthaceae	B-1,B-2,B-3,B-4

328.	*Gomphrena globosa* L.	Amaranthaceae	B-2
329.	*Grangea maderaspatana* (L.) Poir.	Asteraceae	B-1,B-2,B-3,B-4
330.	*Hedyotis bracheata* Miq.ex Hook.f.	Rubiaceae	B-1,B-3,B-4
331.	*Hedyotis corymbosa* (L.)Lam.	Rubiaceae	B-1,B-2,B-3,B-4
332.	*Hedyotis puberula* (G.Don)Thw.	Rubiaceae	B-3
333.	*Heliconia latispatha* Benth.	Heliconiaceae	B-2
334.	*Heliconia rostrata* Ruiz & Pavon	Heliconiaceae	B-2
335.	*Heliotropium indicum* L.	Boraginaceae	B-1,B-2,B-3,B-4
336.	*Heliotropium strigosum* Willd.	Boraginaceae	B-1,B-4
337.	*Heliotropium supinum* L.	Boraginaceae	B-1,B-4
338.	*Hibiscus canabinus* L.	Malvaceae	B-1
339.	*Hippeastrum amaryllis* (L.)Herb.	Amaryllidaceae	B-2
340.	*Hippeastrum reginae* (L.)Herb.	Amaryllidaceae	B-2
341.	*Hybanthus enneaspermus* (L.) F.v. Muell.	Violaceae	B-1,B-2,B-3,B-4
342.	*Hygrophila auriculata* Schumach.	Acanthaceae	B-1,B-3,B-4
343.	*Hyptis suaveolens* (L.) Poit.	Lamiaceae	B-1,B-2,B-3,B-4
344.	*Impatiens balsamina* L.	Balsaminaceae	B-2
345.	*Indigofera linnaei* Ali	Fabaceae	B-1,B-2,B-3,B-4
346.	*Indoneesiella echioides* (L.) Sreemadh.	Acanthaceae	B-1,B-2,B-3,B-4
347.	*Justicia betonica* L.	Acanthaceae	B-3,B-4
348.	*Justicia japonica* Thunb.	Acanthaceae	B-2,B-3
349.	*Justicia quinqueangularis* Koen. ex Roxb.	Acanthaceae	B-1,B-4
350.	*Kalanchoe blossfeldiana* Poelln.	Crassulaceae	B-2
351.	*Kalanchoe pinnata* (Lam.) Pers.	Crassulaceae	B-2

352.	*Laportea interrupta* (L.) Chew	Urticaceae	B-1,B-2,B-3,B-4
353.	*Leucas aspera* (Willd.) Link	Lamiaceae	B-3,B-4
354.	*Leucas cephalotes* (Roth) Spreng.	Lamiaceae	B-1,B-4
355.	*Leucas indica* (L.) R.Br.ex Vatke	Lamiaceae	B-4
356.	*Lindernia ciliata* (Colsm.)Pennell	Scrophulariaceae	B-1,B-2,B-3,B-4
357.	*Lindernia crustacea* (L.) F.v. Muell.	Scrophulariaceae	B-1,B-2,B-3,B-4
358.	*Lippia javanica* (Burm.f.)Spreng.	Verbenaceae	B-4
359.	*Lobelia alsinoides* Lam.	Lobeliaceae	B-1,B-4
360.	*Lobularia maritima* (L.)Desv.	Brassicaceae	B-3
361.	*Ludwigia perennis* L.	Onagraceae	B-1,B-3,B-4
362.	*Malachra capitata* (L.)L.	Malvaceae	B-3
363.	*Maranta arundinacea* L.	Marantaceae	B-2
364.	*Martynia annua* L.	Martyniaceae	B-4
365.	*Mazus pumilus* (Brum.f.) Steenis	Scrophulariaceae	B-2,B-4
366.	*Mecardonia procumbens* (Mill.) Small	Scrophulariaceae	B-1,B-3,B-4
367.	*Melochia corchorifolia* L.	Sterculiaceae	B-3,B-4
368.	*Mentha arvensis* L.	Lamiaceae	B-2
369.	*Mentha piperita* L.	Lamiaceae	B-2
370.	*Mentha spicata* L.	Lamiaceae	B-2
371.	*Merremia hederacea* (Burm.f.)Hall.f.	Convolvulaceae	B-4
372.	*Microccocca mercurialis* (L.) Benth.	Euphorbiaceae	B-1,B-2,B-3,B-4
373.	*Mimosa pudica* L.	Mimosaceae	B-1,B-2,B-3,B-4
374.	*Mirabilis jalapa* L.	Nyctaginaceae	B-2
375.	*Mitracarpus villosus* (Sw.) DC.	Rubiaceae	B-1,B-2,B-3,B-4

376.	*Mollugo pentaphylla* L.	Molluginaceae	B-1,B-2,B-3,B-4
377.	*Murdannia nodiflora* (L.)Brenan	Commelinaceae	B-1,B-2,B-3,B-4
378.	*Murdannia spirata* (L.) Brueck.	Commelinaceae	B-1,B-3,B-4
379.	*Musa acuminata* var. *rubra*	Musaceae	B-2
380.	*Musa paradisiaca* L.	Musaceae	B-2
381.	*Ocimum canum* Sims.	Lamiaceae	B-4
382.	*Origanum majorana* L.	Lamiaceae	B-2
383.	*Oxalis corniculata* L.	Oxalidaceae	B-1,B-2,B-3,B-4
384.	*Oxalis debilis* Kunth	Oxalidaceae	B-2
385.	*Oxalis triangularis* A.St.-Hil.	Oxalidaceae	B-2
386.	*Panadnus amarylifolius* Roxb.	Pandanaceae	B-2
387.	*Parthenium hysterophorus* L.	Asteraceae	B-1,B-2,B-3,B-4
388.	*Peperomia pellucida* Kunth	Piperaceae	B-1,B-3,B-4
389.	*Peristrophe paniculata* (Forssk.) Brummitt	Acanthaceae	B-1,B-3,B-4
390.	*Persicaria virginiana* (L.)Gaertn.	Polygonaceae	B-2
391.	*Petunia hybrid* Juss.	Solanaceae	B-2
392.	*Phaulopsis imbricata* (Forssk.) Sw.	Acanthaceae	B-3,B-4
393.	*Phyla nodiflora* (L.)Greene	Verbenaceae	B-4
394.	*Phyllanthus fraternus* Webster	Euphorbiaceae	B-1,B-2,B-3,B-4
395.	*Phyllanthus virgatus* Forst.f.	Euphorbiaceae	B-1,B-3,B-4
396.	*Physalis longifolia* Nutt.var.*longifolia*	Solanaceae	B-3
397.	*Physalis minima* L.	Solanaceae	B-4
398.	*Phlox drummondii* Hook.	Polemoniaceae	B-1
399.	*Pilea microphylla* (L.)Liebm.	Urticaceae	B-1,B-2,B-3,B-4

400.	*Plectranthus amboinicus* (Lour.)Spreng	Lamiaceae	B-2
401.	*Plectranthus barbatus* Andr.	Lamiaceae	B-2
402.	*Plectranthus scutellarioides* (L.) R.Br.	Lamiaceae	B-2
403.	*Plumbago indica* L.	Plumbaginaceae	B-2,B-4
404.	*Polygala arvensis* L.	Polygalaceae	B-3,B-4
405.	*Polygonum barbatum* L.	Polygonaceae	B-3,B-4
406.	*Portulaca oleracea* L. var. *oleracea*	Portulaceae	B-1,B-2,B-3,B-4
407.	*Portulaca pilosa* L. subsp. *grandiflora* (Hook.) Geesink	Portulaceae	B-2
408.	*Portulaca quadrifida* L.	Portulaceae	B-1,B-2,B-3,B-4
409.	*Portulaca umbraticola* Kunth	Portulaceae	B-2
410.	*Ruellia brittoniana* Leonard	Acanthaceae	B-2
411.	*Ruellia tuberosa* L.	Acanthaceae	B-1,B-3
412.	*Rungia pectinata* (L.) Nees	Acanthaceae	B-1,B-2,B-3,B-4
413.	*Sansevieria cylindrica* Bojer	Asparagceae	B-2
414.	*Sansevieria roxburghiana* Schult. & Schult.f.	Asparagceae	B-2
415.	*Sansevieria trifasciata* Prain.	Asparagceae	B-2
416.	*Scadoxus multiflorus* (Martyn) Raf.	Amaryllidaceae	B-2
417.	*Scoparia dulcis* L.	Scrophulariaceae	B-1,B-2,B-3,B-4
418.	*Sebastiania chamalea* (L.) Muell.-Arg.	Euphorbiaceae	B-2,B-4
419.	*Senna occidentalis* (L.) Link	Caesalpiniaceae	B-2,B-4
420.	*Sesamum orientale* L.	Pedaliaceae	B-3,B-4
421.	*Sida acuta* Burm.f.	Malvaceae	B-1,B-2,B-3,B-4
422.	*Sida cordata* (Burm.f.) Borssum	Malvaceae	B-1,B-3,B-4

423.	*Sida cordifolia* L.	Malvaceae	B-3,B-4
424.	*Sida rhombifolia* L. subsp. *rhombifolia* var. *rhombifolia*	Malvaceae	B-4
425.	*Solanum lycopersicon* L.	Solanaceae	B-2
426.	*Solanum melongena* L.	Solanaceae	B-2
427.	*Solanum nigrum* L.	Solanaceae	B-1,B-2,B-3,B-4
428.	*Solanum tuberosum* L.	Solanaceae	B-2
429.	*Solanum virginianum* L.	Solanaceae	B-4
430.	*Spathiphyllum cochlearispathum* (Liebm.)Engl.	Araceae	B-2
431.	*Spermacoce articularis* L.f.	Rubiaceae	B-1,B-2,B-3,B-4
432.	*Spermacocoe exilis* (L.O.Williams)C.D. Adams	Rubiaceae	B-1,B-2,B-3,B-4
433.	*Sphaeranthus indicus* L.	Asteraceae	B-3,B-4
434.	*Spilanthes calva* DC.	Asteraceae	B-3,B-4
435.	*Spilanthes paniculata* Wall. ex DC.	Asteraceae	B-1,B-2,B-3,B-4
436.	*Synedrella nodiflora* (L.) Gaertn.	Asteraceae	B-1,B-2,B-3,B-4
437.	*Tagetes patula* L.	Asteraceae	B-2
438.	*Talinum triangulare* (Jacq.)Willd.	Talinaceae	B-2
439.	*Tephrosia purpurea* (L.) Pers. var. *purpurea*	Fabaceae	B-3,B-4
440.	*Theriophonum minuatum* (Willd.) Bail	Araceae	B-2
440.	*Tithonia diversifolia* (Hemsl) A.Gray	Asteraceae	B-1,B-2
441.	*Tradescantia zebrine* (Schinz) D.R Hunt	Commelinaceae	B-2
442.	*Tribulus terrestris* L.	Zygophyllaceae	B-2,B-4

443.	*Tridax procumbens* L.	Asteraceae	B-1,B-2,B-3,B-4
444.	*Triumfetta pentandra* A.Rich	Sterculiaceae	B-1,B-4
445.	*Triumfetta rhomboidea* Jasq.	Sterculiaceae	B-3,B-4
446.	*Turnera ulmifolia* L.	Turneraceae	B-2
447.	*Uraria picta* (Jacq.) Desv.ex DC.	Fabaceae	B-2
448.	*Urena lobata* L. subsp. *sinuata* (L.) Borssum var. *sinuata*	Malvaceae	B-1,B-3,B-4
449.	*Vernonia cinerea* (L.) Less.	Asteraceae	B-1,B-2,B-3,B-4
450.	*Waltheria indica* L. var. *indica*	Sterculiaceae	B-3,B-4
451.	*Wedelia chinensis* (Osbeck) Merr.	Asteraceae	B-2
452.	*Withania somnifera* (L.)Dunal	Solanaceae	B-2
453.	*Xanthium indicum* Koenig	Asteraceae	B-3,B-4
454.	*Xanthosoma robustum* Schott.	Araceae	B-1
455.	*Zephyranthes candida* (Lindl.)Herb.	Amaryllidaceae	B-2
456.	*Zephyranthes rosea* (Lindl.)	Amaryllidaceae	B-2
457.	*Zinnia elegans* Jack.	Asteraceae	B-2
458.	*Zornia diphylla* (L.) Pers.	Fabaceae	B-3,B-4
459.	*Zornia gibbosa* Spanoghe	Fabaceae	B-3,B-4
HYDROPHYTES (ANGIOSPERMS)			
460.	*Alisma plantago-aquatica* L.	Alismataceae	B-2
461.	*Ceratophyllum demersum* L.	Ceratophyllaccae	B-2
462.	*Eichhornia crassipes* (Mart.) Solms-Laub.	Pontederiaceae	B-4
463.	*Hydrilla verticillata* (L.f.) Royle	Hydrocharitaceae	B-2
464.	*Lemna perpusila* Torr.	Lemnaceae	B-2,B-4
465.	*Monochoria hastata* Solms-Laub.	Pontederiaceae	B-4

466.	*Monochoria vaginalis* (Burm.f.) Presl	Pontederiaceae	B-4
467.	*Nelumbo nucifera* Gaertn.	Nelumbonaceae	B-2
468.	*Nuphar pumila* (Timm) DC.	Nymphaeaceae	B-2
469.	*Nymphaea mexicana* Zucc.	Nymphaeaceae	B-2
470.	*Nymphaea nouchali* Burm.f.	Nymphaeaceae	B-2
471.	*Nymphaea pubescens* Willd.	Nymphaeaceae	B-2
472.	*Nymphoides hydrophila* (Lour.)Kuntze	Menyanthaceae	B-2
473.	*Nymphoides indica* (L.) Kuntze	Menyanthaceae	B-2
474.	*Pistia stratiotes* L.	Araceae	B-4
475.	*Potamogeton nodosus* Poir.	Potamogetonaceae	B-2
476.	*Spirodela polyrhiza* (L.) Schleiden	Lemnaceae	B-4
477.	*Typha angustifolia* L.	Typhaceae	B-2
CLIMBERS			
478.	*Abrus precatorius* L.	Fabaceae	B-4
479.	*Aganosma caryophyllata* (Roxb. ex Sims) G.Don	Apocynaceae	B-2
480.	*Allamanda blanchetti* A.DC.	Apocynaceae	B-2
481.	*Antigonon leptopus* Hook. & Arn.	Polygonaceae	B-4
482.	*Argeyria nervosa* (Burm.f.) Bojer	Convolvulaceae	B-2
483.	*Artabotrys hexapetalus* (L.f.) Bandari	Annonaceae	B-2
484.	*Aristolochia gigantea* Mart. & Zucc.	Aristolochiaceae	B-1
485.	*Asparagus racemosus* Willd.	Asparagaceae	B-2
486.	*Atylosia scarabaeoides* (L.) Benth.	Fabaceae	B-3,B-4
487.	*Basella alba* L.	Basellaceae	B-2
488.	*Campsis radicans* Seem.	Bignoniaceae	B-2

489.	*Cayratia pedata* (Wall.) Gagnep.	Vitaceae	B-3,B-4
490.	*Cayratia trifolia* (L.) Domin	Vitaceae	B-1,B-3,B-4
491.	*Cissampelos pareira* L.	Menispermaceae	B-2
492.	*Cissus quadrangularis* L.	Vitaceae	B-2
493.	*Clerodendrum splendens* G.Don	Verbenaceae	B-2
494.	*Clerodendrum thomsoniae* Balf.	Verbenaceae	B-2
495.	*Clitoria ternatea* L.	Fabaceae	B-2
496.	*Coccinia grandis* (L.) Voigt	Cucurbitaceae	B-3,B-4
497.	*Cocculus hirsutus* (L.) Diels	Cucurbitaceae	B-3,B-4
499.	*Cucumis melo* L.	Cucurbitaceae	B-2
500.	*Cucumis sativus* L.	Cucurbitaceae	B-2
501.	*Cucurbita maxima* Duchesne	Cucurbitaceae	B-2
502.	*Cuscuta reflexa* Roxb.	Cuscutaceae	B-4
503.	*Dioscorea alata* L.	Dioscoreaceae	B-2
504.	*Diplocyclos palmatus* (L.) C.Jeffrey	Cucurbitaceae	B-4
505.	*Epipremnum Aureum* (Linden & André) G.S.Bunting	Araceae	B-2
506.	*Ficus pumila* L.	Moraceae	B-2
507.	*Gymnema sylvestre* R.Br.	Asclepidaceae	B-2
508.	*Hemidesmus indicus* (L.) R.Br. var. *indicus*	Periplocaceae	B-2,B-3,B-4
509.	*Ichnocarpus frutescens* (L.) W.T.Aiton	Apocynaceae	B-2
510.	*Ipomoea obscura* Ker.-Gawl.	Convolvulaceae	B-4
511.	*Ipomoea pes-tigridis* L.	Convolvulaceae	B-1,B-4

512.	*Ipomoea quamoclit* L.	Convolvulaceae	B-3
513.	*Ipomoea sepiaria* Koenig ex Roxb.	Convolvulaceae	B-3,B-4
514.	*Luffa acutangula* (L.) Roxb.	Cucurbitaceae	B-2
515.	*Luffa aegyptiaca* Mill.	Cucurbitaceae	B-4
516.	*Mansoa alliacea* Gentry.	Bignoniaceae	B-2
517.	*Merremia tridentata* (L.) Hall.f. subsp. *hastata* (Hall.f.) Ooststr.	Convolvulaceae	B-3
518.	*Mikania micrantha* Kunth	Asteraceae	B-1,B-3,B-4
519.	*Momordica charantia* L.	Cucurbitaceae	B-2
520.	*Momordica dioica* Roxb. ex Willd.	Cucurbitaceae	B-2
521.	*Mukia maderaspatana* (L.) M.Roem.	Cucurbitaceae	B-3
522.	*Operculina turpethum* (L.)Silva Manso	Convolvulaceae	B-2
523.	*Paederia foetida* L.	Rubiaceae	B-2
524.	*Passiflora foetida* L.	Passifloraceae	B-2, B-3
525.	*Passiflora incarnata* L.	Passifloraceae	B-2
526.	*Passiflora vitifolia* Kunth	Passifloraceae	B-2
527.	*Pentalinon luteum* (L.) B.F.Hansen & Wunderlin	Apocynaceae	B-2
528.	*Pergularia daemia* (Forssk.) Chiov.	Asclepidaceae	B-4
529.	*Petrea volubilis* L.	Verbenaceae	B-2
530.	*Philodendron scandens* K. Koch & Sello	Araceae	B-2
531.	*Piper betel* L.	Piperaceae	B-2
532.	*Piper longum* L.	Piperaceae	B-2
533.	*Podranea ricasoliana* (Tanf.) Sprague	Bignoniaceae	B-2

534.	*Pyrostegia venusta* (Ker.Gawl.)Miers	Bignoniaceae	B-2
535.	*Quisqualis indica* L.	Combretaceae	B-2
536.	*Rhaphidophora decusirva* (Roxb.) Schott	Araceae	B-2
537.	*Stephania japonica* (Thunb.) Miers	Menispermaceae	B-3
538.	*Syngonium podophyllum* Schott	Araceae	B-2
539.	*Thunbergia fragrans* Roxb.	Acanthaceae	B-2
540.	*Thunbergia grandiflora* (Roxb.ex Rottl.)Roxb.	Acanthaceae	B-1,B-2
541.	*Tinospora cordifolia* (Thunb.) Miers	Menispermaceae	B-2
542.	*Trichosanthes cucumerina* L.	Cucurbitaceae	B-2
543.	*Trichosanthes dioica* Roxb.	Cucurbitaceae	B-2
544.	*Trichosanthes tricuspidata* Lour.	Cucurbitaceae	B-4
545.	*Tylophora indica* (Burm. f.) Merr.	Asclepiadaceae	B-2
546.	*Typhonium trilobatum* (L.) Schott	Araceae	B-2
547.	*Vernonia elliptica* DC.	Asteraceae	B-1, B-2
548.	*Vitis vinifera* L.	Vitaceae	B-2
EPIPHYTES			
549.	*Vanda tesselata* (Roxb.)Hook.ex G.Don	Orchidaceae	B-2
550.	*Dendrobium ursula* Strenge	Orchidaceae	B-2
551.	*Selenicereus undatus* D.R. Hunt	Cactaceae	B-1
GRASSES			
552.	*Aristida setacea* Retz.	Poaceae	B-1, B-2,B-3,B-4
553.	*Bambusa arundinacea* (Retz.) Willd.	Poaceae	B-2
554.	*Bambusa vulgaris* Schrad. Ex J.C.Wendl.	Poaceae	B-2
555.	*Bothriochloa pertusa* (L.) A. Camus	Poaceae	B-1, B-2, B-3,B-4

556.	*Brachiaria distachya* (L.) Stapf	Poaceae	B-1, B-2, B-3,B-4
557.	*Brachiaria mutica* (Forssk.) Stapf	Poaceae	B-4
558.	*Brachiaria ramosa* (L.) Stapf	Poaceae	B-1, B-3,B-4
559.	*Chloris barbata* Sw.	Poaceae	B-1,B-2,B-3,B-4
560.	*Chrysopogon aciculatus* (Retz.) Trin.	Poaceae	B-1,B-4
561.	*Cynodon dactylon* (L.) Pers.	Poaceae	B-1,B-2,B-3,B-4
562.	*Cyperus brevifolius* (Rottb.) Hassk.	Cyperaceae	B-1,B-4
563.	*Cyperus compactus* Retz.	Cyperaceae	B-4
564.	*Cyperus difformis* L.	Cyperaceae	B-1,B-3,B-4
565.	*Cyperus halpan* L.	Cyperaceae	B-1,B-3
566.	*Cyperus imbricatus* Retz.	Cyperaceae	B-4
567.	*Cyperus iria* L.	Cyperaceae	B-1,B-4
568.	*Cyperus kyllingia* Endl.	Cyperaceae	B-1,B-3,B-4
569.	*Cyperus paniceus* (Rottb.) Boeck.	Cyperaceae	B-4
570.	*Cyperus pygmaeus* Rottb.	Cyperaceae	B-4
571.	*Cyperus rotundus* L. var. *rotundus* Kern.	Cyperaceae	B-1,B-2,B-3
572.	*Cyperus triceps* Endl.	Cyperaceae	B-4
573.	*Dactyloctenium aegypticum* (L.) P.Beauv.	Poaceae	B-1,B-2,B-3,B-4
574.	*Digitaria abludens* (Roem. & Schult.) Veldk.	Poaceae	B-3
575.	*Digitaria ciliaris* (Retz.) Koeler	Poaceae	B-1,B-2,B-3,B-4
576.	*Echinochloa colona* (L.) Link	Poaceae	B-1,B-2,B-3,B-4
577.	*Eleusine indica* (L.) Gaertn.	Poaceae	B-1,B-2,B-3,B-4
578.	*Elusine coracana* (L.)Gaertn	Poaceae	B-2
579.	*Eragrostis cilliaris* (L.) R.Br.	Poaceae	B-3

580.	*Eragrostis ciliata* Roxb. Nees	Poaceae	B-1,B-2,B-3,B-4
581.	*Eragrostis unioloides* (Retz.) Nees ex Steud.	Poaceae	B-1,B-2,B-3,B-4
582.	*Eriochloa procera* (Retz.)Hubbard	Poaceae	B-1,B-2,B-3,B-4
583.	*Paspalum scrobiculatum* L.	Poaceae	B-2,B-3
584.	*Paspalum vaginatum* Sw.	Poaceae	B-1,B-3
585.	*Pennisetum pedicellatum* Trin.	Poaceae	B-1,B-3,B-4
586.	*Pennisetum purpureum* Schumach	Poaceae	B-3,B-4
587.	*Perotis indica* (L.)Kuntz	Poaceae	B-3,B-4
588.	*Pogonantherum crinitum* (Thunb.)Kunth	Poaceae	B-2
589.	*Sachharum officinarum* L.	Poaceae	B-2
590.	*Setaria pumila* (Poir.) Roem. & Schult.	Poaceae	B-1,B-3,B-4
591.	*Setaria verticillata* (L.) P.Beauv.	Poaceae	B-1,B-4
592.	*Sorghum vulgare* L.	Poaceae	B-2
593.	*Zea mays* L.	Poaceae	B-2
GYMNOSPERMS			
594.	*Araucaria columnaris* (Forst.f.) Hook.	Araucariaceae	B-2
595.	*Cycas revoluta* Thunb.	Cycadaceae	B-2
596.	*Juniperus communis* L.	Cupressaceae	B-2
597.	*Pinus roxburghii* Sargent	Pinaceae	B-2
598.	*Podocarpus nerefolius* D.Don	Podocarpaceae	B-2
599.	*Platycladus orientalis* (L.) Franco	Cupressaceae	B-2
PTERIDOPHYTES			
600.	*Adiantum incisum* Forssk.	Adiantaceae	B-4
601.	*Adiantum phillipense* L.	Adiantaceae	B-1,B-2,B-3,B-4
602.	*Ampelopteris prolifera* (Retz.) Copel.	Thelypteridaceae	B-2,B-4

603.	*Azolla microphylla* Kaulf	Azollaceae	B-4
604.	*Ceratopteris thalictroides* (L.) Brongn	Ceratopteridaceae	B-4
605.	*Dryopteris cochleata* (D.Don) C.Chr.	Dryopteridaceae	B-2,B-4
606.	*Marsilea minuta* L.	Marseliaceae	B-4
607.	*Marsilea quadrifolia* L.	Marseliaceae	B-4
608.	*Nephrolepis exaltata* (L.) Schott	Nephrolepidaceae	B-2
609.	*Phymatosorus membranifolius* (R.Br.)S.G.	Polypodiaceae	B-2
610.	*Pteris vittata* L.	Pteridaceae	B-1,B-2,B-3,B-4
611.	*Salvinia cuculata* Roxb.	Salviniaceae	B-4
612.	*Salvinia molesta* D.S. Mitch.	Salviniaceae	B-4
613.	*Selaginella ciliaris* (Retz.) Spring	Selaginellaceae	B-4
BRYOPHYTES			
614.	*Barbula calycina*Schwägr	Pottiaceae	B-2,B-4
615.	*Marchantia polymorpha* L.	Marchantiaceae	B-1,B-4
616.	*Riccia beyrichiana* Hampe ex Lehm	Ricciaceae	B-3,B-4
617.	*Trichostomum crispulum* Bruch	Pottiaceae	B-2
MUSHROOMS			
618.	*Agaricus bisporous* (J.E.Lange) Emil.J.Imbact	Agaricaceae	B-2
619.	*Agaricus compestris* L.	Agaricaceae	B-4
620.	*Amanita multisquamosa* Peck	Amanitaceae	B-4
621.	*Amylostereum laevigatum* (Fr.) Boidin	Amylostereaceae	B-4
622.	*Bulgaria inquinans* (Pers.) Fr	Bulgariaceae	B-4
623.	*Byssomerulius corium* (Pers.) Parmasto	Irpicaceae	B-4
624.	*Chaetoderma luna* (Romell ex D.P. Rogers & H.S. Jacks.) Parmasto	Stereaceae	B-4
625.	*Clavaria aurea* Schaeff.	Clavariaceae	B-4

626.	*Crinipellis scabella* (Alb. & Schwein.) Murrill	Marasmiaceae	B-4
627.	*Dacryopinax spathularia* Schweien & G.W.Martin	Dacrymycetaceae	B-4
628.	*Deconia coprophila*(Bull.) P. Karst.	Strophariaceae	B-4
629.	*Entoloma unicolar* (Perk) Hesler	Entolomataceae	B-4
630.	*Ganoderma lucidum* (Curtis) P. Carst.	Ganotodermaceae	B-4
631.	*Lactarius alnicola* A.H. Smith	Russulaceae	B-4
632.	*Marasmius rotula*(Scop.) Fr.	Marasmiaceae	B-1
633.	*Protostropharia semiglobata* (Batsch) Redhead, Moncalvo & Vilgays	Strophariaceae	B-4
634.	*Psilocybe cubensis* (Earle) Singer	Hymenogastraceae	B-1
635.	*Terana caerulea* (Lam.) Kuntze	Phanerochaetaceae	B-4
636.	*Termitomyces eurrhizus* (Berk.&Broome) R.Heim	Lyophyllaceae	B-4
637.	*Termitomyces heimii* Natarajan	Lyophyllaceae	B-4
638.	*Xylaria longipes* Nitschke	Xylariaceae	B-4
LICHENS			
639.	*Chrysothrix chlorina* (Ach.) J.R. Laundon	Chrysothricaceae	B-4
640.	*Cryptothecea scripta* G.Thor	Arthoniaceae	B-4
641.	*Graphis scripta* (L.) Ach.	Graphidaceae	B-1,B-2,B-3,B-4

REPORT ON FAUNAL DIVERSITY OF CUTM, BHUBANESWAR CAMPUS

A team of Faculties, M.Sc. and B.Sc. students of Department of Zoology conducted the survey of faunal diversity (both invertebrates and vertebrates) under the supervision of Dr. Siba Prasad Parida, Associate Professor, Department of Zoology..

Biodiversity is the variety and variability of living organisms on the earth. It includes genetic diversity within and between species and of ecosystems. Thus, in essence, biodiversity is in part a function of climate that represents all life. It brings enormous benefits to mankind from direct harvesting of plants and animals for food, medicine, fuel, construction materials and other uses to aesthetic, cultural, recreational and research values.

Fauna refers to the animals present in a certain region, time period or environment. In Roman mythology, “Fauna” was the sister of Faunus, a good spirit of the forest and animals. The fauna of any given region is usually explained in biological terms to include the genus and species of animal life, their preferred growing or breeding habits and their connection to one another in the environment as well. The documentation of local fauna means to make an organized collection or record by describing the morphology and number of a particular animal at a given area and a particular time. Local fauna study is a study we use to describe the variety of life in a specific area of a country. It refers to the wide variety of ecosystems and living organisms; animals, plants, their habitats and their genes on the selected area.

The present study deals with the documentation of the faunal diversity of the CUTM, Bhubaneswar having quite an impressive amount of animal diversity, including both invertebrates and vertebrates. Various trees and bushes associated with the field serves as a roosting place of the different species of birds at different times of the day. It also acts as a habitat for variety of insects like odonates, dipterans, orthopterans, lepidopterans and coleopterans. There is a butterfly garden at the right of the entrance gate which supports a wide variety of butterflies and other fauna. The window shades of the building of the university serves as the resting place for the birds like the Common Myna and Indian Rock Pigeon.

Table 1. The list of the avian fauna observed in the campus

Sl.No	Common name	Odia name	Scientific name
1	Blue rock pigeon	Para	*Columba livia*
2	Spotted Dove	Kapota	*Streptopelia chinensis*
3	Red Vented Bulbul	Bulbul	*Pycnonotus cafer*
4	Red Whiskered Bulbul	Bulbul	*Pycnonotus jocosus*
5	Indian Treepie	Harada chadhei	*Dendrocitta vagabunda*
6	Common Myna	Bani	*Acridotheres tristis*
7	Asian Pied Starling	Gobara bani	*Sturnus contra*
8	White-breasted Kingfisher	Macharanka	*Halcyon smyrnensis*
9	Common Kingfisher	Chota Macharanka	*Alcedo atthis*
10	Small Bee-Eater	Balisua	*Merops orientalis*
11	House Crow	Kau	*Corvus splendens*
12	Jungle Babbler	Kundakhia	*Turdoides striatus*
13	Black-headed Oriole	Haladibasanta	*Oriolus xanthornus*
14	Oriental Magpie Robin	Robin	*Copsychus saularis*
15	Black Kite	Matia chila	*Milvus migrans*
16	Common Hoopoe	Hoopee	*Upupa epops*
17	Rose-ringed Parakeet	Tia	*Psittacula krameri*
18	Asian Koel	Koilo	*Eudynamys scolopacea*
19	Pond heron	Kanti baga	*Ardeola grayii*
20	Little egret	Bada baga	*Egretta garzetta*
21	Bronze winged	Dalakhumpi	*Metopidius indicus*

	jacana		
22	Little cormorant	Panikua	*Microcarbo niger*
23	Indian Roller	Badabhadalia	*Coracias benghalensis*
24	Purple sunbird	Phulachuin	*Cinnyris asiaticus*
25	Domesticated goose	Hansa	*Anser cygnoides domesticus*
26	Domesticated duck	Bataka	*Anas platyrhynchos domesticus*

Table 2. The list of the mammalian fauna observed in the campus

Sl.No	Common name	Odia name	Scientific name
1	Feral dog	Bula Kukura	*Canis familiaris*
2	Feral cat	Bilei	*Felis domesticus*
3	Grey Mongoose	Neula	*Herpestes edwardsii*
4	Five striped Palm Squirrel	Gunduchi	*Funambulus pennantii*
5	Shrew	Chuchundra	*Suncus murinus*
6	Mouse	Musa	*Mus musculus*

Table 3. The list of the reptilian fauna observed in the campus

Sl.No	Common name	Odia name	Scientific name
1	Garden lizard	Endua	*Calotes versicolor*
2	Common skink	Champei neula	*Eutropis carinata*
3	Bark gecko	Jhitipiti	*Hemidactylus leschenaultii*
4	Spotted gecko	Jhitipiti	*Hemidactylus brookii*
5	Supple skinks	Champeineula	*Lygosoma punctata*
6	Indian cobra	Naga	*Naja naja*
7	Rat snake	Dhamana	*Ptyas mucosa*
8	Bronze back tree snake	Kalinchi	*Dendrelaphis tristis*
9	Kukri snake	Kukri	*Oligodon arnensis*
10	Wolf snake	Kaudia chiti	*Lycodon aulicus*
11	Checkerd keelback	Dhanda sapa	*Xenochrophis piscator*

Table 4. The list of the amphibian fauna observed in the campus

Sl.No	Common name	Odia name	Scientific name
1	Indian Toad	Luni benga	*Duttaphrynus melanostictus*
2	Skittering frog	Panibenga	*Euphlyctis cyanophlyctis*
3	Indian Bull frog	Brahmani benga	*Hoplobatrachus tigerinus*
4	Indian tree frog	Dian benga	*Polypedates maculatus*

Table 5. The list of the fish fauna observed in the campus

Sl.No	Common name	Odia name	Scientific name
1	Catla	Bhakura	*Catla catla*
2	Rohu	Rohi	*Labeo rohita*
3	Iridescent sharks	Aquarium macha	*Pangasianodon hypophthalmus*
4	Gold fish	Aquarium macha	*Carassius auratus*

5	Spotted snakehead	Gadisha	*Channa punctata*
6	Grass carp	Carp	*Ctenopharyngodon idella*

Table 6. The list of the invertebrate fauna observed in the campus

Sl.No	Common name	Scientific name
1	Blister beetle	*Mylabris phalerata*
2	European honey bee	*Apis mellifera*
3	garden snail	*Cornu aspersum*
4	Green Jewel Bug	*Chyrsocoris stolli*
5	Leaf roller moth	*Cnaphalocrocis medinalis*
6	Milkweed bug	*Oncopeltus fasciatus*
7	Painted grassopper	*Poekilocerus pictus*
8	Jumping Spider	*Phintella vitata*
9	Pumpkin beetles	*Aulacophora femoralis*

Table 7. The list of the butterfly fauna observed in the campus

Sl.No	Common name	Scientific name
1	Striped Albatross	*Appias olferna*
2	Angled castor	*Ariadne ariadne*
3	Banded Blue Pierrot	*Discolampa ethion*
4	Blue tiger	*Tirumala limniace*
5	Blue mormon	*Papilio polymnestor*
6	Bushbrown	*Mycalesis perseus*
7	Chocolate pansy	*Junonia iphita*
8	Common baron	*Euthalia aconthea*
9	Common crow	*Euploea core*
10	Common evening brown	*Melanitis leda*
11	Common four rings	*Ypthima huebneri*
12	Common grass yellow	*Eurema hecabe*
13	Common gull	*Cepora Nerissa*
14	Common jay	*Graphium doson*
15	Common jezbel	*Delias eucharis*
16	Common leapord	*Phalanta phalantha*
17	Common mormon	*Papilio polytes*
18	Common pierrot	*Castalius rosimon*
19	Common rose	*Pachliopta aristolochiae*
20	Common sailor	*Neptis hylas*
21	Common silverline	*Spindasis vulcanus*
22	Common wanderer	*Pareronia valeria*
23	Common grass yellow	*Eurema hecabe*
24	Common Redeye	*Matapa aria*
25	Great Eggfly	*Hypolimnas bolina*
28	Twany coaster	*Acraea terpsicore*
29	Dark small branded swift	*Pelopidas mathias*
30	Grass blue	*Zizeeria karsandra*

31	Grass dart	*Taractrocera ceramas*
32	Lemon emigrant	*Catopsilia Pomona*
33	Lemon pansy	*Junonia lemonias*
34	Psyche	*Leptosia nina*
35	Striped tiger	*Danaus genutia*
36	Plain tiger	*Danaus chrysippus*
37	Red tip	*Colotis antevippe*
38	Tailed jay	*Graphium Agamemnon*
39	Three spot grass yellow	*Eurema blanda*
40	Grass demon	*Udaspes folus*
41	Pointed Ciliate Blue	*Anthene lycaenina*
42	Lime butterfly	*Papilio demoleus*
43	Peacock Pansy	*Junonia almanac*
44	Blue pansy	*Junonia orithya*

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	17
2	Four wheeler provided by university	14
3	Four wheelers used as personal transport	48
4	Two wheelers	504
5	Bicycles	212
6	E-Vehicles	12

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	√	√	√
19	School of Maritime studies	√	√	√	√	√	√	5000	√	√	√

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

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

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
Sampling and analysis team	: 1. Pritam Pattanayak, Student 2. Jayantirani Gouda, Student 3. Diptimayee Sahoo, Student 4. Aakash Behera, Student

Sampling site-2	
Water body	: Water purifier
Location	: M.D. building, CUTM, BBSR Campus
Sampling and analysis team	: 1. Pritam Pattanayak, Student 2. Jayantirani Gouda, Student 3. Diptimayee Sahoo, Student 4. Aakash Behera, Student

Sampling site-3	
Water body	: Water purifier
Location	: Kautilya building, CUTM, BBSR Campus
Sampling and analysis team	:1. Pritam Pattanayak, Student 2. Jayantirani Gouda, Student 3. Diptimayee Sahoo, Student 4. Aakash Behera, Student
Sampling site-4	
Water body	: Water purifier
Location	:Skill building, CUTM, BBSR Campus
Sampling and analysis team	: 1. Pritam Pattanayak, Student 2. Jayantirani Gouda, Student 3. Diptimayee Sahoo, Student 4. Aakash Behera, Student

Sampling site-5	
Water body	: Water purifier
Location	: Girls Hostel-1, CUTM, BBSR Campus

Sampling and analysis team	: 1. Jayantirani Gouda, Student 2. Diptimayee Sahoo, Student

Sampling site-6	
Water body	: Water purifier
Location	: Girls Hostel-2, CUTM, BBSR Campus
Sampling and analysis team	: 1. Jayantirani Gouda, Student 2. Diptimayee Sahoo, Student

Sampling site-7	
Water body	: Water purifier
Location	: Girls Hostel-3, CUTM, BBSR Campus
Sampling and analysis team	: 1.Jayantirani Gouda, Student 2. Diptimayee Sahoo, Student

Sampling site-8	
Water body	: Water purifier
Location	: Boys Hostel-1, CUTM, BBSR Campus
Sampling and analysis team	: 1. Pritam Pattanayak, Student 2. Aakash Behera, Student

Sampling site-9	
Water body	: Water purifier
Location	: Boys Hostel-2, CUTM, BBSR Campus
Sampling and analysis team	: 1. Pritam Pattanayak, Student 2. Aakash Behera, Student

Sampling site-10	
Water body	: Water purifier

Location	: Boys Hostel-3, CUTM, BBSR Campus
Sampling and analysis team	: 1. Pritam Pattanayak, Student 2. Aakash Behera, Student

Sampling site-11	
Water body	: Water purifier
Location	: Boys Hostel-4, CUTM, BBSR Campus
Sampling and analysis team	: 1. Pritam Pattanayak, Student 2. Aakash Behera, Student

Sampling site-12	
Water body	: Water purifier
Location	: Boys Hostel-5, CUTM, BBSR Campus
Sampling and analysis team	: 1. Pritam Pattanayak, Student 2. Aakash Behera, Student

Sampling site-13	
Water body	: Water purifier
Location	: Boys Hostel-6, CUTM, BBSR Campus
Sampling and analysis team	: 1. Pritam Pattanayak, Student 4. Aakash Behera, Student

Sampling site-14	
Water body	: Water purifier
Location	: Staff quarter, CUTM, BBSR Campus
Sampling and analysis team	: 1. Pritam Pattanayak, Student 2. Jayantirani Gouda, Student 3. Diptimayee Sahoo, Student 4. Aakash Behera, Student

Sampling site-15	
Water body	: Water purifier
Location	: Maritime building, CUTM, BBSR Campus
Sampling and analysis team	: 1. Pritam Pattanayak, Student 2. Jayantirani Gouda, Student 3. Diptimayee Sahoo, Student 4. Aakash Behera, 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	6.5	6.7	6.5
2	Electrical conductivity	mho/cm	2.25	0.302	0.298	0.316
3	Total suspended solid	mg/l	NS	0.108	0.192	0.124
4	Total dissolved solid	mg/l	500	0.026	0.036	0.034
5	Total solid	mg/l	----	0.134	0.228	0.158
6	Silicon	Ppm	2	00	00	00
7	Phosphorus	Ppm	5	268.6	424.5	468.6
8	Chlorine	Ppm	250	212.4	186.2	162.8
9	Calcium	Ppm	75	42.6	38.4	44.2
10	Iron	Ppm	0.3	0.212	0.208	0.136
11	Cobalt	Ppm	NS	00	00	00
12	Tin	Ppm	NS	00	00	00
13	Europium	Ppm	NS	00	00	00
14	Erbium	Ppm	NS	00	00	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	%		99.896	99.884	99.904

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	6.6	6.4	6.4
2	Electrical conductivity	mho/cm	2.25	0.648	0.436	0.344
3	Total suspended solid	mg/l	NS	0.926	0.486	0.464
4	Total dissolved solid	mg/l	500	0.106	0.048	0.054
5	Total solid	mg/l	----	1.132	.0534	0.518
6	Silicon	Ppm	2	00	00	00
7	Phosphorus	Ppm	5	0.876	1.048	1.948

8	Chlorine	Ppm	250	126.44	122.42	164.54
9	Calcium	Ppm	75	68.32	24.58	36.66
10	Iron	Ppm	0.3	0.134	0.226	0.086
11	Cobalt	Ppm	NS	00	00	00
12	Tin	Ppm	NS	0.876	0.548	0.884
13	Europium	Ppm	NS	00	00	00
14	Erbium	Ppm	NS	00	00	00
15	Chromium	Ppm	0.1	00	0.048	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	**%**		99.686	99.836	99.802

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	6.4	6.5	6.4
2	Electrical conductivity	mho/cm	2.25	0.648	0.546	0.298
3	Total suspended solid	mg/l	NS	0.884	0.678	0.628
4	Total dissolved solid	mg/l	500	0.042	0.028	0.054
5	Total solid	mg/l	----	0.926	0.706	0.708
6	Silicon	Ppm	2	1.082	0.086	0.646
7	Phosphorus	Ppm	5	0.864	1.266	0.868
8	Chlorine	Ppm	250	126.4	132.2	146.22
9	Calcium	Ppm	75	48.6	26.2	22.6
10	Iron	Ppm	0.3	0.084	0.068	0.019
11	Cobalt	Ppm	NS	00	00	00
12	Tin	Ppm	NS	00	0.016	0.028
13	Europium	Ppm	NS	00	00	00
14	Erbium	Ppm	NS	00	00	0.22
15	Chromium	Ppm	0.1	00	0.02	0.01
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			99.881	99.846	99.884

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	6.4	6.7	6.6
2	Electrical conductivity	mho/cm	2.25	0.386	0.328	0.342
3	Total suspended solid	mg/l	NS	0.824	0.888	0.658
4	Total dissolved solid	mg/l	500	0.044	0.062	0.102
5	Total solid	mg/l	----	0.868	0.950	0.750

6	Silicon	Ppm	2	0.184	0.022	0.132
7	Phosphorus	Ppm	5	1.242	0.329	0.819
8	Chlorine	Ppm	250	46.8	62.4	88.6
9	Calcium	Ppm	75	33.6	12.9	17.8
10	Iron	Ppm	0.3	0.16	0.08	0.12
11	Cobalt	Ppm	NS	00	00	00
12	Tin	Ppm	NS	0.04	0.12	0.042
13	Europium	Ppm	NS	00	00	00
14	Erbium	Ppm	NS	00	00	00
15	Chromium	Ppm	0.1	00	00	00
16	Nickel	Ppm	0.02	0.01	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	**%**		99.864	99.832	99.868

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	6.6	6.6	6.5
2	Electrical conductivity	mho/cm	2.25	0.624	0.336	0.398
3	Total suspended solid	mg/l	NS	0.148	0.122	0.146
4	Total dissolved solid	mg/l	500	0.022	0.054	0.032
5	Total solid	mg/l	----	0.170	0.176	0.178
6	Silicon	Ppm	2	0.088	0.021	0.011
7	Phosphorus	Ppm	5	0.982	0.848	1.462
8	Chlorine	Ppm	250	22.14	36.22	36.4
9	Calcium	Ppm	75	16.4	22.24	18.66
10	Iron	Ppm	0.3	0.04	0.01	00
11	Cobalt	Ppm	NS	00	00	00
12	Tin	Ppm	NS	00	00	0.01
13	Europium	Ppm	NS	00	00	00
14	Erbium	Ppm	NS	00	00	00
15	Chromium	Ppm	0.1	0.02	00	00
16	Nickel	Ppm	0.02	00	0.01	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	99.864	99.838

Values of three replicates ± SEM

CONCLUSSION

After summarizing the results of tests conducted in 2021 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.

PHOTOGRAPHS SHOWING WASTE 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	Management of E-waste	Collection of waste for	Waste 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

Recycling of Paper Waste

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 aquestionnaire. With the help of student volunteers and faculties of respective departmrnts the major partof 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

Dr. Atia Arzoo

Dr.Rukmini Mishra

Dr. Yashaswi Nayak

Dr. Sagarika Parida

Dr. Gyanranjan Mahalik

Dr. Siba Prasad Parida

SCHOOL OF APPLIED SCIENCES
CUTM
CENTURION UNIVERSITY OF TECHNOLOGY & MANAGEMENT

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.

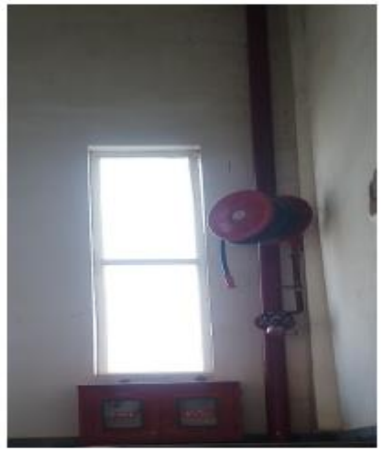
g. Waste management: Land filling is the general waste management strategy adopted by the University and there is no management plan for managing inorganic waste, especially plastics. So polythene use has been banned completely. Biogas plants for effectively managing organic wastes are established in 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: ` 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: 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	DON’T
Collect waste, rubbish and debris within the school and dispose as per set frequency.	**DO NOT** let waste and trash accumulate within the premises.
Dispose all waste as per guidelines.	**DO NOT** dispose waste outside or near parking lots, playground, drainage, swimming pool, ditches or any other location where they can damage the environment.
Keep all equipment clean; do not allow a build-up of wastes.	**DO NOT** let equipment get damaged or rusted; replace if unsuitable for further use.
Oversee contractors to ensure that correct procedures are followed and SOP guidelines are complied with.	**DO NOT** let contractors conduct maintenance in conflict with proper procedures and guidelines; monitor closely.
Impose Penalty on defaulters for littering/spitting/open urinating within the university premises or near the boundary walls	**DO NOT** allow littering, spitting, open urination or any other practices that affect the cleanliness and aesthetics of the premises.
Conduct surprise inspections of the schools to ensure a clean, hygienic and healthy environment for members and staff.	**DO NOT** allow accumulation of unnecessary wastes anywhere.
Involve students and staff in such a manner that they voluntarily contribute towards cleanliness.	**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 managenemt	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

REPORT OF
ENVIRONMENTAL AUDIT
OF CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, BBSR CAMPUS, ODISHA (2019-20)

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 aquestionnaire. With the help of student volunteers and faculties of respective departmrnts the major partof 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

Atia Arzoo

Dr. Atia Arzoo

RMishra.

Dr.Rukmini Mishra

Dr. Yashaswi Nayak

Dr. Sagarika Parida

Gyanranjan Mahalik

Dr. Gyanranjan Mahalik

Dr. Siba Prasad Parida

SCHOOL OF APPLIED SCIENCES
CUTM
CENTURION UNIVERSITY OF TECHNOLOGY & MANAGEMENT

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.

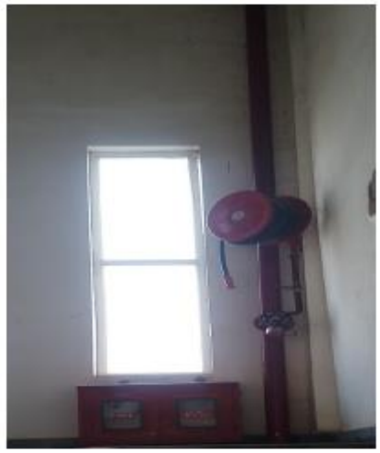
g. Waste management: Land filling is the general waste management strategy adopted by the University and there is no management plan for managing inorganic waste, especially plastics. So polythene use has been banned completely. Biogas plants for effectively managing organic wastes are established in 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

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	LED Bulb	9	330	12	35640	71280	35640	13008600
2	LED Bulb	15	14	8	1680	3360	1680	613200
3	LED Bulb	18	42	8	6048	12096	6048	2207520
4	LED Bulb	20	12	8	1920	3840	1920	700800
5	LED Bulb	23	20	8	3680	7360	3680	1343200
6	LED hanging light	15	3	8	360	720	360	131400
7	LED Focus light	50	257	8	102800	205600	102800	37522000
8	LED Street light	30	8	12	2880	5760	2880	1051200
9	LED Track light	30	6	12	2160	4320	2160	788400
10	CFL	85	2	8	1360	2720	1360	**496400**
11	Celling light	18	58	8	8352	16704	8352	**3048480**
12	Celling light	22	34	8	5984	11968	5984	**2184160**
13	Street light	90	13	8	9360	18720	9360	**3416400**
14	LED tube light	10	130	8	10400	20800	10400	**3796000**
15	Surface panel light	18	14	8	2016	4032	2016	**735840**
16	Surface panel light	24	12	8	2304	4608	2304	**840960**
17	Solar Street light	0	240	12	0	103680	103680	**37843200**
								Total unit saved= 109727 **Rate per unit = 6.00** **Total amount saved = 658362.00**

SOME PHOTOGRAPHS SHOWING ENERGY MANAGEMENT

Sola

r 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.	*Artocarpus heterophyllus* Lam.	Moraceae	B-2
11.	*Averrhoa carambola* L.	Averrhoaceae	B-2
12.	*Bixa orellana* L.	Bixaceae	B-2
13.	*Borassus flabellifer* L.	Arecaceae	B-2
14.	*Brya ebenus* (L.) DC.	Fabaceae	B-2
15.	*Cinammomum tamala* (Buch.-Ham.) T.Nees&C.H. Eberm.	Lauraceae	B-2
16.	*Couroupita guianensis* Aubl.	Lecythidaceae	B-2
17.	*Crataeva magna* (Lour.) DC	Capparaceae	B-2
18.	*Delonix regia* (Boj. ex Hook.) Raf.	Caesalpiniaceae	B-2, B-4
19.	*Dillenia indica* L.	Dilleniaceae	B-2,
20.	*Diospyros melanoxylon* Roxb.	Ebenaceae	B-2
21.	*Elaeis guineensis* Jacq.	Arecaceae	B-4
22.	*Eucalyptus citrodora* Hook.	Myrtaceae	B-2
23.	*Ficus benghalensis* L. var.*benghalensis*	Moraceae	B-2, B-4
24.	*Macarnga peltata* (Roxb.)Muell-Arg.	Euphorbiaceae	B-2
25.	*Magnolia champaca*(L.) Baill. ex Pierre	Magnoliaceae	B-2
26	*Mangifera indica* L.	Anacardiaceae	B-1, B-2, B-3,B-4
27.	*Manilkara zapota*(L.) P.Royen	Sapotaceae	B-1
28.	*Melaleuca citrine* (Curtis) Dum.Cours.	Lythraceae	B-2
29.	*Mesua ferea* L.	Clusiaceae	B-2
30.	*Millettia pinnata* (L.) Panigrahi	Fabaceae	B-2,B-3
31.	*Millingtonia hortensis* L.f.	Bignoniaceae	B-2

32.	*Mimusops elengi* L.	Sapotaceae	B-2, B-3
33.	*Mitragyna parviflora* (Roxb.) Korth	Rubiaceae	B-3
34.	*Phyllanthus emblica* L.	Euphorbiaceae	B-2
35.	*Pimenta dioica* (L.)Merr.	Myrtaceae	B-2
36.	*Plumeria obtuse* L.	Apocynaceae	B-4
37.	*Plumeria rubra* L.	Apocynaceae	B-1, B-2, B-3,B-4
38.	*Polyalthia longifolia* Sonn.	Annonaceae	B-1, B-2, B-3,B-4
39.	*Polyalthia suberosa* (Roxb.) Thwaites	Annonaceae	B-1
40.	*Prosopis cineraria* (L.) Druce	Mimosaceae	B-2
41.	*Psidium guajava* L.	Myrtaceae	B-1, B-2
42.	*Pterocarpus santalinus* L.f.	Fabaceae	B-2
43.	*Pterospermum acerifolium* (L.) Willd.	Sterculiaceae	B-2
44.	*Punica granatum* L.	Punicaceae	B-2
45.	*Ravenala madagascariensis* Sonn.	Strelitziaceae	B-2
46.	*Roystonea regia* (Kunth) O.F.Cook	Arecaceae	B-1, B-2
47.	*Sambucus canadensis* L.	Adoxaceae	B-2
48.	*Santalum album* L.	Santalaceae	B-2
49.	*Saraca asoca* (Roxb.) Willd.	Caesalpiniaceae	B-2
50.	*Senna auricualata* (L.) Roxb.	Caesalpiniaceae	B-2
51.	*Senna siamea* (Lam.) H.S. Irwin & Barneby	Caesalpiniaceae	B-2
52.	*Sesbania grandiflora* (L.) Poiret	Fabaceae	B-4
53.	*Simarouba glauca* DC.	Simaroubaceae	B-2, B-4
54.	*Terminalia bellerica* (Gaertn.) Roxb.	Combretaceae	B-1
55.	*Terminalia catappa* L.	Combretaceae	B-2
56.	*Terminalia chebula* Retz.	Combretaceae	B-1
57.	*Ziziphus mauritiana* Lam.	Rhamnaceae	B-1, B-2, B-3,B-4
SHRUB			
58.	*Acalypha wilkesiana* Mull.	Euphorbiaceae	B-2
59.	*Adenium obesum* (Forssk.) Roem. & Schult	Apocynaceae	B-2
60.	*Agave Americana* L.	Agavaceae	B-2
61.	*Agave salmiana* Otto ex Salm-Dyck	Asparagaceae	B-2
62.	*Allamanda schottii* Hook.	Apocynaceae	B-2
63.	*Codiaeum variegatum* (L.) Juss. A.Rich.	Euphorbiaceae	B-2

64.	*Coprosma repens*	Rubiaceae	B-2
65.	*Cordyline fruticose* (L.) A.Chev. (L.)Nees.	Agavaceae	B-2
66.	*Crossandra infundibuliformis*	Acanthaceae	B-2
67.	*Crotalaria spectabilis* Roth	Fabaceae	B-2
68.	*Cryptostegia grandiflora* R.Br.	Apocynaceae	B-1
69.	*Cuphea hyssopifolia* Kunth	Lythraceae	B-2
70.	*Desmodium pulchellum* (L.)Benth.	Fabaceae	B-4
71.	*Dracaena marginate* Lam. 'tricolor'	Agavaceae	B-2
72.	*Dracena reflexa* Lam.	Agavaceae	B-2
73.	*Dracaena sanderiana* Mast.	Asparagaceae	B-2
74.	*Duranta repens* L.	Verbenaceae	B-2
75.	*Dypsis lutescens* (H.Wendl.) Beentje & J.Dransf	Arecaceae	B-2
76.	*Euphorbia milii* Des Moul.	Euphorbiaceae	B-2
77.	*Euphorbia pulcherrima* Willd. ex Klotzsch	Euphorbiaceae	B-2
78.	*Hibiscus schizopetalus* (Mast.)Hook.f.	Malvaceae	B-1, B-2
79.	*Hypoestes phyllostachya* Baker	Acanthaceae	B-2
80.	*Impatiens glandulifera* Royle	Balsaminaceae	B-2
81.	*Ipomoea carnea* Jacq.	Convolvulaceae	B-1,B-4
82.	*Ixora coccinea* L.	Rubiaceae	B-2
83.	*Jasminum auriculatum* Vahl	Oleaceae	B-2
84.	*Jasminum sambac* (L.) Ait.	Oleaceae	B-2
85.	*Jatropha gossypifolia* L.	Euphorbiaceae	B-2
86.	*Jatropha integerrima* Jacq.	Euphorbiaceae	B-2
87.	*Justicia adhatoda* L.	Acanthaceae	B-2
88.	*Justicia gendarussa* Brum.f.	Acanthaceae	B-2 , B-4
89.	*Kopsia fruticosa* (Roxb.)A.DC.	apocynaceae	B-2
90.	*Lagerstroemia indica* (L.) Pers.	lythraceae	b-2
91.	*Lantana camara* L. var. aculeata (L.) Mold	verbenaceae	b-2
92.	*Lawsonia inermis* L.	lythraceae	b-2
93.	*Loropetalum chinense* (R.Br.)Oliv. var. chinense	hamamelidaceae	b-2
94.	*Malpighia coccigera* L.	malpighiaceae	B-2
95.	*Malvaviscus arboreus* Cav.	malvaceae	B-2
96.	*Melastoma malbathricum* L.	melastomataceae	B-2

97.	*Mussaenda frondosa* L.	rubiaceae	B-2
98.	*Mussaenda phillipica* A.Rich.	rubiaceae	B-2
99.	*Rosa damascina* Miller	rosaceae	B-2
100.	*Rosa fortuneana* Lindley	rosaceae	B-2
101.	*Rosa gallica* L.var.complicata	rosaceae	B-2
102.	*Rosa gallica* var. officinalis	rosaceae	B-2
103.	*Rosa indica* L.	rosaceae	B-2
104.	*Rosa odorata* (Andr.)Sweet var. odorata	rosaceae	B-2
105.	*Sauropus androgynus* (L.) Merr.	euphorbiaceae	B-2
106.	*Solanum torvum* Sw.	solanaceae	B-2, B-4
107.	*Sterblus taxoides* (Roth)Kurz	Moraceae	B-2
108.	*Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schult.cv.plena	apocynaceae	B-2
109.	*Tecoma stans* (L.) Kunth.	bignoniaceae	B-1, B-2
110.	*Thunbergia erecta* (Benth.)T.Anderson	acanthaceae	B-1, B-2
111.	*Vitex negundo* L.	verbenaceae	B-2
112.	*Wrightia antidysenterica* (L.)R.Br.	apocynaceae	B-2
113.	*Ziziphus oenoplia* (L.) Mill.	rhamnaceae	B-4
HERB			
114.	*Abelmoschus esculentus* (L.) Moench	Malvaceae	B-1, B-2
115.	*Abelmoschus manihot* (L.) Medic subsp. Tetraphyllus	malvaceae	B-4
116.	*Aerva lanata* (L.) Juss.ex Schultes.	amaranthacea	B-1.B-2,B-3,B-4
117.	*Aerva sanguinolenta* (L.) BI.	amaranthacea	B-2
118.	*Aeschynomene aspera* L.	fabaceae	B-3,B-4
119.	*Aeschynomene indica* L.	fabaceae	B-1,B-4
120.	*Ageratum conyzoides* L.	asteraceae	B-1,B-2,B-3,B-4
121.	*Allmania nodiflora* (L.) R.Br. ex Wt.	amaranthacea	B-1,B-3,B-4
122.	*Alocasta macrorrhizos* (L.) G.Don	araceae	B-4
123.	*Aloe vera* (L.) Burm.f.	liliaceae	B-1,B-2
124.	*Alpinia galanga* (L.) Willd.	zingiberaceae	B-2
125.	*Alternanthera sessilis* (L.) R.Br. ex DC.	Amaranthacea	B-1,B-2,B-3,B-4
126.	*Alysicarpus vaginalis* (L.) DC. var. nummularifolius Miq.	fabaceae	B-1,B-2,B-3,B-4
127.	*Amaranthus caudatus* L.	amaranthacea	B-2
128.	*Amaranthus spinosus* L	amaranthacea	B-1.B-2,B-3,B-4

129.	*Amaranthus tricolor* L.	amaranthacea	B-1,B-4
130.	*Amaranthus viridis* L.	amaranthacea	B-1,B-2,B-3,B-4
131.	*Asystasia gangetica*(L.) T. Anderson	acanthaceae	B-2
132.	*Barleria cristata* L.	acanthaceae	B-4
133.	*Barleria prionitis* L.	acanthaceae	B-1,B-3,B-4
134.	*Bassia scoparia* (L.) Schrad.	amaranthacea	B-2
135.	*Biophytum sensitivum* (L.) DC.	oxalidaceae	B-1,B-2,B-3,B-4
136.	*Brassica campestris L.*	brassicaceae	B-1,B-2,B-3
137.	*Brassica napus L var. glauca* (Roxb.) Schulz	brassicaceae	B-2
138.	*Brassica oleracea* L. var.capitata	brassicaceae	B-2
139.	*Brassica oleracea* L. var.oleracea	brassicaceae	B-2
140.	*Caladium bicolor* (Aiton) Vent	araceae	B-2
141.	*Canna indica* L.	cannaceae	B-2
142.	*Capsicum annum* L.	solanaceae	B-2
143.	*Catharanthus roseus* (L.) G.Don	apocynaceae	B-1,B-2,B-3,B-4
144.	*Celosia argentea* L.	amaranthacea	B-2
145.	*Celosia cristata* L.	amaranthacea	B-2
146.	*Celosia argentea var.* plumosa	amaranthacea	B-2
147.	*Centella asiatica* (L.) Urban	apiaceae	B-2
148.	*Chamaecostus cuspidatus* (Nees & Mart.) C.Specht & D.W. Stev.	costaceae	B-2
149.	*Chenopodium album* L.	chenopodiaceae	B-4
150.	*Chrozophora rottleri* (Geisel.) Juss.	euphorbiaceae	B-3,B-4
151.	*Chrysanthemum* cinerariifolium (Trev.) Vis.	asteraceae	B-2
152.	*Cleome rutidosperna* DC.	capparaceae	B-1,B-2,B-3,B-4
153.	*Cleome viscosa* L.	capparaceae	B-1,B-2,B-3,B-4
154.	*Coldenia procumbens* L.	boraginaceae	B-1,B-2,B-3,B-4
155.	*Colocasia esculenta* (L.) Schott	araceae	B-4
156.	*Commelina benghalensis* L.	commelinaceae	B-1,B-2,B-3,B-4
157.	*Commelina erecta* L.	commelinaceae	B-1,B-2,B-3,B-4
158.	*Commelina longifolia* Lam.	commelinaceae	B-4
159.	*Commelina paludosaBlume*	commelinaceae	B-3
160.	*Coriandrum sativum* L.	apiaceae	B-2
161.	*Evolvulus alsinoides* (L.) L.	Convolvulaceae	B-1,B-3,B-4

162.	*Evolvulus nummularius* (L.) L.	Convolvulaceae	B-1,B-2,B-3,B-4
163.	*Evovulus sericeus* Sw.	Convolvulaceae	B-3
164.	*Foeniculuem vulgare* L.	Apiaceae	B-2,B-3
165.	*Gaillardia aristata* Pursh	Asteraceae	B-2
166.	*Gaillardia grandiflora* Hort	Asteraceae	B-2
167.	*Gomphrena celosioides* Mart,	Amaranthaceae	B-1,B-2,B-3,B-4
168.	*Gomphrena globosa* L.	Amaranthaceae	B-2
169.	*Grangea maderaspatana* (L.) Poir.	Asteraceae	B-1,B-2,B-3,B-4
170.	*Hedyotis bracheata* Miq.ex Hook.f.	Rubiaceae	B-1,B-3,B-4
171.	*Hedvotis corymbosa* (L.)lam.	Rubiaceae	B-1,B-2,B-3,B-4
172.	*Hedyotis puberula* (G.Don)Thw.	Rubiaceae	B-3
173.	*Heliconia latispatha* Benth.	Tlcliconiaceae	B-2
174.	*Heliconia rostrata* Ruiz & Pavon	Heliconiaceae	B-2
175.	*Hibiscus canabinus* L	Malvaceae	B-1
176.	*Hippeastrum amaryllis* (L.)Herb.	Amaryllidaceae	B-2
177.	*Hyptis suaveolens* (L.) Poit.	Lamiaccac	B-1,B-2,B-3,B-4
178.	*Impatiens balsamina* L.	Balsaminaceae	B-2
179.	*Indigofera linnaei* Ali	Fabaceae	B-1,B-2,B-3,B-4
180.	*Indoneesiella echioides* (L.) Sreemadh.	Acanthaceae	B-1,B-2,B-3,B-4
181.	*Justicia betonica* L.	Acanthaceae	B-3,B-4
182.	*Justicia japonica* Thunb.	Acanthaccac	B-2,B-3
183.	*Justicia quinqueangularis* Koen. ex Roxb.	Acanthaceae	B-1,B-4
184.	*Kalanchoe blossfeldiana* Poelln.	Crassulaceae	B-2
185.	*Kalanchoe pinnata* (Lam.) Pers.	Crassulaccae	B-2
186.	*Laportea interrupta* (L.) Chew	Urticaceae	B-1,B-2,B-3,B-4
187.	*Leucas aspera* (Willd.) Link	Lamiaceae	B-3,B-4
188.	*Leucas cephalotes* (Roth) Spreng.	Lamiaceae	B-1,B-4
189.	*Leucas indica* (L.) R.Br.cx Vatke	Lamiaceae	B-4
190.	*Lindernia ciliata* (Colsm.)Pennell	Scrophulariaceae	B-1,B-2,B-3,B-4
191.	*Lindshot.onaviyouero* (L.) F.v.Muell	Scrophulariaceae	B-1,B-2,B-3,B-4
192.	*Lippia javanica* (Burm.f.)Spreng.	Verbenacea	B-4
193.	*Lobelia alsinoides* Lam.	Lobeliaceae	B-1,B-4
194.	*Lobularia maritima* (L.)Desv.	Brassicaceae	B-3
195.	*Ludwigia perennis* L.	Onagraceae	B-1,B-3,B-4
196.	*Malachra capitata* (L.)L.	Malvaceae	B-3

197.	*Maranta arundinacea* L.	Marantaceae	B-2
198.	*Martynia annua* L.	Martyniaceae	B-4
199.	*Mazus pumilus* (Brum.f.) Steenis	Scrophulariaceae	B-2,B-4
200.	*Mecardonia procumbens* (Mill.) Small	Scrophulariaceae	B-1,B-3,B-4
201.	*Melochia corchorifolia* L.	Sterculiaceae	B-3,B-4
202.	*Mentha arvensis* L.	Lamiaceae	B-2
203.	*Mentha piperita* L.	Lamiaceae	B-2
204.	*Mentha spicata* L.	Lamiaceae	B-2
205.	*Merremia hederacea* (Burm.f.)Hall.f.	Convolvulaceae	B-4
206.	*Microccocca mercurialis* (L.) Benth.	Euphorbiaceae	B-1,B-2,B-3,B-4
207.	*Mimosa pudica* L.	Mimosaceae	B-1,B-2,B-3,B-4
208.	*Mirabilis jalapa* L.	Nyctaginaceae	B-2
209.	*Mitracarpus villosus* (Sw.) DC.	Rubiaceae	B-1,B-2,B-3,B-4
210.	*Mollugo pentaphylla* L.	Molluginaceae	B-1,B-2,B-3,B-4
211.	*Murdannia nodiflora* (L.)Brenan	Commelinaceae	B-1,B-2,B-3,B-4
212.	*Murdannia spirata* (L.) Brueck.	Commelinaceae	B-1,B-3,B-4
213.	*Musa acuminata var.* rubra	Musaccae	B-2
214.	*Musa paradisiaca* L.	Musaceae	B-2
215.	*Ocimum canum* Sims.	Lamiaceae	B-4
216.	*Origanum majorana* L.	Lamiaceae	B-2
217.	*Oxalis corniculata* L.	Oxalidaceae	B-1,B-2,B-3,B-4
218.	*Oxalis debilis* Kunth	Oxalidaceae	B-2
219.	*Oxalis triangularis* A.St.-Hil.	Oxalidaceae	B-2
220.	*Panadnus amarylifolius* Roxb.	Pandanaceae	B-2
221.	*Parthenium hysterophorus* L.	Asteraceae	B-1,B-2,B-3,B-4
222.	*Peperomia pellucida* Kunth	Piperaceae	B-1,B-3,B-4
223.	*Peristrophe paniculata* (Forssk.) Brummitt	Acanthaceae	B-1,B-3,B-4
224.	*Persicaria virginiana* (L.)Gaertn.	Polygonaceae	B-2
225.	*Petunia hybrid* Juss.	Solanaceae	B-2
226.	*Phaulopsis imbricata* (Forssk.) Sw.	Acanthaceae	B-3,B-4
227.	*Phyla nodiflora* (L.) Greene	Verbenaceae	B-4
228.	*Phyllanthus fraternus* Webster	Euphorbiaceae	B-1,B-2,B-3,B-4
229.	*Phyllanthus virgatus* Forst.f	Euphorbiaceae	B-1,B-3,B-4
230.	*Physalis longifolia Nutt.* var longifolia	Solanaceae	B-3

231.	*Physalis minima* L.	Solanaceae	B-4
232.	*Polygala arvensis* L.	Polygalaceae	B-3,B-4
233.	*Polygonum barbatum* L.	Polygonaceae	B-3,B-4
234.	*Portulaca oleracea* L. var. oleracea	Portulaceae	B-1,B-2,B-3,B-4
235.	*Portulaca pilosa* L. subsp. grandiflora (Hook.) Geesink	Portulaceae	B-2
236.	*Portulaca quadrifida* L.	Portulaceae	B-1,B-2,B-3,B-4
237.	*Portulaca umbraticola* Kunth	Portulaceae	B-2
238.	*Ruellia brittoniana* Leonard	Acanthaceae	B-2
239.	*Sansevieria trifasciata* Prain.	Asparagceae	B-2
240.	*Scadoxus multiflorus* (Martyn) Raf.	Amaryllidaceae	B-2
241.	*Scoparia dulcis* L.	Scrophulariaceae	B-1,B-2,B-3,B-4
242.	*Sebastiania chamalea* (L.) Muell.-Arg.	Euphorbiaceae	B-2,B-4
243.	*Senna occidentalis* (L.) Link	Caesalpiniaceae	B-2,B-4
244.	*Sesamum orientale* L.	Pedaliaceae	B-3,B-4
245.	*Solanum tuberosum* L.	Solanaceae	B-2
246.	*Solanum virginianum* L.	Solanaceae	B-4
247.	*Spathiphyllum cochlearispathum* (Liebm.) Engl.	Araceae	B-2
248.	*Spermacoce articularis* L.f.	Rubiaceae	B-1,3-2,B-3,B-4
249.	*Spermacocoe exilis* (L.O.Williams)C.D. Adams	Rubiaceae	B-1,B-2,B-3,B-4
250.	*Theriophonum minuatum* (Willd.)Bail	Araceae	B-2
251.	*Tithonia diversifolia* (Hemsl)A.Gray	Asteraceae	B-1,B-2
252.	*Tradescantia zebrine* (Schinz)D.R Hunt	Commelinaceae	B-2
253.	*Tribulus terrestris* L.	Zygophyllaceae	B-2,B-4
254.	*Tridax procumbens* L.	Asteraceae	B-1,B-2,B-3,B-4
255.	*Triumfetta pentandra A*.Rich	Sterculiaceae	B-1,B-4
256.	*Triumfetta rhomboidea* Jasq.	Sterculiaceae	B-3,B-4
257.	*Turnera ulmifolia* L.	Turneraceae	B-2
258.	*Uraria picta* (Jacq.)Desv.ex DC.	Fabaceae	B-2
259.	*Urena lobata L. subsp. sinuata* (L.) Borssum var. sinuate	Malvaceae	B-1,B-3,B-4
HYDROPHYTES			
260.	*Alisma plantago-aquatica* L.	Alismataceae	B-2
261.	*Ceratophyllum demersum* L.	Ceratophyllaccae	B-2

262.	*Eichhornia crassipes*(Mart.) Solms-Laub.	Pontederiaceae	B-4
263.	*Hydrilla verticillata* (L.f.) Royle	Hydrocharitaceae	B-2
264.	*Lemna perpusila* Tor.	Lemnaecae	B-2,B-4
265.	*Monochoria hastata* Solms-Laub.	Pontederiaceae	B-4
266.	*Monochoria vaginalis* (Burm.f.) Presl	Pontederiaceae	B-4
267.	*Nelumbo nucifera* Gaertn.	Nelumbonaceae	B-2
268.	*Nuphar pumila*(Timm) DC.	Nymphaeaccae	B-2
269.	*Nymphaea mexicana* Zucc.	Nymphaeaccae	B-2
270.	*Nymphaea nouchali* Burm.f.	Nymphaeaceae	B-2
271.	*Nymphaea pubescens* Willd.	Nymphaeaceae	B-2
272.	*Nymphoides hydrophila* (Lour.)Kuntze	Nymphaeaceae	B-2
CLIMBER			
273.	*Argeyria nervosa*(Burm.f.) Bojer	Convolvulaceae	B-2
274.	*Artabotrys hexapetalus*(L.f) Bandari	Annonaceae	B-2
275.	*Asparagus racemosus* Willd.	Asparagaceae	B-2
276.	*Atylosia scarabaeoides* (L.) Benth.	Fabaceae	B-3,B-4
277.	*Basella alba* L.	Basellaceae	B-2
278.	*Campsis radicans* Seem.	Bignoniaceae	B-2
279.	*Cayratia pedata Wall.)* Gagnep.	Vitaceae	B-3,B-4
280.	*Cayratia trifolia* (L.) Domin	Vitaceae	B-1,B-3,B-4
281.	*Coccinia grandis* (L.) Voigt	Cucurbitaceae	B-3,B-4
282.	*Cocculus hirsutus*(L.) Diels	Cucurbitaceae	B-3,B-4
283.	*Cucumis melo* L.	Cucurbitaceae	B-2
284.	*Cucumis sativus* L.	Cucurbitaceae	B-2
285.	*Cucurbita maxima* Duchesne	Cucurbitaceae	B-2
286.	*Cuscuta reflexa* Roxb.	Cuscutaceae	B-4
287.	*Dioscorea alata* L.	Dioscoreaceae	B-2
288.	*Diplocyclos palmatus*(L.) C.Jeffrey	Cucurbitaceae	B-4
289.	*Epipremnum aureum*(Linden & André) G.S.Bunting	Araceae	B-2
290.	*Ichnocarpus frutescens* (L.) W.T.Aiton	Apocynaceae	B-2
291.	*Ipomoea obscura* Ker.-Gawl.	Convolvulaceae	B-4
292.	*Ipomoea pes-tigridis*L.	Convolvulaceae	B-1,B-4
293.	*Ipomoea quamoclit* L.	Convolvulaceae	B-3

294.	*Ipomoea sepiaria Koenig* ex Roxb.	Convolvulaceae	B-3,B-4
295.	*Luffa acutangula*(L.) Roxb.	Convolvulaceae	B-2
296.	*Luffa aegyptiaca* Mill.	Cucurbitaceae	B-4
297.	*Mansoa alliacea* Gentry	Bignoniaceae	B-2
297.	*Passiflora incarnata* L	Passifloraceae	B-2
298.	*Passiflora vitifolia* Kunth	Passifloraceae	B-2
299.	*Piper betel* L	Piperaceae	B-2
300.	*Piper longum* L.	Piperaceae	B-2
301.	*Podranea ricasoliana*(Tanf.) Sprague	Bignoniaceae	B-2
302.	*Pyrostegia venusta* (Ker.Gawl.)Miers	Bignoniaceae	B-2
303.	*Quisqualis indica* L.	Combretaceac	B-2
304.	*Rhaphidophora decisirva* (Roxb.) Schott	Araceae	B-2
305.	*Stephania japonica* (Thunb.) Miers	Menispermaceae	B-3
306.	*Syngonium podophyllum* Schott	Araceae	B-2
307.	*Thunbergia fragrans* Roxb.	Acanthaceae	B-2
308.	*Thunbergia grandiflora* (Roxb.ex Rottl.)Roxb.	Acanthaceae	B-1,B-2
309.	*Tinospora cordifolia*(Thunb.) Miers	Menispermaceae	B-2
310.	*Trichosanthes cucumerina* L.	Cucurbitaceae	B-2
311.	*Typhonium trilobatum (*L.) Schott	Araceae	B-2
312.	*Vernonia elliptica* DC.	Asteraceae	B-1,B-2
314.	*Vitis vinifera* L.	Vitaceae	B-2
EPIPHYTES			
315.	*Vanda tesselata* (Roxb.) Hook.cx G.Don	Rubiaceae	B-2
316.	*Dendrobium ursula* Strenge	Passifloraceae	B-2
GRASS			
317.	*Aristida setacea* Rctz.	Passifloraceae	B-1,B-2,B-3,B-4
318.	*Bambusa arundinacea* (Retz.) Willd.	Apocynaceae	B-2
319.	*Bambusa vulgaris Schrad.* Ex J.C.Wendl.	Asclepidaceae	B-2
320.	*Bothriochloa pertusa* (L.) A. Camus	Verbenaceae	B-1,B-2,B-3,B-4
321.	*Brachiaria distachya* (L.) Stapf	Araceae	B-1,B-2,B-3,B-4
322.	*Brachiaria mutica* (Forssk.) Stapf	Piperaceae	B-4
323.	*Brachiaria ramosa* (L.) Stapf	Piperaceae	B-1,B-3,B-4
324.	*Chloris barbata* Sw.	Bignoniaceae	B-1,B-2,B-3,B-4
325.	*Chrysopogon aciculatus* (Retz.) Trin.	Bignoniaceae	B-1,B-4

326.	*Cynodon dactylon* (L.) Pers.	Combretaceac	B-1,B-2,B-3,B-4
327.	*Cyperus brevifolius* (Rottb.) Hassk.	Araceae	B-1,B-4
328.	*Cyperus compactus* Retz.	Menispermaceae	B-4
329.	*Cyperus difformis* L.	Araceae	B-1,B-3,B-4
330.	*Cyperus halpan* L.	Acanthaceae	B-1,B-3
331.	*Cyperus imbricatus* Retz.	Acanthaceae	B-4
332.	*Cyperus iria* L.	Menispermaceae	B-1,B-4
333.	*Cyperus triceps* Endl.	Cyperaceae	B-1,B-3,B-4
334.	*Dactyloctenium aegypticum* (L.) P.Beauv.	Poaceae	B-1,B-2,B-3,B-4
335.	*Digitaria abludens* (Roem. & Schult.) Veldk.	Poaceae	B-3
336.	*Digitaria ciliaris* (Retz.) Koeler	Poaceae	B-1,B-2,B-3,B-4
337.	*Echinochloa colona (*L.) Link	Poaceae	B-1,B-2,B-3,B-4
338.	*Eleusine indica (*L.) Gaertn.	Poaceae	B-1,B-2,B-3,B-4
339.	*Elusine coracana (*L.)Gaertn	Poaceae	B-2
340.	*Eragrostis ciliaris* (L.) R.Br.	Poaceae	B-3
341.	*Eragrostis ciliata* Roxb. Nees	Poaceae	B-1,B-2,B-3,B-4
342.	*Eragrostis unioloides* (Retz.) Nees ex Steud.	Poaceae	B-1,B-2,B-3,B-4
343.	*Eriochloa procera* (Retz.)Hubbard	Poaceae	B-1,B-2,B-3,B-4
344.	*Paspalum scrobiculatum* L.	Poaceae	B-2,B-3
345.	*Paspalum vaginatum* Sw.	Poaceae	B-1,B-3
346.	*Pennisetum pedicellatum* Trin.	Poaceae	B-1,B-3,B-4
347.	*Pennisetum purpureum* Schumach	Poaceae	B-3,B-4
348.	*Perotis indica* (L.) Kuntz	Poaceae	B-3,B-4
349.	*Pogonantherum crinitum*(Thunb.) Kunth	Poaceae	B-2
350.	*Sachharum officinarum* L.	Poaceae	B-2
351.	*Setaria pumila* (Poir.) Roem. & Schult.	Poaceae	B-1,B-3,B-4
352.	*Setaria verticillata* (L.) P.Beauv.	Poaceae	B-1,B-4
353.	*Sorghum vulgare* L.	Poaceae	B-2
354.	*Zea mays* L.	Poaceae	B-2
GYMNOSPERM			
355.	*Araucaria columnaris* (Forst.f.) Hook.	Araucariaceae	B-2
356.	*Cycas revoluta* Thunb.	Cycadaceae	B-2
357.	*Juniperus communis* L.	Cupressaceae	B-2

358.	*Pinus roxburghii* Sargent	Pinaceae	B-2
359.	*Podocarpus nerefolius* D.Don	Podocarpaceae	B-2
360.	*Platycladus orientalis* (L.) Franco	Cupressaceae	B-2
PTERIDOPHYTES			
361.	*Adiantum incisum* Forssk.	Adiantaceae	B-4
362.	*Adiantum phillipense* L.	Adiantaceae	B-1,B-2,B-3,B-4
363.	*Ampelopteris prolifera* (Retz.) Copel.	Thelypteridaceae	B-2,B-4
364.	*Nephrolepis exaltata*(L.) Schott	Nephrolepidaceae	B-2
365.	*Phymatosorus membranifolius* (R.Br.)S.G. Lu	Polypodiaceae	B-2
366.	*Pteris vittata* L.	Pteridaceae	B-1,B-2,B-3,B-4
367.	*Salvinia cuculata* Roxb.	Salviniaceae	B-4
368.	*Salvinia molesta* D.S. Mitch	Salviniaceae	B-4
369.	*Selaginella ciliaris*(Retz.) Spring	Selaginellaceae	B-4
BRYOPHYTES			
370.	*Barbula calycinaSchwägr*	Pottiaceae	B-2,B-4
371.	*Marchantia polymorpha* L.	Marchantiaceae	B-1,B-4
372.	*Riccia beyrichiana* Hampe ex Lehm	Ricciaceae	B-3,B-4
373.	*Trichostomum crispulumBruch*	Pottiaceae	B-2
MUSHROOMS			
374.	*Agaricus bisporous* (J.E.Lange) Emil.J.Imbact	Agaricaceae	B-2
375.	*Agaricus compestris* L.	Agaricaceae	B-4
376.	*Amanita multisquamosa* Peck	Amanitaceae	B-4
377.	*Amylostereum laevigatum* (Fr.) Boidin	Amylostereaceae	B-4
378.	*Dacryopinax spathularia* Schweien & G.W.Martin	Dacrymycetaceae	B-4
379.	*Deconia coprophila*(Bull.) P. Karst.	Strophariaceae	B-4
380.	*Entoloma unicolar* (Perk) Hesler	Entolomataceae	B-4
381.	*Ganoderma lucidum* (Curtis) P. Carst.	Ganotodermaceae	B-4
382.	*Lactarius alnicola* A.H. Smith	Russulaceae	B-4
383.	*Marasmius rotula*(Scop.) Fr.	Marasmiaceae	B-1
384.	*Protostropharia semiglobata* (Batsch) Redhead, Moncalvo & Vilgays	Strophariaceae	B-4
385.	*Psilocybe cubensis* (Earle) Singer	Hymenogastraceae	B-1
386.	*Terana caerulea* (Lam.) Kuntze	Phanerochaetaceae	B-4

387.	*Termitomyces eurrhizus* (Berk & Broome)	Lyophyllaceae	B-4
388.	*Termitomyces heimii* Natarajan	Lyophyllaceae	B-4
389.	*Termitomyces microcarpus* (Berk. & Broome) R. Heim	Lyophyllaceae	B-4
390.	*Xylaria longipes Nitschke*	Xylariaceae	B-4
LICHEN			
391.	*Chrysothrix chlorina*(Ach.) J.R. Laundon	Chrysothricaceae	B-4
392.	*Cryptothecea scripta* G. Thor	Arthoniaceae	B-4
393.	*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: 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	:05/12/2019
Starting time of sampling	:9:35 A.M.
Ending time of sampling	:9:40 A.M.
Sampling and analysis team	: 1. Priti Choudhary, Student 2. Pragyan Sahoo, Stusent 3. Swagat Kumar Mallick, Student 4. Murali Krishna

Sampling site-2	
Water body	: Water purifier
Location	: M.D. building, CUTM, BBSR Campus
Date	:05/12/2019
Starting time of sampling	:10:00 A.M.
Ending time of sampling	:10:10 A.M.
Sampling and analysis team	: 1. Priti Choudhary, Student 2. Pragyan Sahoo, Stusent 3. Swagat Kumar Mallick, Student 4. Murali Krishna

Sampling site-3	
Water body	: Water purifier
Location	: Kautilya building, CUTM, BBSR Campus
Date	:05/12/2019
Starting time of sampling	:10:15 A.M.
Ending time of sampling	:10:22 A.M.
Sampling and analysis team	:1. Priti Choudhary, Student 2. Pragyan Sahoo, Stusent 3. Swagat Kumar Mallick, Student 4. Murali Krishna
Sampling site-4	

Water body	: Water purifier
Location	:Skill building, CUTM, BBSR Campus
Date	:05/12/2019
Starting time of sampling	:2:05 P.M.
Ending time of sampling	:2:08 P.M.
Sampling and analysis team	: 1. Priti Choudhary, Student 2. Pragyan Sahoo, Stusent 3. Swagat Kumar Mallick, Student 4. Murali Krishna

Sampling site-5	
Water body	: Water purifier
Location	: Girls Hostel-1, CUTM, BBSR Campus
Date	:06/12/2019
Starting time of sampling	:2:25 P.M.
Ending time of sampling	:2:29 P.M.
Sampling and analysis team	: 1. Priti Choudhary, Student 2. Pragyan Sahoo, Stusent

Sampling site-6	
Water body	: Water purifier
Location	: Girls Hostel-2, CUTM, BBSR Campus
Date	:06/12/2019
Starting time of sampling	:2:36 P.M.
Ending time of sampling	:2:48 P.M.
Sampling and analysis team	: 1. Priti Choudhary, Student 2. Pragyan Sahoo, Stusent

Sampling site-7	
Water body	: Water purifier
Location	: Girls Hostel-3, CUTM, BBSR Campus
Date	:06/12/2019

Starting time of sampling	:2:50 P.M.
Ending time of sampling	:2:59 P.M.
Sampling and analysis team	: 11. Priti Choudhary, Student 2. Pragyan Sahoo, Stusent

Sampling site-8	
Water body	: Water purifier
Location	: Boys Hostel-1, CUTM, BBSR Campus
Date	:06/12/2019
Starting time of sampling	:2:30 P.M.
Ending time of sampling	:2:35 P.M.
Sampling and analysis team	: 1. Swagat Kumar Mallick, Student 2. Murali Krishna

Sampling site-9	
Water body	: Water purifier
Location	: Boys Hostel-2, CUTM, BBSR Campus
Date	:06/12/2019
Starting time of sampling	:2:40 P.M.
Ending time of sampling	:2:48 P .M.
Sampling and analysis team	: 1. Swagat Kumar Mallick, Student 2. Murali Krishna

Sampling site-10	
Water body	: Water purifier
Location	: Boys Hostel-3, CUTM, BBSR Campus
Date	:06/12/2019
Starting time of sampling	:2:57 P.M.
Ending time of sampling	:2:59 P.M.
Sampling and analysis team	:1. Swagat Kumar Mallick, Student 2. Murali Krishna, Student

Sampling site-11	
Water body	: Water purifier
Location	: Boys Hostel-4, CUTM, BBSR Campus
Date	:06/12/2019
Starting time of sampling	:03:11 P.M.
Ending time of sampling	:03:14 P.M.
Sampling and analysis team	:1. Swagat Kumar Mallick, Student 2. Murali Krishna

Sampling site-12	
Water body	: Water purifier
Location	: Boys Hostel-5, CUTM, BBSR Campus
Date	:06/12/2019
Starting time of sampling	:3:23 P.M.
Ending time of sampling	:3:25 P.M.
Sampling and analysis team	:1. Swagat Kumar Mallick, Student 2. Murali Krishna

Sampling site-13	
Water body	: Water purifier
Location	: Boys Hostel-6, CUTM, BBSR Campus
Date	:06/12/2019
Starting time of sampling	:3:45 P.M.
Ending time of sampling	:3:48 P.M.
Sampling and analysis team	: 1. Swagat Kumar Mallick, Student 2. Murali Krishna

Sampling site-14	
Water body	: Water purifier

Location	: Staff quarter, CUTM, BBSR Campus
Date	:09/12/2019
Starting time of sampling	:2:06 P.M.
Ending time of sampling	:2:08 P.M.
Sampling and analysis team	: 1. Priti Choudhary, Student 2. Pragyan Sahoo, Stusent 3. Swagat Kumar Mallick, Student 4. Murali Krishna

Sampling site-15	
Water body	: Water purifier
Location	: Boys hostel canteen, CUTM, BBSR Campus
Date	:09/12/2019
Starting time of sampling	:2:47 P.M.
Ending time of sampling	:2:49 P.M.
Sampling and analysis team	: 1. Priti Choudhary, Student 2. Pragyan Sahoo, Stusent 3. Swagat Kumar Mallick, Student 4. Murali Krishna

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	6.7	6.7	6.5
2	Electrical conductivity	mho/cm	2.25	0.244	0.298	0.136
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	%		99.608	99.815	99.654

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	6.8	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-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	6.5	6.7	6.4
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

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	6.6	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-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	6.7
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

CONCLUSSION

After summarizing the results of tests conducted in 2019 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

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

PHOTOGRAPH SHOWING WASTE MANAGEMENT

REPORT OF
ENVIRONMENTAL AUDIT
OF CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, BBSR CAMPUS, ODISHA (2018-19)

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 aquestionnaire. With the help of student volunteers and faculties of respective departmrnts the major partof 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

Atia Arzoo

Dr. Atia Arzoo

RMishra.

Dr.Rukmini Mishra

Dr. Yashaswi Nayak

Dr. Sagarika Parida

Gyanranjan Mahalik

Dr. Gyanranjan Mahalik

S P Parida

Dr. Siba Prasad Parida

SCHOOL OF APPLIED SCIENCES ★ CUTM ★ CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT

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.

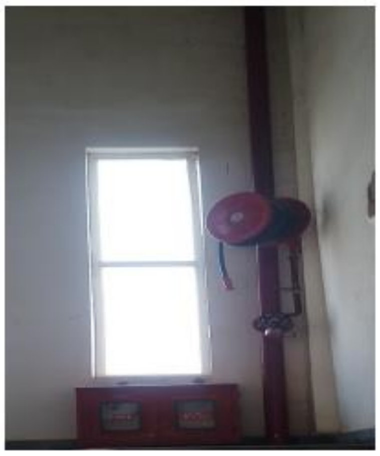
g. Waste management: Land filling is the general waste management strategy adopted by the University and there is no management plan for managing inorganic waste, especially plastics. So polythene use has been banned completely. Biogas plants for effectively managing organic wastes are established in 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	G	√	NA	√	√	√	G
5	Skill Building-2	cs	G	√	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	LED Bulb	5	12	8	480	960	480	175200
2	LED Bulb	9	287	8	20664	41328	20664	7542360
3	LED Bulb	12	10	8	960	1920	960	350400
4	LED Bulb	18	133	8	19152	38304	19152	6990480
5	LED Bulb	50	1	8	400	800	400	146000
6	Flood light	50	3	3	450	900	450	164250
7	Flood light	100	5	3	1500	3000	1500	547500
8	Flood light	200	8	3	4800	9600	4800	1752000
9	Celling light	12	77	8	7392	14784	7392	2698080
10	Celling light	36	79	8	22752	45504	22752	8304480
11	Street light	45	14	12	7560	15120	7560	2759400
12	LED Tubelight	18	576	12	124416	248832	124416	45411840
13	LED Tubelight	20	33	12	7920	15840	7920	2890800
					218446	**436892**	**218446**	**79732790**
Total unit saved= 79732 **Rate per unit = 6.00** **Total amount saved = 478392**								

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.	*Artocarpus heterophyllus* Lam.	Moraceae	B-2
11.	*Averrhoa carambola* L.	Averrhoaceae	B-2
12.	*Azadirachta indica* A. Juss.	Meliaceae	B-2, B-3, B-4
13.	*Bauhinia acuminata* L.	Caesalpiniaceae	B-2
14.	*Bauhinia variegata* L.	Caesalpiniaceae	B-2
15.	*Bixa orellana* L.	Bixaceae	B-2
16.	*Borassus flabellifer* L.	Arecaceae	B-2
17.	*Brya ebenus* (L.) DC.	Fabaceae	B-2
18.	*Cinammomum tamala* (Buch.-Ham.) T.Nees&C.H. Eberm.	Lauraceae	B-2
19.	*Cinammomum verum* J.Presl	Laurace ae	B-2
20.	*Cocos nucifera* L.	Arecaceae	B-1, B-2
21.	*Coffea arabica* L.	Rubiaceae	B-2
22.	*Commiphora wightii* (Arn.) Bhandari	Burseraceae	B-2
23.	*Couroupita guianensis* Aubl.	Lecythidaceae	B-2

24.	*Crataeva magna* (Lour.) DC	Capparaceae	B-2
25.	*Delonix regia* (Boj. ex Hook.) Raf.	Caesalpiniaceae	B-2, B-4
26	*Dillenia indica* L.	Dilleniaceae	B-2,
27.	*Diospyros melanoxylon* Roxb.	Ebenaceae	B-2
28.	*Elaeis guineensis* Jacq.	Arecaceae	B-4
29.	*Eucalyptus citrodora* Hook.	Myrtaceae	B-2
30.	*Ficus benghalensis* L. var.*benghalensis*	Moraceae	B-2, B-4
31.	*Ficus elastica* L.	Moraceae	B-2
32.	*Ficus racemosa* L.	Moraceae	B-4
33.	*Ficus religiosa* L.	Moraceae	B-2, B-4
34.	*Gliricidia sepium*(Jacq.) Walp.	Fabaceae	B-2
35.	*Gardenia gummifera* L.f.	Rubiaceae	B-2
36.	*Gmelina arborea* Roxb.	Verbenaceae	B-3
37.	*Haldina cordifolia* (Roxb.) Ridsale	Rubiaceae	B-2
38.	*Helictres isora* L.	Sterculiaceae	B-4
39.	*Hibiscus tiliaceus* L.	Malvaceae	B-2
40.	*Hylandia dockrillii*Airy Shaw	Euphorbiaceae	B-2
41.	*Lagerstroemia speciosa* (L.) Pers.	Lythraceae	B-1, B-2
42.	*Lannea coromandelica*(Houtt.) Merr.	Anacardiaceae	B-2
43.	*Leucaena leucocephala* (Lam.) de Wit	Fabaceae	B-2, B-3
44.	*Licuala peltata Rooxb*.ex Buch.-Ham.	Arecaceae	B-2
45.	*Limonia acidissima* L.	Rutaceae	B-2
46.	*Livistona chinensis* (Jacq.) R.Br.ex Mart.	Arecaceae	B-2
47.	*Macarnga peltata* (Roxb.)Muell-Arg.	Euphorbiaceae	B-2
48.	*Magnolia champaca*(L.) Baill. ex Pierre	Magnoliaceae	B-2
49.	*Mangifera indica* L.	Anacardiaceae	B-1, B-2, B-3,B-4
50.	*Manilkara zapota*(L.) P.Royen	Sapotaceae	B-1
51.	*Melaleuca citrine* (Curtis) Dum.Cours.	Lythraceae	B-2
52.	*Mesua ferea* L.	Clusiaceae	B-2
53.	*Millettia pinnata* (L.) Panigrahi	Fabaceae	B-2,B-3
54.	*Millingtonia hortensis* L.f.	Bignoniaceae	B-2
55.	*Mimusops elengi* L.	Sapotaceae	B-2, B-3
56.	*Mitragyna parviflora* (Roxb.) Korth	Rubiaceae	B-3
57.	*Morinda pubescens* Sm.	Rubiaceae	B-2, B-3
58.	*Moringa oleifera* Lam.	Moringaceae	B-2
59.	*Muntingia calabura* L.	Muntingiaceae	B-1, B-2
60.	*Murraya koengii* (L.) Sprenge	Rutaceae	B-2
61.	*Murraya paniculata*(L.) Jack	Rutaceae	B-1,B-2,B-3
62.	*Neolamarckia cadamba* (Roxb.) Bosser	Rubiaceae	B-1,B-2
63.	*Nyctanthes arbor-tristis* L.	Oleaceae	B-1, B-2, B-3,B-4
64.	*Olea europaea* L.	Oleaceae	B-2
65.	*Peltophorum pterocarpum* (DC.) K.Heyne	Caesalpiniaceae	B-2, B-4
66.	*Phoenix sylvestris* (L.) Roxb	Arecaceae	B-3
67.	*Phyllanthus acidus* (L.) Skeels	Euphorbiaceae	B-2
68.	*Phyllanthus emblica* L.	Euphorbiaceae	B-2

69.	*Pimenta dioica* (L.)Merr.	Myrtaceae	B-2
70.	*Plumeria obtuse* L.	Apocynaceae	B-4
71.	*Plumeria rubra* L.	Apocynaceae	B-1, B-2, B-3,B-4
72.	*Polyalthia longifolia* Sonn.	Annonaceae	B-1, B-2, B-3,B-4
73.	*Polyalthia suberosa* (Roxb.) Thwaites	Annonaceae	B-1
74.	*Prosopis cineraria* (L.) Druce	Mimosaceae	B-2
75.	*Psidium guajava* L.	Myrtaceae	B-1, B-2
76.	*Pterocarpus santalinus* L.f.	Fabaceae	B-2
77.	*Pterospermum acerifolium* (L.) Willd.	Sterculiaceae	B-2
78.	*Punica granatum* L.	Punicaceae	B-2
79.	*Ravenala madagascariensis* Sonn.	Strelitziaceae	B-2
80.	*Roystonea regia* (Kunth) O.F.Cook	Arecaceae	B-1, B-2
81.	*Sambucus canadensis* L.	Adoxaceae	B-2
82.	*Santalum album* L.	Santalaceae	B-2
83.	*Saraca asoca* (Roxb.) Willd.	Caesalpiniaceae	B-2
84.	*Senna auricualata* (L.) Roxb.	Caesalpiniaceae	B-2
85.	*Senna siamea* (Lam.) H.S. Irwin & Barneby	Caesalpiniaceae	B-2
86.	*Sesbania grandiflora* (L.) Poiret	Fabaceae	B-4
87.	*Simarouba glauca* DC.	Simaroubaceae	B-2, B-4
88.	*Spathodea campanulata* P. Beauv.	Bignoniaceae	B-2
89.	*Spondias pinnata* (L.f.) Kurz	Anacardiaceae	B-2
90.	*Streblus asper* Lour.	Moraceae	B-2
91.	*Syzygium caryophyllifolium* (Lam.) DC.	Myrtaceae	B-1, B-2
92.	*Syzygium cumini*(L.)Skeels	Myrtaceae	B-2
93.	*Syzygium jambos* (L.) Alston	Myrtaceae	B-2
94.	*Syzygium samarhagense* (Bl.) Merr. &Perr.	Myrtaceae	B-2
95.	*Tamarindus indica* L.	Caesalpiniaceae	B-2
96.	*Tectona grandis* L.f.	Verbenaceae	B-2
97.	*Thespesia populnea* (L.) Sol. ex Corrêa	Malvaceae	B-4
98.	*Terminalia arjuna* (Roxb.) Wight & Arn.	Combretaceae	B-1
99.	*Terminalia bellerica* (Gaertn.) Roxb.	Combretaceae	B-1
100.	*Terminalia catappa* L.	Combretaceae	B-2
101.	*Terminalia chebula* Retz.	Combretaceae	B-1
102.	*Ziziphus mauritiana* Lam.	Rhamnaceae	B-1, B-2, B-3,B-4
SHRUB			
103.	*Acalypha wilkesiana* Mull.	Euphorbiaceae	B-2
104.	*Adenium obesum* (Forssk.) Roem. & Schult	Apocynaceae	B-2
105.	*Agave Americana* L.	Agavaceae	B-2
106.	*Agave salmiana* Otto ex Salm-Dyck	Asparagaceae	B-2
107.	*Allamanda schottii* Hook.	Apocynaceae	B-2
108.	*Arachnothryx leucophylla* (Kunth) Planch	Rubiacceae	B-2
109.	*Aucuba japonica* Thunb.	Garryaceae	B-2
110.	*Bougainvillea spectabilis* Willd.	Nyctaginaceae	B-2

111.	*Caesalpinia pulcherrima* (L.) Sw.	Caesalpiniaceae	B-2
112.	*Cajanus cajan* (L.)Millsp.	Fabaceae	B-4
113.	*Calliandra haematocephala* Hassk.	Mimosaceae	B-3
114.	*Calotropis gigantea* (Ait.) R.Br	Asclepiadaceae	B-1, B-2, B-3,B-4
115.	*Carica papaya* L.	Caricaceae	B-2, B-3
116.	*Carissa spinarum* L.	Apocynaceae	B-3
117.	*Cascabela thevetia* (L.)Lippold	Apocynaceae	B-2
118.	*Cestrum nocturnum* L.	Solanaceae	B-2
119.	*Chromolaena odorata* (L.) R. King & H. Robins	Asteraceae	B-1, B-2, B-3,B-4
120.	*Citrus aurantifolia* (Christm.) Swingle	Rutaceae	B-2
121.	*Citrus grandis*(L.) Osbeck	Rutaceae	B-2
122.	*Clerodendrum indicum* (L.) Kuntze	Verbenaceae	B-2
123.	*Clerodendrum inerme* (L.) Gaertn.	Verbenaceae	B-2,B-4
124.	*Clerodendrum viscosum* Vent.	Verbenaceae	B-2,B-4
125.	*Codiaeum variegatum* (L.) Juss. A.Rich.	Euphorbiaceae	B-2
126.	*Coprosma repens*	Rubiaceae	B-2
127.	*Cordyline fruticose* (L.) A.Chev. (L.)Nees.	Agavaceae	B-2
128.	*Crossandra infundibuliformis*	Acanthaceae	B-2
129.	*Crotalaria spectabilis* Roth	Fabaceae	B-2
130	*Cryptostegia grandiflora* R.Br.	Apocynaceae	B-1
131.	*Cuphea hyssopifolia* Kunth	Lythraceae	B-2
132.	*Desmodium pulchellum* (L.)Benth.	Fabaceae	B-4
133.	*Dracaena marginate* Lam. 'tricolor'	Agavaceae	B-2
134.	*Dracena reflexa* Lam.	Agavaceae	B-2
135.	*Dracaena sanderiana* Mast.	Asparagaceae	B-2
136.	*Duranta repens* L.	Verbenaceae	B-2
137.	*Dypsis lutescens* (H.Wendl.) Beentje & J.Dransf	Arecaceae	B-2
138.	*Euphorbia milii* Des Moul.	Euphorbiaceae	B-2
139.	*Euphorbia pulcherrima* Willd. ex Klotzsch	Euphorbiaceae	B-2
140.	*Euphorbia tithymiloides* L.	Euphorbiaceae	B-2
141.	*Fargesia stricta* Hsueh & C. M. Hui, Bull.	Poaceae	B-2
142.	*Flacourtia jangomas* (Lour.)Raeusch.	Salicaceae	B-4
143.	*Gardenia carinata* Wall. ex Roxb.	Rubiaceae	B-1
144.	*Gardenia jasminoides* J.Ellis	Rubiaceae	B-2
145.	*Glycosmis pentaphylla* (Retz.) DC.	Rutaceae	B-1,B-4
146.	*Graptophyllum pictum* (L.) Griff.	Acanthaceae	B-2
147.	*Hamelia patens* Jacq.	Rubiaceae	B-2
148.	*Hibiscus mutabilis* L.	Malvaceae	B-1
149.	*Hibiscus rosa-sinensis* L.	Malvaceae	B-1
150.	*Hibiscus schizopetalus* (Mast.)Hook.f.	Malvaceae	B-1, B-2
151.	*Hypoestes phyllostachya* Baker	Acanthaceae	B-2
152.	*Impatiens glandulifera* Royle	Balsaminaceae	B-2
153.	*Ipomoea carnea* Jacq.	Convolvulaceae	B-1,B-4
154.	*Ixora coccinea* L.	Rubiaceae	B-2

155.	*Jasminum auriculatum* Vahl	Oleaceae	B-2
156.	*Jasminum sambac* (L.) Ait.	Oleaceae	B-2
157.	*Jatropha gossypifolia* L.	Euphorbiaceae	B-2
158.	*Jatropha integerrima* Jacq.	Euphorbiaceae	B-2
159.	*Justicia adhatoda* L.	Acanthaceae	B-2
160.	*Justicia gendarussa* Brum.f.	Acanthaceae	B-2 , B-4
161.	*Kopsia fruticosa* (Roxb.)A.DC.	apocynaceae	B-2
162.	*Lagerstroemia indica* (L.) Pers.	lythraceae	b-2
163.	*Lantana camara* L. var. aculeata (L.) Mold	verbenaceae	b-2
164.	*Lawsonia inermis* L.	lythraceae	b-2
165.	*Loropetalum chinense* (R.Br.)Oliv. var. chinense	hamamelidaceae	b-2
166.	*Malpighia coccigera* L.	malpighiaceae	B-2
167.	*Malvaviscus arboreus* Cav.	malvaceae	B-2
168.	*Melastoma malbathricum* L.	melastomataceae	B-2
169.	*Mussaenda frondosa* L.	rubiaceae	B-2
170.	*Mussaenda phillipica* A.Rich.	rubiaceae	B-2
171.	*Nerium oleander* L.	apocynaceae	B-2
172.	*Ocimum basilicum* L.	lamiaceae	B-2
173.	*Ocimum gratissimum* L.	lamiaceae	B-2
174.	*Ocimum kilimandscharicum* Guerke	lamiaceae	B-2
175.	*Ocimum sanctum* L.	lamiaceae	B-1, B-2
176.	*Opuntia stricta* (Haw.) Haw. var. dillenii (Ker-Gawl.) Benson	cactaceae	B-2
177.	*Pereskia bleo* (Kunth)DC.	cactaceae	B-2
178.	*Phoenix loureiroi* Kunth	arecaceae	B-2
179.	*Phyllanthus myrtifolius* (Wight)Muller	euphorbiaceae	B-2
180.	*Plumbago auriculata* Lam.	plumbaginaceae	B-2
181.	*Polyscias filicifoliam* (C.Moore ex E.Fourn.) L.H.Bailey	araliaceae	B-2
182.	*Rauvolfia serpentina* (L.) Benth. ex Kurz	apocynaceae	B-2
183.	*Rauvolfia tetraphylla* L.	apocynaceae	B-2
184.	*Rhapis excelsa* (Thunb.) A. Henry	arecaceae	B-2
185.	*Riccinus communis* L.	euphorbiaceae	B-2
186.	*Rosa alba* L.	rosaceae	B-2
187.	*Rosa centifolia* L	rosaceae	B-2
188.	*Rosa chinenesis* Jacquin	rosaceae	B-2
189.	*Rosa damascina* Miller	rosaceae	B-2
190.	*Rosa fortuneana* Lindley	rosaceae	B-2
191.	*Rosa gallica* L.var.complicata	rosaceae	B-2
192.	*Rosa gallica* var. officinalis	rosaceae	B-2
193.	*Rosa indica* L.	rosaceae	B-2
194.	*Rosa odorata* (Andr.)Sweet var. odorata	rosaceae	B-2
195.	*Sauropus androgynus* (L.) Merr.	euphorbiaceae	B-2
196.	*Solanum torvum* Sw.	solanaceae	B-2, B-4
197.	*Sterblus taxoides* (Roth)Kurz	Moraceae	B-2

198.	*Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schult.cv.plena	apocynaceae	B-2
199.	*Tecoma stans* (L.) Kunth.	bignoniaceae	B-1, B-2
200.	*Thunbergia erecta* (Benth.)T.Anderson	acanthaceae	B-1, B-2
201.	*Vitex negundo* L.	verbenaceae	B-2
202.	*Wrightia antidysenterica* (L.)R.Br.	apocynaceae	B-2
203.	*Ziziphus oenoplia* (L.) Mill.	rhamnaceae	B-4
	HERB		
204.	*Abelmoschus esculentus* (L.) Moench	Malvaceae	B-1, B-2
205.	*Abelmoschus manihot* (L.) Medic subsp. tetraphyllus	malvaceae	B-4
206.	*Abelmoschus moschatus* Medic.	malvaceae	B-1, B-4
207.	*Abutilon indicum* (L.) Sweet	malvaceae	B-1, B-2, B-3,B-4
208.	*Acalypha indica* L.	euphorbiaceae	B-1, B-2, B-3,B-44
209.	*Achyranthes aspera* L.	amaranthacea	B-1.B-2,B-3,B-4
210.	*Acorus calamus* L.	araceae	B-2
211.	*Aerva javanica* (Burm.f.) Shult.	amaranthacea	B-4
212.	*Aerva lanata* (L.) Juss.ex Schultes.	amaranthacea	B-1.B-2,B-3,B-4
213.	*Aerva sanguinolenta* (L.) BI.	amaranthacea	B-2
214.	*Aeschynomene aspera* L.	fabaceae	B-3,B-4
215.	*Aeschynomene indica* L.	fabaceae	B-1,B-4
216.	*Ageratum conyzoides* L.	asteraceae	B-1,B-2,B-3,B-4
217.	*Allmania nodiflora* (L.) R.Br. ex Wt.	amaranthacea	B-1,B-3,B-4
218.	*Alocasta macrorrhizos* (L.) G.Don	araceae	B-4
219.	*Aloe vera* (L.) Burm.f.	liliaceae	B-1,B-2
220.	*Alpinia galanga* (L.) Willd.	zingiberaceae	B-2
221.	*Alpinia nutans* K.Schum.	zingiberaceae	B-2
222.	*Alpinia purpurata* K.Schum.	zingiberaceae	B-2
223.	*Alternanthera bettzickiana* (Regel) G. Nicholson	amaranthacea	B-2
224.	*Alternanthera paronychioides* St.	amaranthacea	B-1,B-2,B-3,B-4
225.	*Alternanthera philoxeroides* (C. Martius) Grisebach	amaranthacea	B-1,B-2,B-3,B-4
226.	*Alternanthera sessilis* (L.) R.Br. ex DC.	Amaranthacea	B-1,B-2,B-3,B-4
227.	*Alysicarpus vaginalis* (L.) DC. var. nummularifolius Miq.	fabaceae	B-1,B-2,B-3,B-4
228.	*Amaranthus caudatus* L.	amaranthacea	B-2
229.	*Amaranthus spinosus* L	amaranthacea	B-1.B-2,B-3,B-4
230.	*Amaranthus tricolor* L.	amaranthacea	B-1,B-4
231.	*Amaranthus viridis* L.	amaranthacea	B-1,B-2,B-3,B-4
232.	*Ammannia baccifera* L.	lythraceae	B-1.B-2,B-3,B-4
233.	*Ammannia multiflora* Roxb.	lythraceae	B-4
234.	*Ananas comosus* (L.)Merr.	bromeliaceae	B-2
235.	*Andrographis paniculata* (Brum.f.) Wall. ex Nees	acanthaceae	B-1,B-2,B-3,B-4
236.	*Angelonia salicarifolia* Humb.&Bonpl.	scrophulariaceae	B-2
237.	*Anisochilus carnosus* (L.f.) Wall.	lamiaceae	B-1,B-3

238.	*Anisomeles indica* (L.) Kuntze	lamiaceae	B-1, B-4
239.	*Argemone mexicana* L.	papaveraceae	B-1.B-2,B-3,B-4
240.	*Artemisia absinthium* L.	asparaceae	B-2
241.	*Asparagus densiflorus* (Kunth)Jessop	asparaceae	B-2
242.	*Aster indamellus* Griers.	asteraceae	B-2
243.	*Asystasia gangetica* (L.) T. Anderson	acanthaceae	B-2
244.	*Barleria cristata* L.	acanthaceae	B-4
245.	*Barleria prionitis* L.	acanthaceae	B-1,B-3,B-4
246.	*Bassia scoparia* (L.) Schrad.	amaranthacea	B-2
247.	*Biophytum sensitivum* (L.) DC.	oxalidaceae	B-1,B-2,B-3,B-4
248.	*Blepharts maderaspatensis* (L.) Heyne ex Roth	acanthaceae	B-1,B-2,B-3,B-4
249.	*Blumea lacera* (Burm.f.) DC.	asteraceae	B-1.B-2,B-3,B-4
250.	*Boerhavia diffusa* L.	nyctaginaceae	B-1.B-2,B-3,B-4
251.	*Brassica campestris* L.	brassicaceae	B-1,B-2,B-3
252.	*Brassica napus* L var. glauca (Roxb.) Schulz	brassicaceae	B-2
253.	*Brassica oleracea* L. var.capitata	brassicaceae	B-2
254.	*Brassica oleracea* L. var.oleracea	brassicaceae	B-2
255.	*Caladium bicolor* (Aiton) Vent	araceae	B-2
256.	*Canna indica* L.	cannaceae	B-2
257.	*Capsicum annum* L.	solanaceae	B-2
258.	*Catharanthus roseus* (L.) G.Don	apocynaceae	B-1,B-2,B-3,B-4
259.	*Celosia argentea* L.	amaranthacea	B-2
260.	*Celosia cristata* L.	amaranthacea	B-2
261.	*Celosia argentea* var. plumosa	amaranthacea	B-2
262.	*Centella asiatica* (L.) Urban	apiaceae	B-2
263.	*Chamaecostus cuspidatus* (Nees & Mart.) C.Specht & D.W. Stev.	costaceae	B-2
264.	*Chenopodium album* L.	chenopodiaceae	B-4
265.	*Chrozophora rottleri* (Geisel.) Juss.	euphorbiaceae	B-3,B-4
266.	*Chrysanthemum cinerariifolium* (Trev.) Vis.	asteraceae	B-2
267.	*Cleome rutidosperna* DC.	capparaceae	B-1,B-2,B-3,B-4
268.	*Cleome viscosa* L.	capparaceae	B-1,B-2,B-3,B-4
269.	*Coldenia procumbens* L.	boraginaceae	B-1,B-2,B-3,B-4
270.	*Colocasia esculenta* (L.) Schott	araceae	B-4
271.	*Commelina benghalensis* L.	commelinaceae	B-1,B-2,B-3,B-4
272.	*Commelina erecta* L.	commelinaceae	B-1,B-2,B-3,B-4
273.	*Commelina longifolia* Lam.	commelinaceae	B-4
274.	*Commelina paludosa* Blume	commelinaceae	B-3
275.	*Coriandrum sativum* L.	apiaceae	B-2
276.	*Cosmos caudatus* Kunth	asteraceae	B-3,B-4
277.	*Costus speciosus* (Koenig) Sm.	costaceae	B-4
278.	*Crinum astaticum* L.	liliaceae	B-2
279.	*Crotalaria pallida* Ait.	Fabaceae	B-1,3-2,B-3,B4
280.	*Crotalaria prostrata* L	Fabaceae	B-4

281.	*Crotalaria verrucosa* L.	Fabaceae	B-4
282.	*Croton bonplandianus* Baill	Fabaceae	B-1,B-2.B-3.B-4
283.	*Curcuma amada* Roxb.	Zingiberaceae	B-1,B-2,B-3,B-4
284.	*Curcuma longa* L.	Zingiberaceae	B-2
285.	*Curcuma zedoaria* (Christm.)Rose.	Zingiberaceae	B-2
286.	*Cvanotis cristata* (L.) D.Don	Commelinaceae	B-2,B-4
287.	*Cyanotis tuberosa* (Roxb.)Schult.&Schult.f	Commelinaceae	B-2,B-4
288.	*Dentella repens* (L.) J.R. & G. Forst. var. repens	Rubiaceae	B-1,B-2,B-3,B-4
289.	*Desmodium gangeticum* (L.) DC.	Fabaceae	B-2
290.	*Desmodium triflorum* (L.) DC.	Fabaceae	B-1,B-2,B-3,B-4
291.	*Dicliptera bupleuroides* Nees	Acanthaceae	B-1,B-2,B-3,B-4
292.	*Digera muricata* (L.) Mart	Amaranthaceae	B-1,B-2
293.	*Dipteracanthus prostrates* (Poir.) Nees	Acanthaceac	B-1,B-2,B-3,B-4
294.	*Eclipta prostrata* (L.) L.	Asteraceae	B-1,B-2,B-3,B-4
295.	*Emilia sonchifolia* (L.) DC.	Asteraceae	B-1,B-2,B-3,B-4
296.	*Eranthemum capense* L.	Acanthaceae	B-3,B-4
297.	*Eryngium foetidum* L.	Apiaccac	B-1,B-2,B-3,B-4
298.	*Euphorbia heterophylla* L.	Euphorbiaceae	B-3,B-4
299.	*Euphorbia hirta* L.	Euphorbiaceae	B-1,B-2,B-3,B-4
300.	*Euphorbia indica* Lam	Euphorbiaceae	B-2
301.	*Euphorbia rosea* Retz.	Euphorbiaceae	B-1,B-3
302.	*Euphorbia serpens* H.B.K	Euphorbiaceae	B-1, B-4
303.	*Euphorbia thymifolia* L.	Euphorbiaceae	B-1,B-2,B-3,B-4
304.	*Evolvulus alsinoides* (L.) L.	Convolvulaceae	B-1,B-3,B-4
305.	*Evolvulus nummularius* (L.) L.	Convolvulaceae	B-1,B-2,B-3,B-4
306.	*Evovulus sericeus* Sw.	Convolvulaceae	B-3
307.	*Foeniculuem vulgare* L.	Apiaceae	B-2,B-3
308.	*Gaillardia aristata* Pursh	Asteraceae	B-2
309.	*Gaillardia grandiflora* Hort	Asteraceae	B-2
310.	*Glinus oppositifolius* (L.) A.DC.	Molluginaceae	B-1,B-2,B-3,B-4
311.	*Globba marantina* L.	Zingiberaceae	B-2
312.	*Gnaphalium polycaulon* Pers.	Asteraceae	B-1,B-2,B-3,B-4
313.	*Gomphrena celosioides* Mart,	Amaranthaceae	B-1,B-2,B-3,B-4
314.	*Gomphrena globosa* L.	Amaranthaceae	B-2
315.	*Grangea maderaspatana* (L.) Poir.	Asteraceae	B-1,B-2,B-3,B-4
316.	*Hedyotis bracheata* Miq.ex Hook.f.	Rubiaceae	B-1,B-3,B-4
317.	*Hedvotis corymbosa* (L.) lam.	Rubiaceae	B-1,B-2,B-3,B-4
318.	*Hedyotis puberula* (G.Don)Thw.	Rubiaceae	B-3
319.	*Heliconia latispatha* Benth.	Heliconiaceae	B-2
320.	*Heliconia rostrata* Ruiz & Pavon	Heliconiaceae	B-2
321.	*Heliotropium indicum* L.	Boraginaceae	B-1,B-2,B-3,B-4
322.	*Heliotropium strigosum* Willd.	Boraginaceae	B-1,B-4
323.	*Heliotropium supinum* L.	Boraginaceae	B-1,B-4
324.	*Hibiscus canabinus* L	Malvaceae	B-1

325.	*Hippeastrum amaryllis* (L.)Herb.	Amaryllidaceae	B-2
326.	*Hippeastrum reginae* (L.)Herb.	Amaryllidaceae	B-2
327.	*Ilybanthus enneaspermus* (L.) F.y. Muell.	Violaceae	B-1,B-2,B-3,B-4
328.	*Hygrophila auriculata* Schumach.	Acanthaceae	B-1,B-3,B-4
329.	*Hyptis suaveolens* (L.) Poit.	Lamiaccac	B-1,B-2,B-3,B-4
330.	*Impatiens balsamina* L.	Balsaminaceae	B-2
331.	*Indigofera linnaei* Ali	Fabaceae	B-1,B-2,B-3,B-4
332.	*Indoneesiella echioides* (L.) Sreemadh.	Acanthaceae	B-1,B-2,B-3,B-4
333.	*Justicia betonica* L.	Acanthaceae	B-3,B-4
334.	*Justicia japonica* Thunb.	Acanthaccac	B-2,B-3
335.	*Justicia quinqueangularis* Koen. ex Roxb.	Acanthaceae	B-1, B-4
336.	*Kalanchoe blossfeldiana* Poelln.	Crassulaceae	B-2
337.	*Kalanchoe pinnata* (Lam.) Pers.	Crassulaccae	B-2
338.	*Laportea interrupta* (L.) Chew	Urticaceae	B-1,B-2,B-3,B-4
339.	*Leucas aspera* (Willd.) Link	Lamiaceae	B-3,B-4
340.	*Leucas cephalotes (*Roth) Spreng.	Lamiaceae	B-1,B-4
341.	*Leucas indica* (L.) R.Br.cx Vatke	Lamiaceae	B-4
342.	*Lindernia ciliata* (Colsm.)Pennell	Scrophulariaceae	B-1,B-2,B-3,B-4
343.	*Lindshot.onaviyo* uero	Scrophulariaceae	B-1,B-2,B-3,B-4
344.	*Lippia javanica* (Burm.f.)Spreng.	Verbenacea	B-4
345.	*Lobelia alsinoides* Lam.	Lobeliaceae	B-1,B-4
346.	*Lobularia maritima* (L.)Desv.	Brassicaceae	B-3
347.	*Ludwigia perennis* L.	Onagraceae	B-1,B-3,B-4
348.	*Malachra capitata* (L.)L.	Malvaceae	B-3
349.	*Maranta arundinacea* L.	Marantaceae	B-2
350.	*Martynia annua* L.	Martyniaceae	B-4
351.	*Mazus pumilus* (Brum.f.) Steenis	Scrophulariaceae	B-2,B-4
352.	*Mecardonia procumbens* (Mill.) Small	Scrophulariaceae	B-1,B-3,B-4
353.	*Melochia corchorifolia* L.	Sterculiaceae	B-3,B-4
354.	*Mentha arvensis* L.	Lamiaceae	B-2
355.	*Mentha piperita* L.	Lamiaceae	B-2
356.	*Mentha spicata* L.	Lamiaceae	B-2
357.	*Merremia hederacea* (Burm.f.)Hall.f.	Convolvulaceae	B-4
357.	*Microccocca mercurialis* (L.) Benth.	Euphorbiaceae	B-1,B-2,B-3,B-4
358.	*Mimosa pudica* L.	Mimosaceae	B-1,B-2,B-3,B-4
359.	*Mirabilis jalapa* L.	Nyctaginaceae	B-2
360.	*Mitracarpus villosus* (Sw.) DC.	Rubiaceae	B-1,B-2,B-3,B-4
361.	*Mollugo pentaphylla* L.	Molluginaceae	B-1,B-2,B-3,B-4
362.	*Murdannia nodiflora* (L.) Brenan	Commelinaceae	B-1,B-2,B-3,B-4
363.	*Murdannia spirata* (L.) Brueck.	Commelinaceae	B-1,B-3,B-4
364.	*Musa acuminata* var. rubra	Musaccae	B-2
365.	*Musa paradisiaca* L.	Musaceae	B-2
366.	*Ocimum canum* Sims.	Lamiaceae	B-4
367.	*Origanum majorana* L.	Lamiaceae	B-2
368.	*Oxalis corniculata* L.	Oxalidaceae	B-1,B-2,B-3,B-4

369.	*Oxalis debilis* Kunth	Oxalidaceae	B-2
370.	*Oxalis triangularis* A.St.-Hil.	Oxalidaceae	B-2
371.	*Panadnus amarylifolius* Roxb.	Pandanaceae	B-2
372.	*Parthenium hysterophorus* L.	Asteraceae	B-1,B-2,B-3,B-4
373.	*Peperomia pellucida* Kunth	Piperaceae	B-1,B-3,B-4
375.	*Peristrophe paniculata* (Forssk.) Brummitt	Acanthaceae	B-1,B-3,B-4
376.	*Persicaria virginiana* (L.)Gaertn.	Polygonaceae	B-2
377.	*Petunia hybrid* Juss.	Solanaceae	B-2
378.	*Phaulopsis imbricata* (Forssk.) Sw.	Acanthaceae	B-3,B-4
379.	*Phyla nodiflora* (L.) Greene	Verbenaceae	B-4
380.	*Phyllanthus fraternus* Webster	Euphorbiaceae	B-1,B-2,B-3,B-4
381.	*Phyllanthus virgatus* Forst.f	Euphorbiaceae	B-1,B-3,B-4
382.	*Physalis longifolia* Nutt. var *longifolia*	Solanaceae	B-3
383.	*Physalis minima* L.	Solanaceae	B-4
384.	*Pilea microphylla* (L.) Liebm.	Urticaceae	B-1,B-2,B-3,B-4
385.	*Plectranthus amboinicus* (Lour.)Spreng	Lamiaceae	B-2
386.	*Plectranthus barbatus* Andr.	Lamiaceae	B-2
387.	*Plectranthus scutellarioides* (L.) R.Br.	Lamiaceae	B-2
388.	*Plumbago indica* L.	Plumbaginaceae	B-2,B-4
389.	*Polygala arvensis* L.	Polygalaceae	B-3,B-4
390.	*Polygonum barbatum* L.	Polygonaceae	B-3,B-4
391.	*Portulaca oleracea* L. var. oleracea	Portulaceae	B-1,B-2,B-3,B-4
392.	*Portulaca pilosa* L. subsp. grandiflora (Hook.) Geesink	Portulaceae	B-2
393.	*Portulaca quadrifida* L.	Portulaceae	B-1,B-2,B-3,B-4
394.	*Portulaca umbraticola* Kunth	Portulaceae	B-2
395.	*Ruellia brittoniana* Leonard	Acanthaceae	B-2
396.	*Ruellia tuberosa* L.	Acanthaceae	B-1,B-3
397.	*Rungia pectinata* (L.) Nees	Acanthaceae	B-1,B-2,B-3,B-4
398.	*Sansevieria cylindrica* Bojer	Asparagceae	B-2
399.	*Sansevieria roxburghiana* Schult. & Schult.f.	Asparagceae	B-2
400.	*Sansevieria trifasciata* Prain.	Asparagceae	B-2
401.	*Scadoxus multiflorus* (Martyn) Raf.	Amaryllidaceae	B-2
402.	*Scoparia dulcis* L.	Scrophulariaceae	B-1,B-2,B-3,B-4
403.	*Sebastiania chamalea* (L.) Muell.-Arg.	Euphorbiaceae	B-2,B-4
404.	*Senna occidentalis* (L.) Link	Caesalpiniaceae	B-2,B-4
405.	*Sesamum orientale* L.	Pedaliaceae	B-3,B-4
406.	*Sida acuta* Burm.f.	Malvaceae	B-1,B-2,B-3,B-4
407.	*Sida cordata* (Burm.f.) Borssum	Malvaceae	B-1,B-3,B-4
408.	*Sida cordifolia* L.	Malvaceae	B-3,B-4
409.	*Sida rhombifolia* L. subsp. rhombifolia var. rhombifolia	Malvaceae	B-4
410.	*Solanum lycopersicon* L.	Solanaceae	B-2
411.	*Solanum melongena* L.	Solanaceae	B-2
412.	*Solanum nigrum* L.	Solanaceae	B-1,B-2,B-3,B -4

413.	*Solanum tuberosum* L.	Solanaceae	B-2
414.	*Solanum virginianum* L.	Solanaceae	B-4
415.	*Spathiphyllum cochlearispathum* (Liebm.) Engl.	Araceae	B-2
416.	*Spermacoce articularis* L.f.	Rubiaceae	B-1,3-2,B-3,B-4
417.	*Spermacocoe exilis* (L.O.Williams)C.D. Adams	Rubiaceae	B-1,B-2,B-3,B-4
418.	*Sphaeranthus indicus* L.	Asteraceae	B-3,B-4
419.	*Spilanthes calva* DC.	Asteraceae	B-3,B-4
420.	*Spilanthes paniculata* Wall. ex DC.	Asteraceae	B-1,B-2.B-3,B-4
421.	*Synedrella nodiflora* (L.) Gaertn.	Asteraceae	B-1,B-2.B-3,B-4
422.	*Tagetes patula* L.	Asteraceae	B-2
423.	*Talinum triangulare* (Jacq.) Willd.	Talinaceae	B-2
424.	*Tephrosia purpurea* (L.) Pers. var. purpurea	Fabaceae	B-3,B-4
425.	*Theriophonum minuatum* (Willd.)Bail	Araceae	B-2
426.	*Tithonia diversifolia* (Hemsl)A.Gray	Asteraceae	B-1,B-2
427.	*Tradescantia zebrine* (Schinz)D.R Hunt	Commelinaceae	B-2
428.	*Tribulus terrestris* L.	Zygophyllaceae	B-2,B-4
429.	*Tridax procumbens* L.	Asteraceae	B-1,B-2,B-3,B-4
430.	*Triumfetta pentandra* A.Rich	Sterculiaceae	B-1,B-4
431.	*Triumfetta rhomboidea* Jasq.	Sterculiaceae	B-3,B-4
432.	*Turnera ulmifolia* L.	Turneraceae	B-2
433.	*Uraria picta* (Jacq.)Desv.ex DC.	Fabaceae	B-2
434.	*Urena lobata* L. subsp. sinuata (L.) Borssum var. sinuata	Malvaceae	B-1,B-3,B-4
435.	*Vernonia cinerea* (L.) Less.	Asteraceae	B-1,B-2,B-3,B-4
436.	*Waltheria indica* L. var. indica	Sterculiaceae	B-3,B-4
437.	*Wedelia chinensis* (Osbeck) Merr.	Asteraceae	B-2
438.	*Withania somnifera* (L.)Dunal	Solanaceae	B-2
439.	*Xanthium indicum* Koenig	Asteraceae	B-3,B-4
440.	*Xanthosoma robustum* Schott.	Araceae	B-1
441.	*Zephyranthes candida* (Lindl.)Herb.	Amaryllidaceae	B-2
442.	*Zephyranthes rosea* (Lindl.)	Amaryllidaceae	B-2
443.	*Zinnia elegans* Jack.	Asteraceae	B-2
444.	*Zornia diphylla* (L.) Pers.	Fabaceae	B-3,B-4
445.	*Zornia gibbosa* Spanoghe	Fabaceae	B-3,B-4
HYDROPHYTES			
446.	*Alisma plantago-aquatica* L.	Alismataceae	B-2
447.	*Ceratophyllum demersum* L.	Ceratophyllaccae	B-2
448.	*Eichhornia crassipes* (Mart.) Solms-Laub.	Pontederiaceae	B-4
449.	*Hydrilla verticillata* (L.f.) Royle	Hydrocharitaceae	B-2
450.	*Lemna perpusila* Tor.	Lemnaecae	B-2,B-4
451.	*Monochoria hastata* Solms-Laub.	Pontederiaceae	B-4
452.	*Monochoria vaginalis* (Burm.f.) Presl	Pontederiaceae	B-4
453.	*Nelumbo nucifera* Gaertn.	Nelumbonaceae	B-2

454	*Nuphar pumila* (Timm) DC.	Nymphaeaccae	B-2
455	*Nymphaea mexicana* Zucc.	Nymphaeaccae	B-2
456	*Nymphaea nouchali* Burm.f.	Nymphaeaceae	B-2
457	*Nymphaea pubescens* Willd.	Nymphaeaceae	B-2
458	*Nymphoides hydrophila* (Lour.)Kuntze	Nymphaeaceae	B-2
459	*Nymphoides indica* (L.) Kuntze	Menyanthaceae	B-2
460	*Pistia stratiotes* L.	Araceae	B-4
461	*Potamogeton nodosus* Poir.	Potamogetonaceae	B-2
462	*Spirodela polyrhiza* (L.) Schleiden	Lemnaceae	B-4
463	*Typha angustifolia* L.	Typhaceae	B-2
CLIMBER			
464	*Abrus precatorius* L.	Fabaceae	B-4
465	*Aganosma caryophyllata* (Roxb. ex Sims) G.Don	Apocynaceae	B-2
466	*Allamanda blanchetti* A.DC.	Apocynaceae	B-2
467	*Antigonon leptopus* Hook. & Arn.	Polygonaceae	B-4
468	*Argeyria nervosa* (Burm.f.) Bojer	Convolvulaceae	B-2
469	*Artabotrys hexapetalus* (L.f) Bandari	Annonaceae	B-2
470	*Asparagus racemosus* Willd.	Asparagaceae	B-2
471	*Atylosia scarabaeoides* (L.) Benth.	Fabaceae	B-3, B-4
472	*Basella alba* L.	Basellaceae	B-2
473	*Campsis radicans* Seem.	Bignoniaceae	B-2
474	*Cayratia pedata* Wall.) Gagnep.	Vitaceae	B-3, B-4
475	*Cayratia trifolia* (L.) Domin	Vitaceae	B-1,B-3,B-4
476	*Cissampelos pareira* L.	Menispermaceae	B-2
477	*Cissus quadrangularis* L.	Vitaceae	B-2
478	*Clerodendrum splendens* G.DoN	Verbenaceae	B-2
479	*Clerodendrum thomsoniae* Balf.	Verbenaceae	B-2
480	*Clitoria ternatea* L.	Fabaceac	B-2
481	*Coccinia grandis* (L.) Voigt	Cucurbitaceae	B-3,B-4
482	*Cocculus hirsutus* (L.) Diels	Cucurbitaceae	B-3,B-4
483	*Cucumis melo* L.	Cucurbitaceae	B-2
482	*Cucumis sativus* L.	Cucurbitaceae	B-2
483	*Cucurbita maxima* Duchesne	Cucurbitaceae	B-2
484	*Cuscuta reflexa* Roxb.	Cuscutaceae	B-4
485	*Dioscorea alata* L.	Dioscoreaceae	B-2
486	*Diplocyclos palmatus* (L.) C.Jeffrey	Cucurbitaceae	B-4
487	*Epipremnum aureum* (Linden & André) G.S.Bunting	Araceae	B-2
488	*Ficus pumila* L.	Moraceae	B-2
489	*Gymnema sylvestre* R.Br.	Asclepidaceae	B-2
490	*Hemidesmus indicus* (L.) R.Br. var. indicus	Periplocaceae	B-2,B-3,B-4
491	*Ichnocarpus frutescens* (L.) W.T.Aiton	Apocynaceae	B-2
492	*Ipomoea obscura* Ker.-Gawl.	Convolvulaceae	B-4
493	*Ipomoea pes-tigridis* L.	Convolvulaceae	B-1,B-4

494	*Ipomoea quamoclit* L.	Convolvulaceae	B-3
495	*Ipomoea sepiaria* Koenig ex Roxb.	Convolvulaceae	B-3,B-4
496	*Luffa acutangular* (L.) Roxb.	Cucurbitaceae	B-2
497	*Luffa aegyptiaca* Mill.	Cucurbitaceae	B-4
498	*Mansoa alliacea* Gentry	Bignoniaceae	B-2
499	*Merremia tridentata* (L.) Hall.f. subsp. hastata (Hall.f.) Ooststr.	Convolvulaceae	B-3
500	*Mikania micrantha* Kunth	Asteraceae	B-1,B-3,B-4
501	*Momordica charantia* L.	Cucurbitaceae	B-2
502	*Momordica dioica* Roxb. ex Willd M.Roem.	Cucurbitaceae	B-2
503	*Mukia maderaspatana* (L.)	Cucurbitaceae	B-2
504	*Operculina turpethum* (L.) Silva Manso	Convolvulaceae	B-2
505	*Paederia foetida* L.	Rubiaceae	B-2
506	*Passiflora foetida* L.	Passifloraceae	B-2,B-3
507	*Passiflora incarnata* L	Passifloraceae	B-2
508	*Passiflora vitifolia* Kunth	Passifloraceae	B-2
509	*Pentalinon lutcum* (L.) B.F.Hansen & Wunderlin	Apocynaceae	B-2
510	*Pergularia daemia* (Forssk.) Chiov.	Asclepidaceae	B-4
511	*Petrea volubilis* L.	Verbenaceae	B-2
512	*Philodendron scandens* K. Koch & Sello	Araceae	B-2
513	*Piper betel* L	Piperaceae	B-2
514	*Piper longum* L.	Piperaceae	B-2
515	*Podranea ricasoliana* (Tanf.) Sprague	Bignoniaceae	B-2
516	*Pyrostegia venusta* (Ker.Gawl.)Miers	Bignoniaceae	B-2
517	*Quisqualis indica* L.	Combretaceac	B-2
518	*Rhaphidophora decisirva* (Roxb.) Schott	Araceae	B-2
519	*Stephania japonica* (Thunb.) Miers	Menispermaceae	B-3
520	*Syngonium podophyllum* Schott	Araceae	B-2
521	*Thunbergia fragrans* Roxb.	Acanthaceae	B-1,B-2
522	*Thunbergia grandiflora* (Roxb.ex Rottl.)Roxb.	Acanthaceae	B-2
523	*Tinospora cordifolia* (Thunb.) Miers	Menispermaceae	B-2
524	*Trichosanthes cucumerina* L.	Cucurbitaceae	B-2
525	*Trichosanthes dioica* Roxb.	Cucurbitaceae	B-2
526	*Trichosanthes tricuspidata* Lour.	Cucurbitaceae	B-4
527	*Tylophora indica* (Burm.f.) Merr.	Asclepiadaceae	B-2
528	*Typhonium trilobatum* (L.) Schott	Araceae	B-2
529	*Vernonia elliptica* DC.	Asteraceae	B-1,B-2
530	*Vitis vinifera* L.	Vitaceae	B-2
EPIPHYTES			
531	*Vanda tesselata (*Roxb.) Hook.cx G.Don	Orchidaceae	B-2
532	*Dendrobium ursula* Strenge	Orchidaceae	B-2
GRASS			
533	*Aristida setacea* Rctz.	Poaceae	B-1,B-2,B-3,B -4
534	*Bambusa arundinacea* (Retz.) Willd.	Poaceae	B-2

535	*Bambusa vulgaris* Schrad. Ex J.C.Wendl.	Poaceae	B-2
536	*Bothriochloa pertusa* (L.) A. Camus	Poaceae	B-1,B-2,B-3,B -4
537	*Brachiaria distachya* (L.) Stapf	Poaceae	B-1,B-2,B-3,B -4
538	*Brachiaria mutica* (Forssk.) Stapf	Poaceae	B-4
539	*Brachiaria ramosa* (L.) Stapf	Poaceae	B-1,B-3,B -4
540	*Chloris barbata* Sw.	Poaceae	B-1,B-2,B-3,B -4
541	*Chrysopogon aciculatus* (Retz.) Trin.	Poaceae	B-1,B -4
542	*Cynodon dactylon* (L.) Pers.	Poaceae	B-1,B-2,B-3,B -4
543	*Cyperus brevifolius* (Rottb.) Hassk.	Cyperaceae	B-1,B -4
544	*Cyperus compactus* Retz.	Cyperaceae	B-4
545	*Cyperus difformis* L.	Cyperaceae	B-1,B-3,B -4
546	*Cyperus halpan* L.	Cyperaceae	B-1,B-3
547	*Cyperus imbricatus* Retz.	Cyperaceae	B-4
548	*Cyperus iria* L.	Cyperaceae	B-1,B-4
549	*Cyperus kyllingia* Endl.	Cyperaceae	B-1,B-3,B -4
550	*Cyperus paniceus* (Rottb.) Boeck.	Cyperaceae	B-4
551	*Cyperus pygmaeus* Rotth.	Cyperaceae	B-4
552	*Cyperus rotundus* L. var. rotundus Kem.	Cyperaceae	B-1,B-2,B-3
553	*Cyperus triceps* Endl.	Cyperaceae	B-4
554	*Dactyloctenium aegypticum* (L.) P.Beauv.	Poaceae	B-1,B-2,B-3,B -4
555	*Digitaria abludens* (Roem. & Schult.) Veldk.	Poaceae	B-3
556	*Digitaria ciliaris* (Retz.) Koeler	Poaceae	B-1,B-2,B-3,B -4
557	*Echinochloa colona* (L.) Link	Poaceae	B-1,B-2,B-3,B -4
558	*Eleusine indica (*L.) Gaertn.	Poaceae	B-1,B-2,B-3,B -4
559	*Elusine coracana* (L.)Gaertn	Poaceae	B-2
560	*Eragrostis ciliaris* (L.) R.Br.	Poaceae	B-3
561	*Eragrostis ciliata* Roxb. Nees	Poaceae	B-1,B-2,B-3,B -4
562	*Eragrostis unioloides* (Retz.) Nees ex Steud.	Poaceae	B-1,B-2,B-3,B -4
563	*Eriochloa procera* (Retz.) Hubbard	Poaceae	B-1,B-2,B-3,B -4
564	*Paspalum scrobiculatum* L.	Poaceae	B-2,B-3
565	*Paspalum vaginatum* Sw.	Poaceae	B-1,B-3
567	*Pennisetum pedicellatum* Trin.	Poaceae	B-1,B-3,B -4
568	*Pennisetum purpureum* Schumach	Poaceae	B-3, B-4
569	*Perotis indica* (L.) Kuntz	Poaceae	B-3,B-4
570	*Pogonantherum crinitum* (Thunb.) Kunth	Poaceae	B-2
571	*Sachharum officinarum* L.	Poaceae	B-2
572	*Setaria pumila* (Poir.) Roem. & Schult.	Poaceae	B-1,B-3,B -4
573	*Setaria verticillata (*L.) P.Beauv.	Poaceae	B-1,B -4
574	*Sorghum vulgare* L.	Poaceae	B-2
575	*Zea mays* L.	Poaceae	B-2
	GYMNOSPERM		
576	*Araucaria columnaris* (Forst.f.) Hook.	Araucariaceae	B-2
577	*Cycas revoluta* Thunb.	Cycadaceae	B-2
578	*Juniperus communis* L.	Cupressaceae	B-2

579	*Pinus roxburghii* Sargent	Pinaceae	B-2
580	*Podocarpus nerefolius* D.Don	Podocarpaceae	B-2
581	*Platycladus orientalis* (L.) Franco	Cupressaceae	B-2
PTERIDOPHYTES			
582	*Adiantum incisum* Forssk.	Adiantaceae	B-4
583	*Adiantum phillipense* L.	Adiantaceae	B-1,B-2,B-3,B-4
584	*Ampelopteris prolifera* (Retz.) Copel.	Thelypteridaceae	B-2,B-4
585	*Azolla microphylla* Kaulf	Azollaceae	B-4
586	*Ceratopteris thalictroides* (L.) Brongn	Ceratopteridaceae	B-4
587	*Dryopteris cochleata* (D.Don) C.Chr.	Dryopteridaceae	B-2,B-4
588	*Marsilea minuta* L.	Marseliaceae	B-4
589	*Marsilea quadrifolia* L.	Marseliaceae	B-4
590	*Nephrolepis exaltata* (L.) Schott	Nephrolepidaceae	B-2
591	*Phymatosorus membranifolius* (R.Br.)S.G. Lu	Polypodiaceae	B-2
592	*Pteris vittata L.*	Pteridaceae	B-1,B-2,B-3,B-4
593	*Salvinia cuculata Roxb.*	Salviniaceae	B-4
594	*Salvinia molesta D.S. Mitch*	Salviniaceae	B-4
595	*Selaginella ciliaris(Retz.) Spring*	Selaginellaceae	B-4
BRYOPHYTES			
596	*Barbula calycina* Schwägr	Pottiaceae	B-2,B-4
597	*Marchantia polymorpha* L.	Marchantiaceae	B-1,B-4
598	*Riccia beyrichiana* Hampe ex Lehm	Ricciaceae	B-3,B-4
599	*Trichostomum crispulum* Bruch	Pottiaceae	B-2
MUSHROOMS			
600	*Agaricus bisporous* (J.E.Lange) Emil.J.Imbact	Agaricaceae	B-2
601	*Agaricus compestris* L.	Agaricaceae	B-4
602	*Amanita multisquamosa* Peck	Amanitaceae	B-4
603	*Amylostereum laevigatum* (Fr.) Boidin	Amylostereaceae	B-4
604	*Bulgaria inquinans* (Pers.) Fr	Bulgariaceae	B-4
605	*Byssomerulius corium* (Pers.) Parmasto	Irpicaceae	B-4
606	*Chaetoderma luna* (Romell ex D.P. Rogers & H.S. Jacks.) Parmasto	Stereaceae	B-4
607	*Clavaria aurea* Schaeff.	Clavariaceae	B-4
608	*Crinipellis scabella* (Alb. & Schwein.) Murrill	Marasmiaceae	B-4
609	*Dacryopinax spathularia* Schweien & G.W.Martin	Dacrymycetaceae	B-4
610	*Deconia coprophila*(Bull.) P. Karst.	Strophariaceae	B-4
611	*Entoloma unicolar* (Perk) Hesler	Entolomataceae	B-4
612	*Ganoderma lucidum* (Curtis) P. Carst.	Ganotodermaceae	B-4
613	*Lactarius alnicola* A.H. Smith	Russulaceae	B-4
614	*Marasmius rotula* (Scop.) Fr.	Marasmiaceae	B-1
615	*Protostropharia semiglobata* (Batsch) Redhead, Moncalvo & Vilgays	Strophariaceae	B-4
616	*Psilocybe cubensis (*Earle) Singer	Hymenogastraceae	B-1

617	*Terana caerulea* (Lam.) Kuntze R.Heim	Phanerochaetaceae	B-4
618	*Termitomyces eurrhizus* (Berk & Broome)	Lyophyllaceae	B-4
619	*Termitomyces heimii* Natarajan	Lyophyllaceae	B-4
620	*Termitomyces microcarpus* (Berk. & Broome) R. Heim	Lyophyllaceae	B-4
621	*Xylaria longipes* Nitschke	Xylariaceae	B-4
LICHEN			
622	*Chrysothrix chlorina* (Ach.) J.R. Laundon	Chrysothricaceae	B-4
623	*Cryptothecea scripta* G. Thor	Arthoniaceae	B-4
624	*Graphis scripta* (L.) Ach.	Graphidaceae	B-1,B-2,B-3,B-4

Green Agenda in Syllabus

Sl.	Department/School	Environmental	Green	Green Clubs	Animal	Ethics	Extention

No.		education Syllabus	research		Experiments	committee?	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	15
2	Four wheeler provided by university	10
3	Four wheelers used as personal transport	26
4	Two wheelers	488
5	Bicycles	242
6	E-Vehicles	4

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: ` 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: 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.

Water Analysis report

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	6.3	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-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	6.8	6.5	6.8
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	6.9	6.6	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	6.4	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

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	6.6	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

CONCLUSSION

After summarizing the results of tests conducted in 2018 omparing 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

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.

Major objectives of waste management is for uniform cleanliness guidelines it is essential to have a standard operating procedure to ensure that the university maintain set standards of cleanliness 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 waste management through 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 actual allocation of resources and the actual frequency of cleaning may vary according to the local situations. It is important that all aspects of cleaning and sanitation provision are aligned with the Swachh Bharat Mission Guidelines and other relevant environment-related guidelines issued by the Government of India.

The Standard Operating Procedures are set out in a detailed format to cover the issues required to implement proper cleaning of university premises.

This program is to ensure the proper handling and legal disposal of all waste generated from all facilities. This program is an aide to summarize the applicable requirements of many different waste types and regulations, but should not be considered all inclusive of every waste regulation. As new regulations are promulgated and/or other facets of waste become part of this program, updates will be made.

Roles and Responsibilities

Environmental Health & Safety (EHS)
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.

Good Practices

1. Providing clear signs in the bin rooms and consistent wording, symbols and colors on all bins

2. Providing clean bins and bin rooms that are free of dumped and undisposed waste since dirty and untidy waste facilities will demotivate visitors and staff to use the facilities

3. Closed-circuit television (CCTV) monitoring of waste rooms and bin storage areas

4. Educating the students, teaching faculty and staff on importance of adequate waste management

5. Providing clean bins and bin rooms that are free of dumped and undisposed waste since dirty and untidy waste facilities will demotivate visitors and staff to use the facilities

6. Closed-circuit television (CCTV) monitoring of waste rooms and bin storage areas

7. Educating the students, teaching faculty and staff on importance of adequate waste management and sanitation facilities

8. Repairing signs, labels, bins and equipment and promptly replacing damaged equipment using the same designs

9. Drinking water coolers, filters should be periodically cleaned and the waste collected from them should be disposed off appropriately.

10. Providing/availing a collection service for waste and recycling

11. Training of all maintenance staff in the use of the waste system and any equipment

12. Orientation of students, teaching faculty and staff on the importance of maintaining cleanliness and good water, sanitation and hygiene practices

The management to have full control over:

1. What is being disposed of
2. Separation of waste and recyclables
3. Correct use of waste and recycling bins
4. Use of the waste storage facilities
5. Use of bins and other equipment.

Implementing these strategies may seem like a lot of effort initially, but they become easier to manage as the entire university including students, teaching faculty and staff get used to working with the system. However, infrastructure development alone cannot bring about the change hoped for. It has to be complimented by creating awareness and interest, motivating people to want to change their behaviour. Activities and events helping create this awareness should be made part of children's curriculum at university.

Some other things to be kept in mind on the issue of university waste management:

a) Frequency of waste collection

b) Identifying waste storage requirement/points

c) Color identification of garbage bins

d) Ensuring student, teaching faculty and staff‟s health and safety

e) Legal Obligation

f) Preparing checklists

g) Providing signage boards/posters on bins and important area of waste generation and handling

h) Compliance to the SOP for maintaining cleanliness standards in the university.

Do's and Don'ts

Do's and Don'ts

DO	DON'T
Collect waste, rubbish and debris within the school and dispose as per set frequency.	**DO NOT** let waste and trash accumulate within the premises.
Dispose all waste as per guidelines.	**DO NOT** dispose waste outside or near parking lots, playground, drainage, swimming pool, ditches or any other location where they can damage the environment.
Keep all equipment clean; do not allow a build-up of wastes.	**DO NOT** let equipment get damaged or rusted; replace if unsuitable for further use.
Oversee contractors to ensure that correct procedures are followed and SOP guidelines are complied with.	**DO NOT** let contractors conduct maintenance in conflict with proper procedures and guidelines; monitor closely.
Impose Penalty on defaulters for littering/spitting/open urinating within the university premises or near the boundary walls	**DO NOT** allow littering, spitting, open urination or any other practices that affect the cleanliness and aesthetics of the premises.
Conduct surprise inspections of the schools to ensure a clean, hygienic and healthy environment for members and staff.	**DO NOT** allow accumulation of unnecessary wastes anywhere.
Involve students and staff in such a manner that they voluntarily contribute towards cleanliness.	**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 managenemt	Waste management practices
1	Aryabhatta building	L	L	L	N	Organic	E-	All kinds	Waste

2	Madhusudan building	L	L	L	N	wastes are collected from all the sites and managed	wastes are collected from all the sites and managed	of wastes are collected and managed	management practices adopted properly
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

REPORT OF
ENVIRONMENTAL AUDIT
OF CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, BBSR CAMPUS, ODISHA (2017-18)

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 aquestionnaire. With the help of student volunteers and faculties of respective departmrnts the major partof 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

Dr. Yashaswi Nayak

Dr. Sagarika Parida

Gyanranjan Mahalik
Dr. Gyanranjan Mahalik

SCHOOL OF APPLIED SCIENCES
CUTM
CENTURION UNIVERSITY OF TECHNOLOGY & MANAGEMENT

Dr. Siba Prasad Parida

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	√	A	NA	√	√	A
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	Boys hostel-1	C	G	√	NA	NA		√	G
10	Boys hostel-2	C	G	√	NA	NA		√	G
11	Boys hostel-3	C	G	√	NA	NA		√	G
12	Boys hostel-4	C	G	√	NA	NA		√	G
13	Boys hostel-5	C	G	√	NA	NA		√	G
14	Canteen-1	C	A	√	NA	NA		**NA**	G
15	Canteen-2	C	A	√	NA	NA		**NA**	G
16	Guest house	C	G	√	NA	√		√	G

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

PHOTOGRAPH SHOWING ECOFRIENDLY ENVIRONMENT

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 cultured hydrophytes in ponds as well as tanks 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.

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 area alloted for 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.	*Artocarpus heterophyllus* Lam.	Moraceae	B-2
11.	*Averrhoa carambola* L.	Averrhoaceae	B-2
12.	*Bixa orellana* L.	Bixaceae	B-2
13.	*Borassus flabellifer* L.	Arecaceae	B-2
14.	*Brya ebenus* (L.) DC.	Fabaceae	B-2
15.	*Cinammomum tamala* (Buch.-Ham.) T.Nees&C.H. Eberm.	Lauraceae	B-2
16.	*Couroupita guianensis* Aubl.	Lecythidaceae	B-2
17.	*Crataeva magna* (Lour.) DC	Capparaceae	B-2
18.	*Delonix regia* (Boj. ex Hook.) Raf.	Caesalpiniaceae	B-2, B-4
19.	*Dillenia indica* L.	Dilleniaceae	B-2,
20.	*Diospyros melanoxylon* Roxb.	Ebenaceae	B-2
21.	*Elaeis guineensis* Jacq.	Arecaceae	B-4
22.	*Eucalyptus citrodora* Hook.	Myrtaceae	B-2
23.	*Ficus benghalensis* L. var.*benghalensis*	Moraceae	B-2, B-4
24.	*Magnolia champaca*(L.) Baill. ex Pierre	Magnoliaceae	B-2
25	*Mangifera indica* L.	Anacardiaceae	B-1, B-2, B-3,B-4
26.	*Manilkara zapota*(L.) P.Royen	Sapotaceae	B-1
27.	*Melaleuca citrine* (Curtis) Dum.Cours.	Lythraceae	B-2
28.	*Millettia pinnata* (L.) Panigrahi	Fabaceae	B-2,B-3
29.	*Millingtonia hortensis* L.f.	Bignoniaceae	B-2
30.	*Mitragyna parviflora* (Roxb.) Korth	Rubiaceae	B-3
31.	*Phyllanthus emblica* L.	Euphorbiaceae	B-2
32.	*Pimenta dioica* (L.)Merr.	Myrtaceae	B-2
33.	*Plumeria obtuse* L.	Apocynaceae	B-4
34.	*Polyalthia suberosa* (Roxb.) Thwaites	Annonaceae	B-1
35.	*Prosopis cineraria* (L.) Druce	Mimosaceae	B-2
36.	*Pterocarpus santalinus* L.f.	Fabaceae	B-2
37.	*Pterospermum acerifolium* (L.) Willd.	Sterculiaceae	B-2
38.	*Punica granatum* L.	Punicaceae	B-2
39.	*Ravenala madagascariensis* Sonn.	Strelitziaceae	B-2

40.	*Santalum album* L.	Santalaceae	B-2
41.	*Saraca asoca* (Roxb.) Willd.	Caesalpiniaceae	B-2
42.	*Senna auricualata* (L.) Roxb.	Caesalpiniaceae	B-2
43.	*Senna siamea* (Lam.) H.S. Irwin & Barneby	Caesalpiniaceae	B-2
44.	*Sesbania grandiflora* (L.) Poiret	Fabaceae	B-4
45.	*Simarouba glauca* DC.	Simaroubaceae	B-2, B-4
46.	*Terminalia bellerica* (Gaertn.) Roxb.	Combretaceae	B-1
47.	*Terminalia catappa* L.	Combretaceae	B-2
48.	*Terminalia chebula* Retz.	Combretaceae	B-1
49.	*Ziziphus mauritiana* Lam.	Rhamnaceae	B-1, B-2, B-3,B-4
SHRUB			
1.	*Acalypha wilkesiana* Mull.	Euphorbiaceae	B-2
2.	*Agave Americana* L.	Agavaceae	B-2
3.	*Allamanda schottii* Hook.	Apocynaceae	B-2
4.	*Codiaeum variegatum* (L.) Juss. A.Rich.	Euphorbiaceae	B-2
5.	*Coprosma repens*	Rubiaceae	B-2
6.	*Crossandra infundibuliformis*	Acanthaceae	B-2
7.	*Crotalaria spectabilis* Roth	Fabaceae	B-2
8.	*Cryptostegia grandiflora* R.Br.	Apocynaceae	B-1
9.	*Desmodium pulchellum* (L.)Benth.	Fabaceae	B-4
10.	*Dracaena marginate* Lam. 'tricolor'	Agavaceae	B-2
11.	*Dracena reflexa* Lam.	Agavaceae	B-2
12.	*Dracaena sanderiana* Mast.	Asparagaceae	B-2
13.	*Duranta repens* L.	Verbenaceae	B-2
14.	*Euphorbia milii* Des Moul.	Euphorbiaceae	B-2
15.	*Euphorbia pulcherrima* Willd. ex Klotzsch	Euphorbiaceae	B-2
16.	*Hibiscus schizopetalus* (Mast.)Hook.f.	Malvaceae	B-1, B-2
17.	*Hypoestes phyllostachya* Baker	Acanthaceae	B-2
18.	*Impatiens glandulifera* Royle	Balsaminaceae	B-2
19.	*Ipomoea carnea* Jacq.	Convolvulaceae	B-1,B-4
20.	*Jasminum auriculatum* Vahl	Oleaceae	B-2
21.	*Jatropha gossypifolia* L.	Euphorbiaceae	B-2
22.	*Jatropha integerrima* Jacq.	Euphorbiaceae	B-2
23.	*Justicia adhatoda* L.	Acanthaceae	B-2

24.	*Lantana camara* L. var. aculeata (L.) Mold	verbenaceae	B-2
25.	*Lawsonia inermis* L.	lythraceae	B-2
26.	*Malvaviscus arboreus* Cav.	malvaceae	B-2
27.	*Mussaenda phillipica* A.Rich.	rubiaceae	B-2
28.	*Rosa damascina* Miller	rosaceae	B-2
29.	*Rosa fortuneana* Lindley	rosaceae	B-2
30.	*Rosa gallica* L.var.complicata	rosaceae	B-2
31.	*Rosa gallica* var. officinalis	rosaceae	B-2
32.	*Rosa indica* L.	rosaceae	B-2
33.	*Sauropus androgynus* (L.) Merr.	euphorbiaceae	B-2
34.	*Sterblus taxoides* (Roth)Kurz	Moraceae	B-235
35.	*Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schult.cv.plena	apocynaceae	B-2
36.	*Vitex negundo* L.	verbenaceae	B-2
37.	*Wrightia antidysenterica* (L.)R.Br.	apocynaceae	B-2
HERB			
1.	*Abelmoschus esculentus* (L.) Moench	Malvaceae	B-1, B-2
2.	*Aeschynomene aspera* L.	fabaceae	B-3,B-4
3.	*Aeschynomene indica* L.	fabaceae	B-1,B-4
4.	*Alocasta macrorrhizos* (L.) G.Don	araceae	B-4
5.	*Aloe vera* (L.) Burm.f.	liliaceae	B-1,B-2
6.	*Alpinia galanga* (L.) Willd.	zingiberaceae	B-2
7.	*Amaranthus caudatus* L.	amaranthacea	B-2
8.	*Asystasia gangetica*(L.) T. Anderson	acanthaceae	B-2
9.	*Barleria cristata* L.	acanthaceae	B-4
10.	*Barleria prionitis* L.	acanthaceae	B-1,B-3,B-4
11.	*Bassia scoparia* (L.) Schrad.	amaranthacea	B-2
12.	*Biophytum sensitivum* (L.) DC.	oxalidaceae	B-2,B-3
13.	*Brassica campestris L.*	brassicaceae	B-1
14.	*Brassica oleracea* L. var.capitata	brassicaceae	B-2
15.	*Canna indica* L.	cannaceae	B-2
16.	*Capsicum annum* L.	solanaceae	B-2
17.	*Celosia argentea* L.	amaranthacea	B-2
18.	*Celosia cristata* L.	amaranthacea	B-2
19.	*Celosia argentea var.* plumosa	amaranthacea	B-2

20.	*Centella asiatica* (L.) Urban	apiaceae	B-2
21.	*Chenopodium album* L.	chenopodiaceae	B-4
22.	*Chrozophora rottleri* (Geisel.) Juss.	euphorbiaceae	B-3,B-4
23.	*Colocasia esculenta* (L.) Schott	araceae	B-4
24.	*Commelina longifolia* Lam.	commelinaceae	B-4
25.	*Commelina paludosaBlume*	commelinaceae	B-3
26.	*Coriandrum sativum* L.	apiaceae	B-2
27.	*Evovulus sericeus* Sw.	Convolvulaceae	B-3
28.	*Foeniculuem vulgare* L.	Apiaceae	B-2,B-3
29.	*Gaillardia aristata* Pursh	Asteraceae	B-2
30.	*Gaillardia grandiflora* Hort	Asteraceae	B-2
31.	*Gomphrena globosa* L.	Amaranthaceae	B-2
32.	*Hedyotis puberula* (G.Don)Thw.	Rubiaceae	B-3
33.	*Heliconia latispatha* Benth.	Tlcliconiaceae	B-2
34.	*Heliconia rostrata* Ruiz & Pavon	Heliconiaceae	B-2
35.	*Hibiscus canabinus* L	Malvaceae	B-1
36.	*Hippeastrum amaryllis* (L.)Herb.	Amaryllidaceae	B-2
37.	*Hyptis suaveolens* (L.) Poit.	Lamiaccac	B-2,B-3,B-4
38.	*Impatiens balsamina* L.	Balsaminaceae	B-2
39.	*Indigofera linnaei* Ali	Fabaceae	B-3,B-4
40.	*Justicia japonica* Thunb.	Acanthaccac	B-2,B-3
41.	*Justicia quinqueangularis* Koen. ex Roxb.	Acanthaceae	B-1,B-4
42.	*Kalanchoe blossfeldiana* Poelln.	Crassulaceae	B-2
43.	*Kalanchoe pinnata* (Lam.) Pers.	Crassulaccae	B-2
44.	*Laportea interrupta* (L.) Chew	Urticaceae	B-1,B-2
45.	*Leucas aspera* (Willd.) Link	Lamiaceae	B-3,B-4
46.	*Leucas cephalotes* (Roth) Spreng.	Lamiaceae	B-1,B-4
47.	*Leucas indica* (L.) R.Br.cx Vatke	Lamiaceae	B-4
48.	*Lindshot.onaviyouero* (L.) F.v.Muell	Scrophulariaceae	B-1,B-2,B-3
49.	*Lippia javanica* (Burm.f.)Spreng.	Verbenacea	B-4
50.	*Lobelia alsinoides* Lam.	Lobeliaceae	B-1,B-4
51.	*Lobularia maritima* (L.)Desv.	Brassicaceae	B-3
52.	*Ludwigia perennis* L.	Onagraceae	B-1,B-3,B-4
53.	*Malachra capitata* (L.)L.	Malvaceae	B-3
54.	*Maranta arundinacea* L.	Marantaceae	B-2

55.	*Melochia corchorifolia* L.	Sterculiaceae	B-3,B-4
56.	*Mentha arvensis* L.	Lamiaceae	B-2
57.	*Mentha piperita* L.	Lamiaceae	B-2
58.	*Mentha spicata* L.	Lamiaceae	B-2
59.	*Merremia hederacea* (Burm.f.)Hall.f.	Convolvulaceae	B-4
60.	*Mimosa pudica* L.	Mimosaceae	B-1,B-2,B-3,B-4
61.	*Mirabilis jalapa* L.	Nyctaginaceae	B-2
62.	*Murdannia nodiflora* (L.)Brenan	Commelinaceae	B-3,B-4
63.	*Murdannia spirata* (L.) Brueck.	Commelinaceae	B-1,B-3
64.	*Musa acuminata var.* rubra	Musaccae	B-2
65.	*Musa paradisiaca* L.	Musaceae	B-2
66.	*Ocimum canum* Sims.	Lamiaceae	B-4
67.	*Oxalis corniculata* L.	Oxalidaceae	B-2,B-3,B-4
68.	*Oxalis debilis* Kunth	Oxalidaceae	B-2
69.	*Oxalis triangularis* A.St.-Hil.	Oxalidaceae	B-2
70.	*Parthenium hysterophorus* L.	Asteraceae	B-1,B-2,B-3,B-4
71.	*Persicaria virginiana* (L.)Gaertn.	Polygonaceae	B-2
72.	*Petunia hybrid* Juss.	Solanaceae	B-2
73.	*Phaulopsis imbricata* (Forssk.) Sw.	Acanthaceae	B-3,B-4
74.	*Phyla nodiflora* (L.) Greene	Verbenaceae	B-4
75.	*Phyllanthus fraternus* Webster	Euphorbiaceae	B-1,B-2,B-3,B-4
76.	*Phyllanthus virgatus* Forst.f	Euphorbiaceae	B-1,B-3,B-4
77.	*Physalis longifolia Nutt.* var longifolia	Solanaceae	B-3
78.	*Physalis minima* L.	Solanaceae	B-4
79.	*Polygala arvensis* L.	Polygalaceae	B-3,B-4
80.	*Polygonum barbatum* L.	Polygonaceae	B-3,B-4
81.	*Portulaca oleracea* L. var. oleracea	Portulaceae	B-1,B-2,B-3,B-4
82.	*Portulaca quadrifida* L.	Portulaceae	B-1,B-2,B-3,B-4
83.	*Portulaca umbraticola* Kunth	Portulaceae	B-2
84.	*Ruellia brittoniana* Leonard	Acanthaceae	B-2
85.	*Sansevieria trifasciata* Prain.	Asparagceae	B-2
86.	*Scadoxus multiflorus* (Martyn) Raf.	Amaryllidaceae	B-2
87.	*Scoparia dulcis* L.	Scrophulariaceae	B-1,B-2,B-3,B-4
88.	*Sesamum orientale* L.	Pedaliaceae	B-3,B-4
89.	*Solanum tuberosum* L.	Solanaceae	B-2

90.	*Solanum virginianum* L.	Solanaceae	B-4
91.	*Spermacoce articularis* L.f.	Rubiaceae	B-1,3-2,B-3,B-4
92.	*Theriophonum minuatum* (Willd.)Bail	Araceae	B-2
93.	*Tithonia diversifolia* (Hemsl)A.Gray	Asteraceae	B-1,B-2
94.	*Tradescantia zebrine* (Schinz)D.R Hunt	Commelinaceae	B-2
95.	*Tribulus terrestris* L.	Zygophyllaceae	B-2,B-4
96.	*Tridax procumbens* L.	Asteraceae	B-1,B-2,B-3,B-4
97.	*Triumfetta pentandra A.*Rich	Sterculiaceae	B-1,B-4
98.	*Triumfetta rhomboidea* Jasq.	Sterculiaceae	B-3,B-4
99.	*Turnera ulmifolia* L.	Turneraceae	B-2
HYDROPHYTES			
1.	*Alisma plantago-aquatica* L.	Alismataceae	B-2
2.	*Ceratophyllum demersum* L.	Ceratophyllaccae	B-2
3.	*Eichhornia crassipes*(Mart.) Solms-Laub.	Pontederiaceae	B-4
4.	*Hydrilla verticillata* (L.f.) Royle	Hydrocharitaceae	B-2
5.	*Lemna perpusila* Tor.	Lemnaecae	B-2,B-4
6.	*Monochoria hastata* Solms-Laub.	Pontederiaceae	B-4
7.	*Monochoria vaginalis* (Burm.f.) Presl	Pontederiaceae	B-4
8.	*Nelumbo nucifera* Gaertn.	Nelumbonaceae	B-2
9.	*Nuphar pumila*(Timm) DC.	Nymphaeaccae	B-2
10.	*Nymphaea mexicana* Zucc.	Nymphaeaccae	B-2
11.	*Nymphaea nouchali* Burm.f.	Nymphaeaceae	B-2
12.	*Nymphaea pubescens* Willd.	Nymphaeaceae	B-2
13.	*Nymphoides hydrophila* (Lour.)Kuntze	Nymphaeaceae	B-2
CLIMBER			
1.	*Argeyria nervosa*(Burm.f.) Bojer	Convolvulaceae	B-2
2.	*Artabotrys hexapetalus*(L.f) Bandari	Annonaceae	B-2
3.	*Asparagus racemosus* Willd.	Asparagaceae	B-2
4.	*Atylosia scarabaeoides* (L.) Benth.	Fabaceae	B-3,B-4
5.	*Cayratia pedata Wall.)* Gagnep.	Vitaceae	B-3,B-4
6.	*Cayratia trifolia* (L.) Domin	Vitaceae	B-1,B-3,B-4
7.	*Coccinia grandis* (L.) Voigt	Cucurbitaceae	B-3,B-4
8.	*Cocculus hirsutus*(L.) Diels	Cucurbitaceae	B-3,B-4
9.	*Ipomoea quamoclit* L.	Convolvulaceae	B-3

10.	*Ipomoea sepiaria Koenig* ex Roxb.	Convolvulaceae	B-3,B-4
11.	*Luffa aegyptiaca* Mill.	Cucurbitaceae	B-4
12.	*Mansoa alliacea* Gentry	Bignoniaceae	B-2
13.	*Passiflora incarnata* L	Passifloraceae	B-2
14.	*Passiflora vitifolia* Kunth	Passifloraceae	B-2
15.	*Piper betel* L	Piperaceae	B-2
16.	*Piper longum* L.	Piperaceae	B-2
17.	*Podranea ricasoliana*(Tanf.) Sprague	Bignoniaceae	B-2
18.	*Pyrostegia venusta* (Ker.Gawl.)Miers	Bignoniaceae	B-2
19.	*Quisqualis indica* L.	Combretaceac	B-2
20.	*Syngonium podophyllum* Schott	Araceae	B-2
21.	*Thunbergia fragrans* Roxb.	Acanthaceae	B-2
22.	*Trichosanthes cucumerina* L.	Cucurbitaceae	B-2
23.	*Vitis vinifera* L.	Vitaceae	B-2
EPIPHYTES			
1.	*Vanda tesselata* (Roxb.) Hook.cx G.Don	Rubiaceae	B-2
GRASS			
1.	*Aristida setacea* Rctz.	Passifloraceae	B-1,B-2,B-3,B-4
2.	*Bambusa arundinacea* (Retz.) Willd.	Apocynaceae	B-2
3.	*Bambusa vulgaris Schrad.* Ex J.C.Wendl.	Asclepidaceae	B-2
4.	*Brachiaria ramosa* (L.) Stapf	Piperaceae	B-1,B-3,B-4
5.	*Chloris barbata* Sw.	Bignoniaceae	B-1,B-2,B-3,B-4
6.	*Chrysopogon aciculatus* (Retz.) Trin.	Bignoniaceae	B-1,B-4
7.	*Cynodon dactylon* (L.) Pers.	Combretaceac	B-1,B-2,B-3,B-4
8.	*Cyperus brevifolius* (Rottb.) Hassk.	Araceae	B-1,B-4
9.	*Cyperus compactus* Retz.	Menispermaceae	B-4
10.	*Cyperus difformis* L.	Araceae	B-1,B-3,B-4
11.	*Cyperus halpan* L.	Acanthaceae	B-1,B-3
12.	*Cyperus imbricatus* Retz.	Acanthaceae	B-4
13.	*Dactyloctenium aegypticum* (L.) P.Beauv.	Poaceae	B-1,B-2,B-3,B-4
14.	*Digitaria ciliaris* (Retz.) Koeler	Poaceae	B-1,B-2,B-3,B-4
15.	*Eragrostis ciliaris* (L.) R.Br.	Poaceae	B-3
16.	*Eragrostis ciliata* Roxb. Nees	Poaceae	B-1,B-2,B-3,B-4
17.	*Eriochloa procera* (Retz.)Hubbard	Poaceae	B-1,B-2,B-3,B-4
18.	*Paspalum scrobiculatum* L.	Poaceae	B-2,B-3

19.	*Paspalum vaginatum* Sw.	Poaceae	B-1,B-3
20.	*Pennisetum pedicellatum* Trin.	Poaceae	B-1,B-3,B-4
21.	*Pennisetum purpureum* Schumach	Poaceae	B-3,B-4
22.	*Perotis indica* (L.) Kuntz	Poaceae	B-3,B-4
23.	*Pogonantherum crinitum*(Thunb.) Kunth	Poaceae	B-2
24.	*Sachharum officinarum* L.	Poaceae	B-2
25.	*Setaria pumila* (Poir.) Roem. & Schult.	Poaceae	B-1,B-3,B-4
26.	*Setaria verticillata* (L.) P.Beauv.	Poaceae	B-1,B-4
GYMNOSPERM			
1.	*Pinus roxburghii* Sargent	Pinaceae	B-2
2.	*Podocarpus nerefolius* D.Don	Podocarpaceae	B-2
3.	*Platycladus orientalis* (L.) Franco	Cupressaceae	B-2
PTERIDOPHYTES			
1.	*Pteris vittata* L.	Pteridaceae	B-1,B-2,B-3,B-4
2.	*Salvinia cuculata* Roxb.	Salviniaceae	B-4
3.	*Salvinia molesta* D.S. Mitch	Salviniaceae	B-4
4.	*Selaginella ciliaris*(Retz.) Spring	Selaginellaceae	B-4
BRYOPHYTES			
1.	*Barbula calycinaSchwägr*	Pottiaceae	B-2,B-4
2.	*Marchantia polymorpha* L.	Marchantiaceae	B-1,B-4
3.	*Riccia beyrichiana* Hampe ex Lehm	Ricciaceae	B-3,B-4
4.	*Trichostomum crispulumBruch*	Pottiaceae	B-2
MUSHROOMS			
1.	*Agaricus bisporous* (J.E.Lange) Emil.J.Imbact	Agaricaceae	B-2
2.	*Agaricus compestris* L.	Agaricaceae	B-4
3.	*Amanita multisquamosa* Peck	Amanitaceae	B-4
4.	*Amylostereum laevigatum* (Fr.) Boidin	Amylostereaceae	B-4
5.	*Entoloma unicolar* (Perk) Hesler	Entolomataceae	B-4
6.	*Ganoderma lucidum* (Curtis) P. Carst.	Ganotodermaceae	B-4
7.	*Lactarius alnicola* A.H. Smith	Russulaceae	B-4
8.	*Marasmius rotula*(Scop.) Fr.	Marasmiaceae	B-1
9.	*Protostropharia semiglobata* (Batsch) Redhead, Moncalvo & Vilgays	Strophariaceae	B-4
10.	*Termitomyces heimii* Natarajan	Lyophyllaceae	B-4

11.	*Termitomyces microcarpus* (Berk. & Broome) R. Heim	Lyophyllaceae	B-4
12.	*Xylaria longipes Nitschke*	Xylariaceae	B-4
LICHEN			
1.	*Graphis scripta* (L.) Ach.	Graphidaceae	B-2,B-3,B-4

FAUNAS DIVERSITY

A survey on faunal diversity in our BBSR campus of Centurion University of Technology and Management has done from 1st of November 2017 to 15th of March 2018. Based on the survey, we prepared report and hereby the report is submmited to The Department of Zoology , School of Applied Sciences on 30th of March.

ANIMAL	Sl.No.	Common name	Scientific name
Vertibrates	●	Grey pansy	*Junonia atlites*
	●	Indian crow butterfly	*Euploea core*
	●	Common evening brown	*Melanitis leda*
	●	Agathia	*Agathia laetata*
	●	Striped tiger butterfly	*Danaus genutia*
	●	Green hairstreak	*Callophrys rubi*
	●	Bamboo treebrown	*Lethe europa*
	●	Indian honey bee	*Apis indica*
	●	Oriental hornet	*Vespa orientalis*
	●	Mantis	*Hierodula patellifera*
	●	Carpenter ant	*Camponotus sp.*
	●	Garden cross spider	*Argiope pulchella*

	●	Giant Land snail	*Achatina fulica*
Invertibrates	●	Chiken	*Gallus gallus domesticus*
	●	Domestic goose(grey)	*Anser cygnoides domesticus*
	●	Indian runner duck	*Anas platyrhynchos domesticus*
	●	Pigeon	*Columba livia domestica*
	●	Crow	*Corvus splendens*
	●	House sparrow	*Passer domesticus*
	●	Indian myna	*Acridotheres tristis*
	●	Egret	*Ardea alba*
	●	Cat	*Felis catus*
	●	Dog	*Canis lupus familiaris*
	●	cow	*Bos indicus*
	●	Goat	*Capra hircus*
	●	Domestic Rabbit	*Oryctilagus cuniculus domesticus*
	●	Rohu	*Labeo rohita*
	●	Catla	*Catla catla*
	●	Tilapia	*Oreochromis niloticus*
	●	Pangasius	*Pangasius pangasius*

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	12
2	Four wheeler provided by university	11
3	Four wheelers used as personal transport	21
4	Two wheelers	518
5	Bicycles	234

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	√	√	√	√	√	√	5000	√	√	√
3	Koutilya building	√	√	√	√	√	√	10000	√	√	√
4	Skill building-1	√	√	√	√	√	√	5000	√	√	√
5	Staff quarter	√	√	√	√	√	√	25000	√	√	√
6	Ladies hostel-1	√	√	√	√	√	√	25000	√	√	√
7	Ladies hostel-2	√	√	√	√	√	√	25000	√	√	√
8	Boys hostel-1	√	√	√	√	√	√	25000	√	√	√
9	Boys hostel-2	√	√	√	√	√	√	25000	√	√	√
10	Boys hostel-3	√	√	√	√	√	√	25000	√	√	√
11	Boys hostel-4	√	√	√	√	√	√	25000	√	√	√
12	Boys hostel-5	√	√	√	√	√	√	25000	√	√	√
13	Canteen-1	√	√	√	√	√	√	10000	√	√	√
14	Canteen-2	√	√	√	√	√	√	10000	√	√	√

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: 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

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

Sampling site-3	
Water body	: Water purifier
Location	: Kautilya building, CUTM, BBSR Campus
Sampling site-4	
Water body	: Water purifier
Location	:Skill building, CUTM, BBSR Campus

Sampling site-5	
Water body	: Water purifier

Location	: Girls Hostel-1, CUTM, BBSR Campus

Sampling site-6	
Water body	: Water purifier
Location	: Girls Hostel-2, CUTM, BBSR Campus

Sampling site-7	
Water body	: Water purifier
Location	: Boys Hostel-1, CUTM, BBSR Campus

Sampling site-8	
Water body	: Water purifier
Location	: Boys Hostel-2, CUTM, BBSR Campus

Sampling site-9	
Water body	: Water purifier
Location	: Boys Hostel-3, CUTM, BBSR Campus

Sampling site-10	
Water body	: Water purifier
Location	: Boys Hostel-4, CUTM, BBSR Campus

Sampling site-11	
Water body	: Water purifier
Location	: Boys Hostel-5, CUTM, BBSR Campus

Sampling site-12	
Water body	: Water purifier
Location	: Staff quarter, CUTM, BBSR Campus

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	6.7	6.5	8.1
2	Electrical conductivity	mho/cm	2.25	0.416	0.328	0.284
3	Total suspended solid	mg/l	NS	0.108	0.192	0.124
4	Total dissolved solid	mg/l	500	0.026	0.036	0.034
5	Total solid	mg/l	----	0.134	0.228	0.158
6	Silicon	Ppm	2	00	00	00
7	Phosphorus	Ppm	5	268.6	424.5	468.6
8	Chlorine	Ppm	250	212.4	186.2	162.8
9	Calcium	Ppm	75	42.6	38.4	44.2
10	Iron	Ppm	0.3	0.212	0.208	0.136
11	Cobalt	Ppm	NS	00	00	00
12	Tin	Ppm	NS	00	00	00
13	Europium	Ppm	NS	00	00	00
14	Erbium	Ppm	NS	00	00	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	%		99.896	99.884	99.904

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	6.6	6.4	6.4
2	Electrical conductivity	mho/cm	2.25	0.648	0.436	0.344
3	Total suspended solid	mg/l	NS	0.926	0.486	0.464
4	Total dissolved solid	mg/l	500	0.106	0.048	0.054
5	Total solid	mg/l	----	1.132	.0534	0.518
6	Silicon	Ppm	2	00	00	00
7	Phosphorus	Ppm	5	0.876	1.048	1.948
8	Chlorine	Ppm	250	126.44	122.42	164.54
9	Calcium	Ppm	75	68.32	24.58	36.66
10	Iron	Ppm	0.3	0.134	0.226	0.086
11	Cobalt	Ppm	NS	00	00	00
12	Tin	Ppm	NS	0.876	0.548	0.884
13	Europium	Ppm	NS	00	00	00

14	Erbium	Ppm	NS	00	00	00
15	Chromium	Ppm	0.1	00	0.048	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	**%**		99.686	99.836	99.802

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	6.4	6.5	6.4
2	Electrical conductivity	mho/cm	2.25	0.648	0.546	0.298
3	Total suspended solid	mg/l	NS	0.884	0.678	0.628
4	Total dissolved solid	mg/l	500	0.042	0.028	0.054
5	Total solid	mg/l	----	0.926	0.706	0.708
6	Silicon	Ppm	2	1.082	0.086	0.646
7	Phosphorus	Ppm	5	0.864	1.266	0.868
8	Chlorine	Ppm	250	126.4	132.2	146.22
9	Calcium	Ppm	75	48.6	26.2	22.6
10	Iron	Ppm	0.3	0.084	0.068	0.019
11	Cobalt	Ppm	NS	00	00	00
12	Tin	Ppm	NS	00	0.016	0.028
13	Europium	Ppm	NS	00	00	00
14	Erbium	Ppm	NS	00	00	0.22
15	Chromium	Ppm	0.1	00	0.02	0.01
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			99.881	99.846	99.884

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	6.4	6.7	6.6
2	Electrical conductivity	mho/cm	2.25	0.386	0.328	0.342
3	Total suspended solid	mg/l	NS	0.824	0.888	0.658
4	Total dissolved solid	mg/l	500	0.044	0.062	0.102
5	Total solid	mg/l	----	0.868	0.950	0.750
6	Silicon	Ppm	2	0.184	0.022	0.132
7	Phosphorus	Ppm	5	1.242	0.329	0.819
8	Chlorine	Ppm	250	46.8	62.4	88.6
9	Calcium	Ppm	75	33.6	12.9	17.8
10	Iron	Ppm	0.3	0.16	0.08	0.12
11	Cobalt	Ppm	NS	00	00	00

12	Tin	Ppm	NS	0.04	0.12	0.042
13	Europium	Ppm	NS	00	00	00
14	Erbium	Ppm	NS	00	00	00
15	Chromium	Ppm	0.1	00	00	00
16	Nickel	Ppm	0.02	0.01	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	**%**		99.864	99.832	99.868

CONCLUSSION

After summarizing the results of tests conducted in 2017-18 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.

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	Staff quarter	M	M	L	L				
6	Ladies hostel-1	M	M	L	L				
7	Ladies hostel-2	M	M	L	L				
8	Boys hostel-1	M	M	L	L				
9	Boys hostel-2	M	M	L	L				
10	Boys hostel-3	M	M	L	L				
11	Boys hostel-4	M	M	L	L				
12	Boys hostel-5	M	M	L	L				
13	Canteen-1	H	M	L	N				

14	Canteen-2	H	M	L	N				
15	Guest house	M	L	L	N				
H-High M-Medium L-Low N-Nil									

PHOTOGRAPH SHOWING WASTE MANAGEMENT

Composting unit

GREEN INITIATIVES AND WASTE MANAGEMENT AT CUTM

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

Centurion University of Technology and Management
Alluri Nagar, P.O. – R Sitapur, Via – Uppalada, Paralakhemundi,
Dist.: Gajapati – 761211, Odisha, India
www.cutm.ac.in
2021-2022

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 aquestionnaire. With the help of student volunteers and faculties of respective departmrnts the major partof 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

Atia Arzoo

Dr. Atia Arzoo

RMishra.

Dr.Rukmini Mishra

Dr. Yashaswi Nayak

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SCHOOL OF APPLIED SCIENCES * CENTURION UNIVERSITY OF TECHNOLOGY & MANAGEMENT * CUTM

CONTENTS

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.

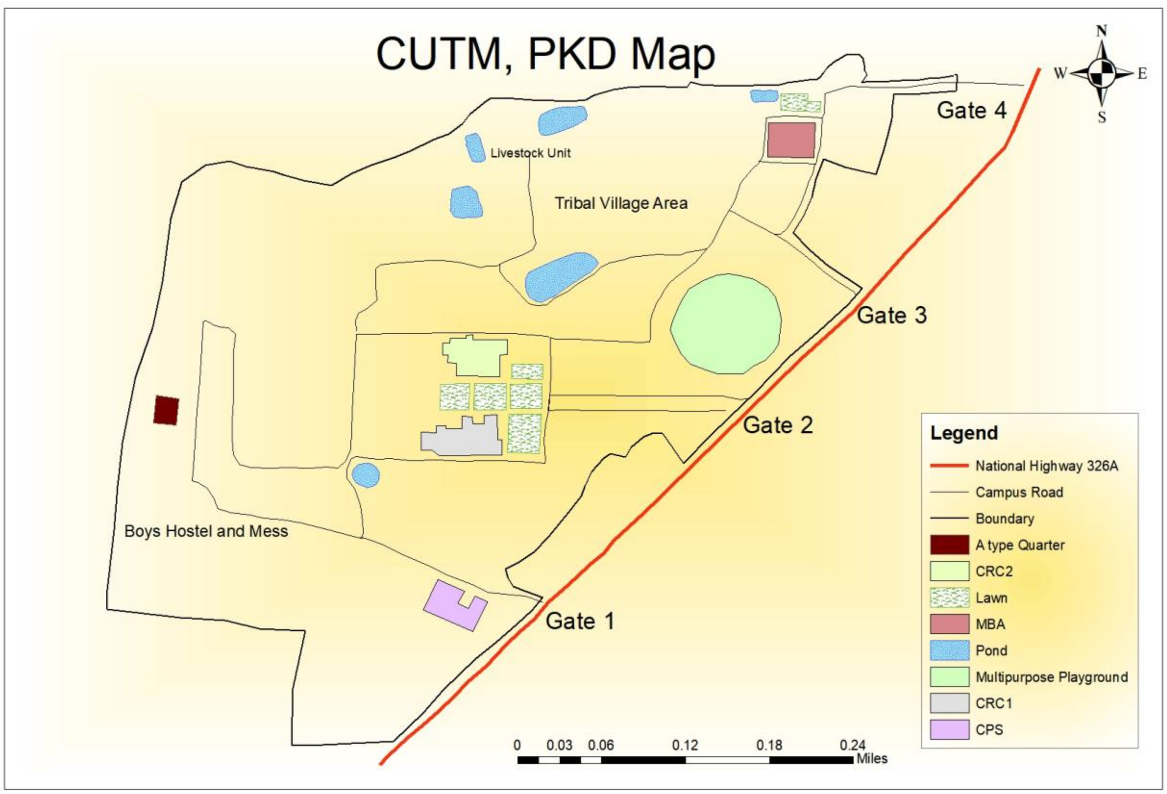
h. Water Quality: In general, is within the stipulated standards**,** though absence of coliform bacteria in all the samples tested indicates no possible contamination with sewage water.

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

5. METEOROLOGICAL PARAMETERS OF CUTM-PKD (Year -2021-22)

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
22	1	30.9	17.0	22.6	0.0	13	142	33.4	10	11.6	5	10	0	0	0
22	2	32.0	16.0	22.3	0.0	13	88	38.5	26	12.6	3	10	0	0	0
22	3	35.2	21.3	26.1	0.0	0	94	42.4	31	16.4	4	29	0	0	0
22	4	37.3	24.7	29.8	0.0	0	262	40.8	26	21.0	4	29	0	0	0
22	5				0.0	0							0	0	0
22	6				0.0	0							0	0	0
22	7				0.0	0							0	0	0
22	8				0.0	0							0	0	0
22	9				0.0	0							0	0	0
22	10				0.0	0							0	0	0
22	11				0.0	0							0	0	0
22	12				0.0	20							0	0	0
		33.9	19.8	25.2	0.0	46	586	42.4	MAR	11.6	DEC	78	0	0	0

PRECIPITATION (mm)

YR	MO	TOTAL	DEP. FROM NORM	MAX OBS. DAY	DATE	DAYS OF RAIN OVER .2	2	20
22	1	25.9	0.0	25.7	30	2	1	1
22	2	0.0	0.0	0	1	0	0	0
22	3	10.7	0.0	10.7	31	1	1	0
22	4	13.2	0.0	7.9	19	5	2	0
22	5							
22	6							
22	7							
22	8							
22	9							
22	10							
22	11							
22	12							
		49.8	0.0	25.7	SEP	8	4	1

WIND SPEED (km/hr)

YR	MO	AVG.	HI	DATE	DOM DIR
22	1	1.5	24.1	28	N
22	2	1.3	30.6	21	N
22	3	0.8	30.6	13	N
22	4	2.9	54.7	14	N
22	5				
22	6				
22	7				
22	8				
22	9				
22	10				
22	11				

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:

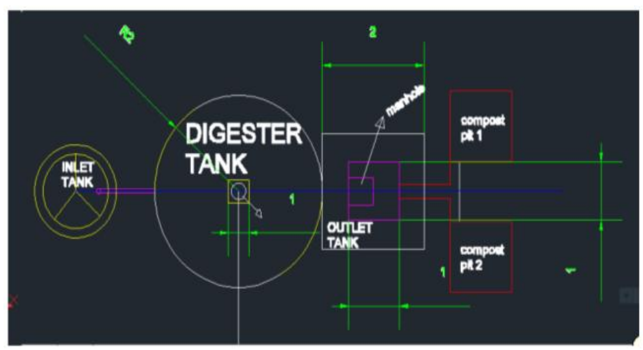
- Steps should be taken to use the food and vegetable waste as Biogas.
- The college has the complete data of food and vegetable waste from all the student mess.

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.

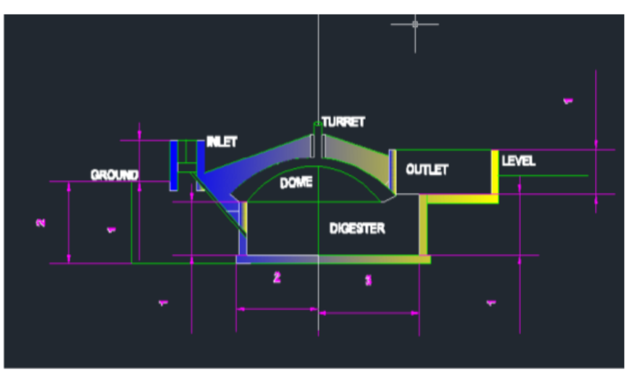
Categories	Vegetable waste (kg)	Food Waste (kg)
SOUTH MESS	1021.54	769.61
NORTH MESS	3241.42	1492.56
ITI MESS	921.49	1782.65

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

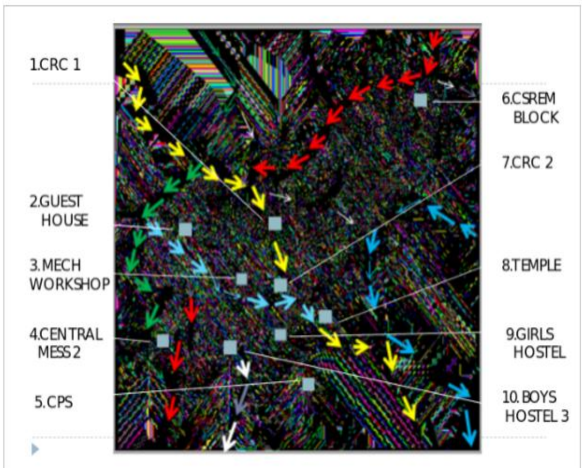
Goal: To control soil erosion
Benchmark:

- The college should take steps towards land stabilization by way of controlling soil erosion through construction of check dams in the sloppy areas.

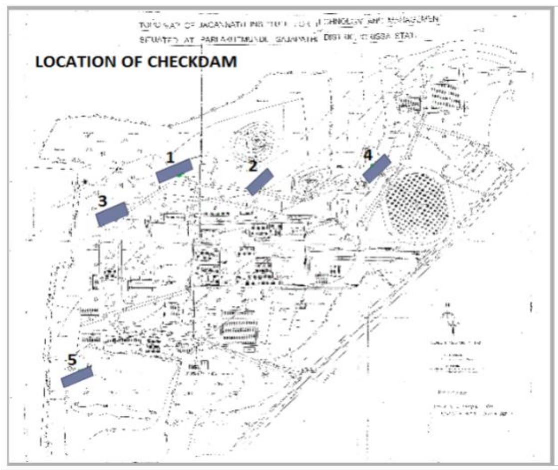
- This will eventually enhance the ground water resources.

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.

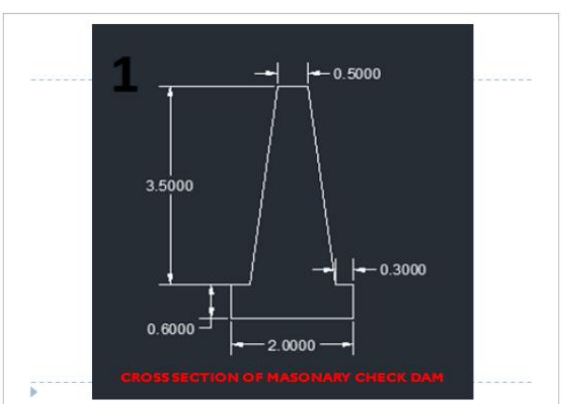
This enhances the ground water resources which can be used for the agricultural purpose of the college. In dry season the plants in the college get dried so we can water the plants by using this water. The water is not required to be treated and can be used directly for watering. This avoids the cost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

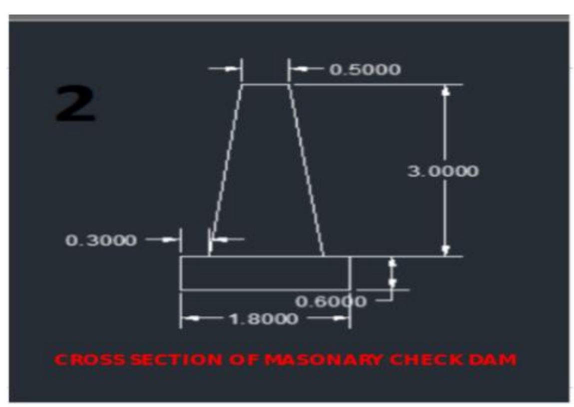


Natural Drainage network order map



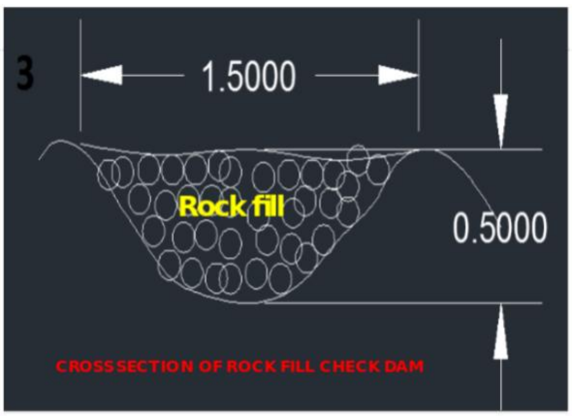
Location of check dam



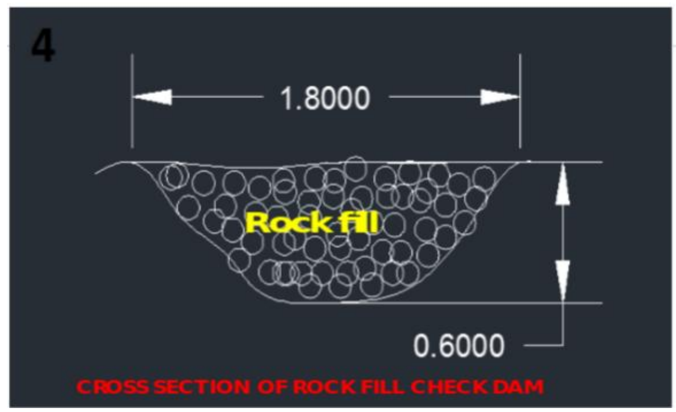


Check dam at location 1

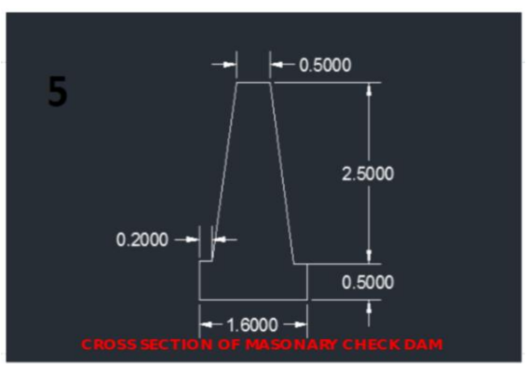
Check dam at location 2



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

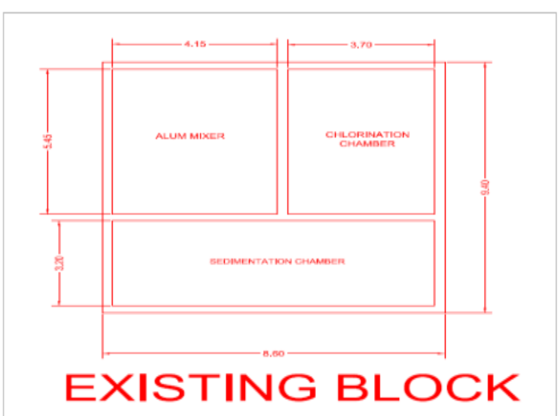
Goal: To use the waste water in an efficient way
Benchmark:

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

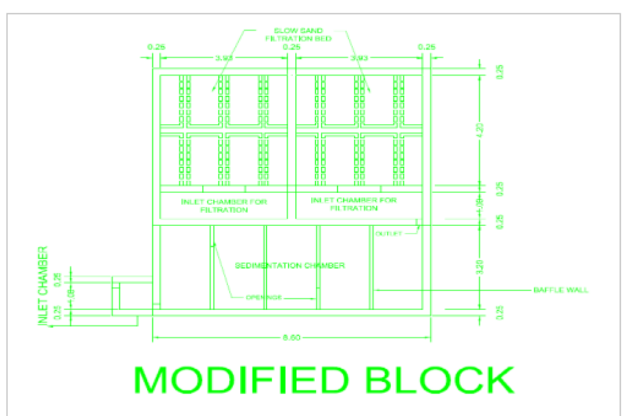
Performance: The waste water of bathrooms pH value, hardness, DO and BOD does not exceed the standard values. Therefore, the college has thought of treating the waste water which are collected from the bathrooms of the hostels to treat it and to use it for gardening purposes. By this process the college 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 colle ge 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	Bael	*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. **In charge Name**: G. Prameela

3.**"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

4. **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.

5. 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

6. Training for Students

- Each year B.Sc.(Ag) students of MSSSoA undergo AELP programme on Organic Research Farm
- Sixteen students of B.Sc. (Ag) final year have undertook the AELP programme during 2016-17, 2017-18, 2018-19.

7. Outcome

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

8. Student's involvement in Unit

Application of Vermiwash for Tomato Crop

Application of Agniastra for Tomato Crop

Pruning of Tomato Crop

9. Trainings and Visits



Visit of NGO's members

Visit of NSDC Official Dr. Gipson Verghese

Visit of Punjab Minister and Prof. Mukti K Mishra

17. COMPOSTING UNIT AT PKD Campus:

1. **Faculty In charge:** Dr.Saurav Barman
2. **Incharge Name**: Mr. E.Sandeep Kumar
3. **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.

4. **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

5. **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.
- Twenty four students of B.Sc(Ag) final year have undertook the AELP programme during 2016-17, 2017-18, 2018-19.

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.

6. 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.

7. 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.

8. Student's involvement in Unit

Chopping of leaves using Shredrer

Release of Earthworms in the Vermicompost pit

Watering the Vermicompost pit

9. 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

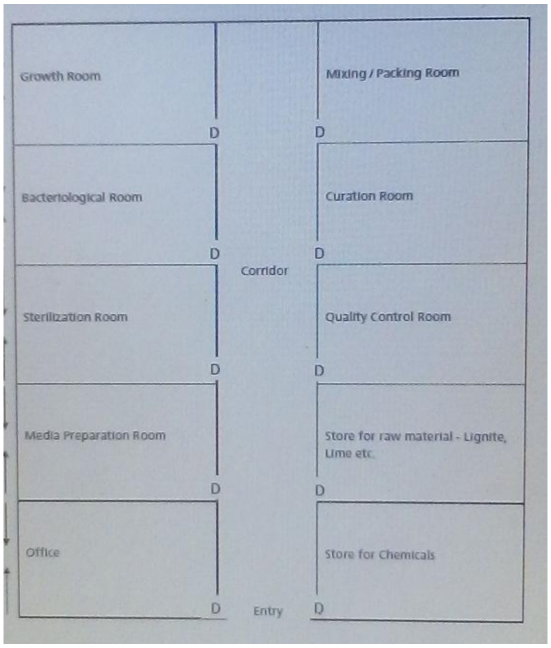
Objectives:

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

Executive Summary

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 natural resources for butterfly 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 Paralakhemundi Spread over 120 acres on the foothills of the Eastern ghats in a serene environment lies the main campus of Centurion University in Paralakhemundi. It is the only technological University in South Odisha.

Block wise area under survey:

Block-1: consist of subunits – 1-9 including Main gate, Playground, Tribal mess, Baitarani hostel, MBA building, protected cultivation, Banana farm and 4th gate.

Block-2: consist of the subunits- 10-18 including Hydroponics unit, Banana orchard, Temple area, CPS school, CRC1, CRC2, Pond area, Eicher lab, and Bus parking.

Block-3: consist of the subunits 19-26 including New C type quarters, Indravati hostel and Student fields, Agro-forestry field, Mango fields, Organic farm, Pond, STP 3 and STP 2.

Block-4: consist of subunits 27-34 including Central mess 1 and 2, Boy’s hostel 1,2,3, A, B, C type quarters, Gram tarang blocks, Welding lab, Hill top, Dhaba, Gram tarang ground, Guest house.

Block-5: consist of subunits 35-41 Horticulture fields, Fishery Pond, Farm machinery lab, Vasco tank, Tribal village, Dairy unit and Forest side.

LIST OF DIFFERENT KINDS OF FLORA FOUND IN THE CAMPUS

SI NO	TREE SPECIES	FAMILY	BLOCK
Timber Trees			
1	*Acacia auriculoformis A. Cunn. ex Benth.*	Fabaceae	B1, B2
2	*Acacia mangium Willd.*	Fabaceae	B1, B3, B5
3	*Alstonia scholaris (L.) R.Br.*	Apocynaceae	B1, B2, B3, B4, B5
4	*Anacardium occidentale L.*	Anacardiaceae	B4, B5
5	*Araucaria heterophylla (Salisb.) Franco*	Araucariaceae	B3, B4
6	*Artocarpus heterophyllus Lam.*	Moraceae	B2, B3, B5
7	*Asparagus racemosus Wild.*		
8	*Azadirachta indica A. Juss.*	Meliaceae	B4, B5
9	*Bambusa vulgaris*	Poaceae	B3
10	*Bauhinia variegate L.*	Fabaceae	B1, B3
11	*Bombax ceiba L.*	Malvaceae	B5
12	*Buchanania lanzan spreng.*	Anacardiaceae	B4, B5
13	*Butea monosperma Lam.*	Fabaceae	B1, B2
14	*Callophylum innophylum L.*	Calophyllaceae	B1, B2, B3, B4, B5
15	*Calotropis gigantea (L.) Dryand.*	Apocyanaceae	B1, B2
16	*Casia seamea Lam.*	Fabaceae	B1, B2, B3, B4, B5
17	*Cocos nucifera L.*	Arecaceae	B1, B2, B3, B4, B5
18	*Dalbergia sissoo Roxb.*	Fabaceae	B1, B3
19	*Delonix regia (Boj. ex Hook.) Raf.*	Fabaceae	B1, B3, B4
20	*Embellica officinalis*	Phyllanthaceae	B5
21	*Ficus benghalensis L.*	Moraceae	B1, B2, B5
22	*Ficus religiosa L.*	Moraceae	B1
23	*Gliricidia seepium (Jacq.) Walp.*	Fabaceae	B1, B2, B3
24	*Gmelina arborea Roxb.*	Lamiaceae	B3, B4, B5
25	*Holarrhaena antidysenterica*	Apocyanacea	B5
26	*Leucaena leucocephala (Lam.) de Wit*	Fabaceae	B2, B3
27	*Mangifera indica L.*	Anacardiaceae	B1, B2, B3, B4, B5
28	*Melia azadirach L.*	Meliaceae	B5
29	*Mimusops elengi L.*	Sapotaceae	B3, B4
30	*Moringa oleifera Lam.*	Moringaceae	B1, B2, B3, B4, B5
31	*Murraya koengii (L.) Sprengel*	Rutaceae	B5
32	*Neolamarckia cadamba (Roxb.) Bosser*	Rubiaceae	B1, B2
33	*Plumeria alba L.*	Apocynaceae	B2, B3

34	*Polyalthia longifolia (Sonn.) Thwaites*	Annonaceae	B1, B2, B4
35	*Pongamia pinnata*	Fabaceae	B1, B2, B3
36	*Psidium guajava L.*	Myrtaceae	B3, B4
37	*Pterocarpus marsupium Roxburgh.*	Fabaceae	B1, B5
38	*Pterospermum xylocarpum*	Sterculiaceae	B4, B5
39	*Samanea samman*	Fabaceae	B1, B2, B3, B4
40	*Saraca asoca (Roxb.) Willd.*	Fabaceae	B3, B5
41	*Schleichera oleosa (Lour.) Oken*	Sapindaceae	B4, B5
42	*Shorea robusta Roth.*	Dipterocarpaceae	B4
43	*Sterospermum colais*	Bignoniaceae	B1, B2
44	*Swietenia macrophyla King.*	Meliaceae	B2, B5
45	*Syzygium cumini L.*	Myrtaceae	B2
46	*Tamarindus indica L.*	Caesalpiniaceae	B4, B5
47	*Taminalia arjuna ((Roxb.) Wight & Arn.*	Combretaceae	B5
48	*Tectona grandis L.*	Lamiaceae	B1, B2, B3, B4, B5
49	*Terminalia catapa L.*	Combretaceae	B5
50	*Ziziphus jojoba Mill.*	Rhamnaceae	B4, B5
CROP SPECIES			
51.	*Anthurium*	Araceae	B2,B1
52.	*Arachis hypogea*	Fabaceae	B2,B3
53.	*Brassica Juncea*	Brassicaceae	B2,B3
54.	*Brassica rapa subsp. chinensis*	Brassicaceae	B1,B2
55.	*Brassica rapa subsp. pekinensis*	Brassicaceae	B3,B4
56.	*Cajanus cajan*	Fabaceae	B2,B3
57.	*Carthamus tinctorius*	Asteraceae	B3
58.	*Cicer arietinum*	Fabaceae	B2
59.	*Corchorus capsularis*	Malvaceae	B2
60.	*Crotalaria juncea*	Fabaceae	B2,B3
61.	*Dendrobium spp*	Orchidaceae	B2,
62.	*Elausine coracana*	Poaceae	B2,B3
63.	*Gerbera jamesonii*	Asteraceae	B1
64.	*Gossypium spp*	Malvaceae	B2,B3
65.	*Helianthus annuus*	Asteraceae	B4,B3
66.	*Lactuca sativa*	Asteraceae	B1,B2,B3
67.	*Lens culinaris*	Fabaceae	B2,B3
68.	*Oryza sativa*	Poaceae	B2,B3
69.	*Pennisetum glaucum*	Poaceae	B2

70.	*Pisum sativum*	Fabaceae	B2,B3
71.	*Saccharum officinarum*	Poaceae	B4,B5,B3
72.	*Sesamum indicum*	Pedaliaceae	B3
73.	*Setaria italica*	Poaceae	B2,B3
74.	*Sorghum bicolar*	Poaceae	B2,B3
75.	*Vigna mungo*	Fabaceae	B2,B3
76.	*Vigna radiata*	Fabaceae	B4,B3
77.	*Zea mays*	Poaceae	B2
	FRUIT AND PLANTATION TREES		
78.	*Aegle marmelos* (L.) Corr.	Rutaceae	B-1,B-5
79.	*Anacardium occidentale* L.	Anacardiaceae	B-1, B-2, B-4, B-5
80.	*Annanas comosus* L.	Bromiliaceae	B-1,B-2,B-5
81.	*Annona reticulata L.*	Annonaceae	B-1
82.	*Annona squamosa L.*	Annonaceae	B-1, B-2, B-3,B-5
83.	*Areca catechu L.*	Arecaceae	B-2, B-5
84.	*Artocarpus heterophyllus* L.	Moraceae	B-1, B-2, B-3, B-4, B-5
85.	*Averrhoea carambola L*	Oxalidaceae	B-3, B-4
86.	*Borasus flabellifer L.*	Arecaceae	B-2,B-3,B-5
87.	*Camelia sinensis* L..	Theaceae	B-4
88.	*Canthium parviflorum*	Rubiaceae	B-3, B-5
89.	*Carica papaya* L.	Caricaceae	B-1,B-2,B-3, B-4, B-5
90.	*Carissa carandas L.*	Apocynaceae	B-3, B-2, B-5
91.	*Cinnamomum verum L.*	Myrtaceae	B-2
92.	*Citrus aurantifolia L*	Rutaceae	B-2
93.	*Citrus reticulata L.*	Rutaceae	B-2,B-5
94.	*Cocus nucifera*	Arecaceae	B-1.B-2,B-3,B-4, B-5
95.	*Coffea robusta L.*	Rubiaceae	B-4
96.	*Emblica officinale L.*	Euphorbiaceae	B-2
97.	*Ficus carica L.*	Moraceae	B-2, B-4
98.	*Garcinia mangostana L.*	guttiferae	B-5
99.	*Litchi chinensis L.*	Sapindaceae	B-1
100.	*Mangifera indica L*	Anacardiaceae	B-1,B-2,B-3,B-4, B-5
101.	*Manilkara achras L.*	Sapotaceae	B-2,B-4
102.	*Morinda citrifolia*	Rubiaceae	B-2, B-3, B-4, B-5
103.	*Musa paradisica L.*	Musaceae	B-1, B-2,B-3, B-5
104.	*Nephelium longan* L	Sapindaceae	B-2
105.	*Phoenix regia L*	Arecaceae	B-2,B-3, B-5
106.	*Phoenix sylvestris L*	Arecaceae	B-2,B-3,B-5,

107.	*Prunus cerasus L*	Rosaceae	B-3
108.	*Prunus communis L.*	Rosaceae	B-1
109.	*Psidium gujava L.*	Myrtaceae	B-1, B-2, B-3
110.	*Punica granatum L.*	Punicaceae	B-1
111.	*Selenicereus undatus*	Cactaceae	B-4
112.	*Tamarindus indica L.*	Leguminaceae	B-3, B-4, B-5
113.	*Ziziphus oenoplia L*	Rhamanaceae	B-3, B-5
114.	*Zizyphus mauritiana* L.	Rhamnaceae	B-2, B-3,B-5
VEGETABLES			
115.	*Abelmoschus esculentus L.*	Malvaceae	B-2, B-5
116.	*Abelmoschus manihot* (L.) subsp. T*etraphyllus*	Malvaceae	B-2
117.	*Allium cepa L*	Amaryllidaceae	B-1, B-2, B-5
118.	*Alocasia macrorrhiza L*	Araceae	B-3
119.	*Alternanthera sessillis*	Amaranthaceae	B-1, B-2, B-5
120.	*Amaranthus blitum L.*	Amaranthaceae	B-2, B-5
121.	*Amaranthus tricolor*	Amaranthaceae	B-2
122.	*Apium graveolens L.*	Umbelliferae	B-2
123.	*Basella alba L.*	Basillaceae	B-2
124.	*Basella rubra L.*	Basillaceae	B-2, B-5
125.	*Brassica chinensis*	Cruciferae	B-2, B-5
126.	*Brassica oleracea var. acephala*	Cruciferae	B-2, B-5
127.	*Brassica oleracea var. botrytis*	Cruciferae	B-2, B-5
128.	*Brassica oleracea var. gemmifera*	Cruciferae	B-2, B-5
129.	*Brassica oleracea var. gongylodes*	Cruciferae	B-2, B-5
130.	*Brassica oleracea var. italica*	Cruciferae	B-2, B-5
131.	*Brassica oleracea var.capitata*	Cruciferae	B-2,B-5
132.	*Brassica pekinensis var rubra*	Cruciferae	B-2, B-5
133.	*Brassica rapa* L.	Cruciferae	B-2
134.	*Capsicum annuam var. grossum L.*	Solanaceae	B-1
135.	*Capsicum annum var longum L.*	Solanaceae	B-2, B-5
136.	*Citrullus lanatus L*	Cucurbitaceae	B-1
137.	*Coccinia indica L*	Cucurbitaceae	B-1, B-2,B-3, B-4,B-5
138.	*Coriandrum sativum L*	Umbelliferae	B-1, B-2,B-5
139.	*Cucumis sativus L.*	Cucurbitaceae	B-1, B-2, B-5
140.	*Cucurbita moschata L*	Cucurbitaceae	B-5
141.	*Cucurbita pepo L*	Cucurbitaceae	B-2,B-5
142.	*Cyamopsis tetragonolobus L*	Leguminaceae	B-2, B-5

143.	*Cynara scolymus L*	Compositae	B-2
144.	*Daucus carota L.*	Umbelliferae	B-5
145.	*Ipomea aquatica L*	Convolvulaceae	B-1, B-2
146.	*Lablab purpureus L*	Leguminaceae	B-2,B-3,B-5
147.	*Lactuca sativa L.*	Compositae	B-2, B-4
148.	*Luffa acutangular L*	Cucurbitaceae	B-2, B-3, B-5
149.	*Mentha arvens L.*	Piperaceae	B-2
150.	*Momordica chanrantia L.*	Cucurbitaceae	B-1,B-2,B-3,B-5
151.	*Moringa oleifera L.*	Moringaceae	B-2, B-5
152.	*Murraya koenigii L*	Rutaceae	B-2, B-3, B-4
153.	*Phaseolus vulgaris L.*	Leguminaceae	B-5
154.	*Portilaca sps.*	Portulaceaceae	B-2,B-3,B-5
155.	*Raphanus sativus L.*	Cruciferae	B-2, B-5
156.	Rumex vesicarius L.	Polygonaceae	B-2
157.	*Sesbania grandiflora L*	Leguminaceae	B-2
158.	*Solanum indicum L.*	Solanaceae	B-2, B-5
159.	*Solanum lycopersicum L*	Solanaceae	B-2, B-5
160.	*Solanum lycopersicum var. cerasiforme*	Solanaceae	B-2
161.	*Solanum melongena L.*	Solanaceae	B-1, B-2, B-5
162.	*Solanum tuberosum L*	Solanaceae	B-1
163.	*Vigna unguiculata L.*	Leguminaceae	B-5
164.	*Zea mays var. rugosa L.*	Poaceae	B-3, B-5
MEDICINAL AND AROMATIC CROPS			
165.	*Acacia longifolia*	Leguminaceae	B-2
166.	*Adenanthera pavonine*	Fabaceae	B-2
167.	*Allamanda purpurea*	Acanthaceae	B-2
168.	*Bixa ollerana*	Bixaceae	B-2
169.	*Bombax ceiba*	Malvaceae	B-2
170.	*Butea monosperma*	Leguminaceae	B-2
171.	*Callistemon lanceolatus*	Myrtaceae	B-2
172.	*Citharexylum spinosum*	Verbenaceae	B-2
173.	*Clerodendrum indicum*	Lamiaceae	B-2
174.	*Cymbopogon sp*	Gramineae	B-2
175.	*Endospermum diadenum*	Euphorbiaceae	B-2
176.	*Gardenia jasminoides*	Rubiaceae	B-2
177.	*Gmelina arborea*	Verbenaceae	B-2
178.	*Grewia asiatica*	Tiliaceae	B-2
179.	*Hamelia patens*	Rubiaceae	B-2

180.	*Juglans regia*	Juglandaceae	B-2
181.	*Kaempferia parviflora*	Zingeberaceae	B-2
182.	*Kigelia Africana*	Bignoniaceae	B-2
183.	*Lagerstroemia flos-reginae*	*Lythraceae*	B-2
184.	*Lawsonia inermis*	*Lythraceae*	B-2
185.	*Leucophyllum frutescens*	Scrophulariaceae	B-2
186.	*Ligustrum sinense*	Oleaceae	B-2
187.	*Limonia acidissima*	Rutaceae	B-2
188.	*Manilkara hexandra*	Sapotaceae	B-2
189.	*Melia azaderach*	Meliaceae	B-2
190.	*Mimusops elengii*	Sapotaceae	B-2
191.	*Murraya exotica*	Rutaceae	B-2
192.	*Nyctanthes arbor-tristis*	Nyctanthaceae	B-2
193.	*Oroxylum indicum*	Bignoniaceae	B-2
194.	*Phyllanthus Emblica*	Phyllanthaceae	B-2
195.	*Pimenta dioica*	Myrtaceae	B-2
196.	*Plantanus racemose*	Platanaceae	B-2
197.	*Plumeria pudica*	Apocynaceae	B-2
198.	*Prunus serotina*	Rosaceae	B-2
199.	*Psoropis cineraria*	Fabaceae	B-2
200.	*Pterocarpus santalinus*	Leguminaceae	B-2
201.	*Pterocarya rhoifolia*	Juglandaceae	B-2
202.	*Putranjiva roxburghii*	Euphorbiaceae	B-2
203.	*Quercus cestaneifolia*	Fagaceae	B-2
204.	*Rhus glabra*	Anacardiaceae	B-2
205.	*Salix sp*	Salicaceae	B-2
206.	*Santalum album*	*Santalaceae*	B-2
207.	*Sapindus mukorossi*	Sapindaceae	B-2
208.	*Spathodea campanulate*	Bignoniaceae	B-2
209.	*Stachytarpheta jamaicensis*	Verbenaceae	B-2
210.	*Strychnos spinosa*	Loganiaceae	B-2
211.	*Swietenia macrophylla*	Meliaceae	B-2
212.	*Syzigium sp*	Myrtaceae	B-2
213.	*Terminalia catappa*	Combretaceae	B-2
214.	*Thespesia populnea*	Malvaceae	B-2
CLIMBERS			
215.	*Allamanda blanchetti* A.DC.	Apocynaceae	B-2
216.	*Allamanda cathartica var grandiflora*	Apocynaceae	B-2

217.	*Artabotrys odoratissimus*	Annonaceae	B-2
218.	*Asparagus racemosus* Willd.	Asparagaceae	B-2
219.	*Bougainvillea spp.*	Nyctaginaceae	B-2
220.	Cardiospermum halicacabum	Sapindaceae	
221.	Cissus nodosa	Vitaceae	B-3, B-5
222.	Cissus striata	Vitaceae	B-5
223.	*Clerodendron splendens*	Verbanaceae	B-1
224.	*Clitoria ternatea L*	Leguminaceae	B-1,B-2,B-5
225.	*Coccinia grandis* (L.)	Cucurbitaceae	B-3,B-4
226.	*Cuscuta reflexa* Roxb.	Cuscutaceae	B-4
227.	Epipremum aureum L	Araceae	B-2,B-3,B-5
228.	Gloriosa superba	Colchicaceae	B-5,B-3
229.	*Ipomea cairica*	Convolvulaceae	B-2,B-5
230.	*Ipomoea obscura* Ker.-Gawl.	Convolvulaceae	B-4
231.	*Ipomoea quamoclit* L.	Convolvulaceae	B-3
232.	*Ipomoea sepiaria Koenig* ex Roxb.	Convolvulaceae	B-3,B-4
233.	*Jacquemontia pentantha L.*	Convolvulaceae	B-1,B-4
234.	*Jasminum nitidum L.*	Oleaceae	B-2
235.	Nastrucium	Tropaeolaceae	B-5
236.	*Piper betel* L	Piperaceae	B-2
237.	*Piper longum* L.	Piperaceae	B-2
238.	*Pyrostegia venusta*	Bignoniaceae	B-2
239.	*Quisqualis indica* L.	Combretaceac	B-2
240.	Sarcopetalum harveyanum L.	Menispermaceae	B-5, B-3
241.	Sicyos angulatus L.	Cucurbitaceae	B-5,B-3
242.	*Syngonium podophyllum* Schott	Araceae	B-2
243.	*Tinospora cordifolia*(Thunb.) Miers	Menispermaceae	B-2
	SHRUBS		
244.	*Acalypha hispida L*	Euphorbiaceae	B-1,B-2
245.	*Allamanda grandiflora L.*	Apocynaceae	B-1, B-2, B-3
246.	*Aralia*	Araliaceae	B-1,B-2,B-3,B-4, B-5
247.	*Artabotrys odoratissimus L*	Annonaceae	B-2, B-5
248.	*Barleria cristata L.*	Acanthaceae	B-1, B-2,B-3,B-4,B-5
249.	*Bauhinia tomentosa L*	Leguminaceae	B-1, B-2,B-3,B-5
250.	*Beloperone guttata L.*	Acanthaceae	B-2
251.	*Caesalpinia pulcherrima L.*	Leguminaceae	B-1,B-2,B-3, B-5

252.	*Calotropis gigantia L.*	Apocynaceae	B-5
253.	*Calotropis procera L.*	Apocynaceae	B-4, B-5
254.	*Clerodendron inerme L.*	Verbenaceae	B-1
255.	*Crossandra*	Acanthaceae	B-2,B-3,B-5
256.	*Duranta plumieri*	Verbenaceae	B-1,B-2,B-3,B-4,B-5
257.	*Hibiscus mutabilis*	Malvaceae	B-1,B-2, B-3,B-4, B-5
258.	*Hibiscus rosasinensis*	Malvaceae	B-2,B-5
259.	*Ixora*	Rubiaceae	B-1,B-2,B-3, B-4,B-5
260.	*Lantana camera*	Verbenaceae	B-2,B-3, B-4, B-5
261.	*Mimosa pudica L.*	Fabaceae	B-1,B-2,B-3,B-4,B-5
262.	*Poinsettia pulcherrima*	Euphorbiaceae	B-1,B-2,B-3,B-4,B-5
FOLIAGE PLANTS			
263.	*Acalypha hispida*	Euphorbiaceae	B-1, B-2,B-4,B-5
264.	*Acalypha wilkesiana Mull.*	Euphorbiaceae	B-2,B-4,B-5
265.	*Agave americana*	Amaryllidaceae	B-2,B-4
266.	*Agave salmiana Otto ex Salm-Dyck*	Asparagaceae	B-2
267.	*Agloanema spp.*	Araceae	B-2
268.	*Aglonemma nitidum*	Araceae	B-2
269.	*Alternanthera bicolour*	Amaranthaceae	B-2
270.	*Araucaria spp.*	Coniferae	B-2,B-1
271.	*Asparagus spp.*	Lilaceae	B-2
272.	*Begonia spp.*	Bignoniaceae	B-1,B-2,B-4,B-5
273.	*Bryophyllum sp.*	Crassulaceae	B-2
274.	*Caladium bicolour*	Araceae	B-2
275.	*Calathea spp*	Maranthaceae	B-2
276.	*Callisia repens*	Commelinaceae	B-2
277.	*Chlorophytm comosum variegate*	Liliaceae	B-2,B-1
278.	*Codiaeum variegatum*	Euphorbiaceae	B-1,B-2,B-3,B-4,B-5
279.	*Coleus spp.*	Lamiaceae	B-1,B-2,B-3,B-4,B-5
280.	*Cordyline fruticosa(L.) A.Chev. (L.)Nees.*	Agavaceae	B-1,B-2,B-3,B-4,B-5
281.	*Crassula ovata*	Crassulaceae	B-2
282.	*Ctenanthe lubbersiana*	Marantaceae	B-2
283.	*Cycas revoluta*	Cycadaceae	B-1,B-2,B-3,B-4,B-5
284.	*Dieffenbachia maculate*	Araceae	B-1,B-2,B-3,,B-5
285.	*Dracaena marginata*	Asparagaceae	B-1,B-2,B-3,,B-5
286.	*Dracaena marginataLam. 'tricolor'*	Agavaceae	B-2,B-3
287.	*Dracaena sanderiana Mast.*	Asparagaceae	B-2,B-3,B-5

288.	*Dracena reflexa*	Asparagaceae	B-2,B-3
289.	*Duranta erecta*	Verbenaceae	B-1,B-2,B-3,B-4,B-5
290.	*Duranta goldiana*	Verbenaceae	B-1,B-2,B-3,B-4,B-5
291.	*Duranta repens L.*	Verbenaceae	B-1,B-2,B-3,B-4,B-5
292.	*Ficus elastioca*	Moraceae	B-2
293.	*Juniperus chinensis*	Cupressaceae	B-2
294.	*Pedilanthus tithymaloides*	Euphorbiaceae	B-2,B-3,B-4,B-5
295.	*Philodendron spp.*	Araceae	B-1,B-2,B-5
296.	*Ravenala madagascariensis*	Strelitziaceae	B-1,B-2
297.	*Roheo bicolor*	Commelinaceae	B-2
298.	*Sansevieria trifasicata*	Aspargaceae	B-1,B-2
299.	*Scindapsus aureus*	Araceae	B-2,B-5
300.	*Syngonium podophyllum*	Araceae	B-1,B-2,B-3,B-4,B-5
301.	*Tradescantia pallida*	Commelinaceae	B-1,B-2,B-3,B-4,B-5
302.	*Tradescantia spatheca*	Commenlinaceae	B-1,B-2,B-3,B-4,B-5
303.	*Tradescantia zebrina*	Commelinaceae	B-2
304.	*Zamia furcarea*	Asparagaceae	B-2
FLOWERING PLANTS			
305.	*Adenium obesum*	Apocynaceae	B-1,B-2,B-4,B-5
306.	*Alyssum maritimum*	Compositeae	B-2
307.	*Barleria cristata L.*	acanthaceae	B-2
308.	*Barleria prionitis L.*	acanthaceae	B-2
309.	*Caesalpinia pulcherrima*	Fabaceae	B-1,B-2,B-4,B-5
310.	*Canna indica*	Cannaceae	B-2
311.	*Celosia argentia*	Amranthaceae	B-2
312.	*Chrysanthemum cinerariifolium*	asteraceae	B-2,B-3
313.	*Chrysanthemum grandiflorum*	Compositeae	B-2,B-3
314.	*Cosmos bipinnatus*	Compositeae	B-2
315.	*Cosmos caudatus Kunth*	asteraceae	B-2
316.	*Crossandra infundibuliformis*	Acanthaceae	B-1,B-2,B-5
317.	*Cuphea hyssopifolia Kunth*	Lythraceae	B-2
318.	*Euphorbia heterophylla L.*	Euphorbiaceae	B-2
319.	*Euphorbia hirta L.*	Euphorbiaceae	B-2
320.	*Euphorbia indica Lam*	Euphorbiaceae	B-2
321.	*Euphorbia mili*	Euphorbiaceae	B-2,B-5
322.	*Euphorbia pulcherrima Willd. ex Klotzsch*	Euphorbiaceae	B-2
323.	*Euphorbia tithymiloides L.*	Euphorbiaceae	B-1,B-2
324.	*Gardenia carinata Wall. ex Roxb.*	Rubiaceae	B-2,

325.	*Gardenia jasminoides J.Ellis*	Rubiaceae	B-2
326.	*Gerbera jamesonii*	Compositeae	B-1,B-2
327.	*Gomphrena globosa L.*	Amaranthaceae	B-2
328.	*Hamelia patens Jacq.*	Rubiaceae	B-1
329.	*Helianthus annus*	Compositeae	B-2,B-3
330.	*Hibiscus canabinus L*	Malvaceae	B-1.B-2,B-3,B-4,B-5
331.	*Hibiscus mutabilis L.*	Malvaceae	B-1.B-2,B-3,B-4,B-5
332.	*Hibiscus rosa-sinensis L.*	Malvaceae	B-1.B-2,B-3,B-4,B-5
333.	*Hymenocallis litterolis*	Amaryllidaceae	B-2
334.	*Impatiens balsamina L.*	Balsaminaceae	B-2
335.	*Impatiens glandulifera Royle*	Balsaminaceae	B-2
336.	*Ipomoea carnea Jacq.*	Convolvulaceae	B-1,B-2
337.	*Ixora coccinea*	Rutaceae	B-1.B-2,B-3,B-4,B-5
338.	*Jasminium auriculatum*	Oleaceae	B-1,B-2,B-5
339.	*Jasminium sambac*	Oleaceae	B-1,B-2,B-5
340.	*Jatropha gossypifolia L.*	Euphorbiaceae	B-2,B-5
341.	*Lilium spp*	Lilliaceae	B-2
341.	*Malvaviscus arboreus Cav.*	malvaceae	B-1.B-2,B-3,B-4,B-5
342.	*Mimosa pudica L.*	Mimosaceae	B-1,B-2,B-5
343.	*Mirabilis jalapa L.*	Nyctaginaceae	B-2
344.	*Orchid spp.*	Orchidaceae	B-2
345.	*Polianthus tuberosa*	Amaryllidaceae	B-2,B-3
346.	*Portulaca grandiflora*	Portulaceae	B-1.B-2,B-3,B-4,B-5
347.	*Portulaca oleracea L. var. oleracea*	Portulaceae	B-1.B-2,B-3,B-4,B-5
348.	*Portulaca pilosa L. subsp. grandiflora (Hook.) Geesink*	Portulaceae	B-1.B-2,B-3,B-4,B-5
349.	*Rosa alba L.*	Rosaceae	B-2
350.	*Rosa centifolia L*	Rosaceae	B-2
350.	*Rosa chinenesis Jacquin*	Rosaceae	B-2
351.	*Rosa damascina Miller*	Rosaceae	B-2
352.	*Rosa indica L.*	Rosaceae	B-1,B-2
353.	*Rosa odorata (Andr.)Sweet var. odorata*	Rosaceae	B-2
354.	*Ruellia brittoniana* Leonard	Acanthaceae	B-2
355.	*Strelitzia reginae*	Strelitziaceae	B-2
356.	*Tagetes erecta*	Compositeae	B-1.B-2,B-3,B-4,B-5
357.	*Tagetes patula*	Compositeae	B-1.B-2,B-3,B-4,B-5
358.	*Tecoma stans (L.) Kunth.*	bignoniaceae	B-2,B-5
359.	*Zephyranthes candida*	Amaryllidaceae	B-2

360.	*Zephyranthes candida (Lindl.)Herb.*	Amaryllidaceae	B-2
361.	*Zephyranthes rosea(Lindl.)*	Amaryllidaceae	B-2
362.	*Zinnia elegans Jack.*	Asteraceae	B-2
PALMS, FERNS, CACTUS AND GROUND COVERS			
363.	*Alternanthera ficodea*	Amranthaceae	B-2
364.	*Beaucarnea recurvata*	Arecaceae	B-2
365.	*Cactus spp.*	Cactaceae	B-1,B-2
366.	*Crysalidocarpus lutesens*	Arecaceae	B-1,B-2
367.	*Cuphea gerlonica*	Lythraceae	B-1,B-2
368.	*Cycas revoluta*	Arecaceae	B-1.B-2,B-3,B-4,B-5
369.	*Dypsis leptocheilos*	Arecaceae	B-1,B-2
370.	*Hyophorbe legenicaulis*	Arecaceae	B-1,B-2
371.	*Iresine lindenii*	Amranthaceae	B-2
372.	*Livingstonia rotundifolia*	Arecaceae	B-1,B-2
373.	*Phoenix roebelenii*	Arecaceae	B-5
374.	*Raphis excelsa*	Arecaceae	B-1,B-2
375.	*Roystonea regia*	Arecaceae	B-1,B-2
376.	*Tridax procumbens*	Asteraceae	B-2
GRASSES			
377.	*Aristida setacea* Rctz.	Passifloraceae	B-1,B-2,B-3,B-4
378.	*Bambusa vulgaris Schrad.* Ex J.C.Wendl.	Asclepidaceae	B-2, B-5
379.	*Bothriochloa pertusa* (L.) A. Camus	Verbenaceae	B-1,B-2,B-3,B-4, B-5
380	*Brachiaria distachya* (L.) Stapf	Araceae	B-1,B-2,B-3,B-4, B-5
381.	*Brachiaria mutica* (Forssk.) Stapf	Piperaceae	B-2
382.	*Brachiaria ramosa* (L.) Stapf	Piperaceae	B-1,B-5
383.	*Chloris barbata* Sw.	Bignoniaceae	B-1,B-5
384.	*Chrysopogon aciculatus* (Retz.) Trin.	Bignoniaceae	B-1,B-2,B-3,B-4, B-5
385.	*Cynodon dactylon* (L.) Pers.	Combretaceac	B-1,B-2, B-3, B-4,B-5
386.	*Cyperus brevifolius* (Rottb.) Hassk.	Araceae	B-3, B-5
387.	*Cyperus compactus* Retz.	Menispermaceae	B-1,B-3
388.	*Cyperus difformis* L.	Araceae	B-1,B-3
389.	*Cyperus halpan* L.	Acanthaceae	B-2
390.	*Cyperus imbricatus* Retz.	Acanthaceae	B-1,,B-2, B-3, B-4
391.	*Cyperus iria* L.	Menispermaceae	B-1,B-3,B-4
392.	*Cyperus triceps* Endl.	Cyperaceae	B-1,B-3,B-4
393.	*Dactyloctenium aegypticum* (L.) P.Beauv.	Poaceae	B-1,B-2,B-3
394.	*Digitaria abludens* (Roem. & Schult.) Veldk.	Poaceae	B-3
395.	*Digitaria ciliaris* (Retz.) Koeler	Poaceae	B-1,B-2,B-3

396.	*Echinochloa colona (*L.) Link	Poaceae	B-1,B-2,B-3
397.	*Eleusine indica (*L.) Gaertn.	Poaceae	B-1,B-2,B-3,B-4
398.	*Elusine coracana (*L.)Gaertn	Poaceae	B-2
399.	*Eragrostis ciliaris* (L.) R.Br.	Poaceae	B-3
400.	*Eragrostis ciliata* Roxb. Nees	Poaceae	B-1,B-2,B-3,B-4
401.	*Eragrostis unioloides* (Retz.) Nees ex Steud.	Poaceae	B-1,B-2,B-3,B-4
402.	*Eriochloa procera* (Retz.)Hubbard	Poaceae	B-1,B-2,B-3,B-4
403.	*Paspalum scrobiculatum* L.	Poaceae	B-2,B-3
404.	*Paspalum vaginatum* Sw.	Poaceae	B-1,B-3
399.	*Pennisetum pedicellatum* Trin.	Poaceae	B-1,B-3,B-4
400.	*Pennisetum purpureum* Schumach	Poaceae	B-3,B-4
401.	*Perotis indica* (L.) Kuntz	Poaceae	B-3,B-4
402.	*Pogonantherum crinitum*(Thunb.) Kunth	Poaceae	B-2
404.	*Setaria pumila* (Poir.) Roem. & Schult.	Poaceae	B-1,B-3,B-4
405.	*Setaria verticillata* (L.) P.Beauv.	Poaceae	B-1,B-4

Pic: Rose garden, CUTM, Paralakhemundi.

Pic: Fish pond, CUTM, Paralakhemundi.

Pic: Fish pond, CUTM, Paralakhemundi.

FAUNAL DIVERSITY

A survey on faunal diversity in our Paralakhemundi campus of Centurion University of Technology and Management has done from 1st of December 2020 to 25th of December 2020. Based on the survey, we prepared report and hereby the report is submmited to the Department of Entomology, MSSSOA, CUTM, Paralakhemundi on 30th of December.

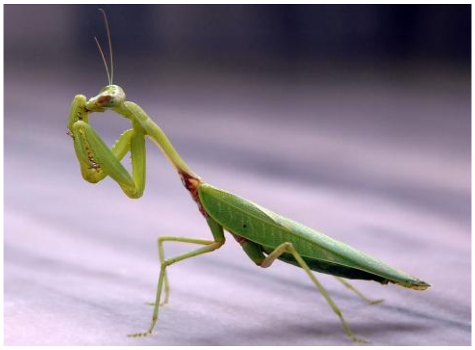
ANIMAL	Sl.No.	Common name	Scientific name
Invertebrates	1.	Preying mantid	*Mantis religiosa*
	2.	Two-spotted assassin bug	*Platymeris biguttatus*
	3.	Scarlet skimmer	*Crocothemis servilia*
	4.	Globe skimmer	*Pantala flavescens*
	5.	Slender skimmer	*Orthetrum sabina*
	6.	Great spreadwing	*Archilestes grandis*
	7.	Coconut rhinoceros beetle	*Oryctes rhinoceros*
	8.	Dung beetle	*Dichotomius carolinus*
	9.	Six-spot ground beetle	*Anthia sexguttata*
	10.	Dark grass blue	*Zizeeria knysna*
	11.	Tussock moth	*Lymantria sp.*
	12.	Swallowtail butterfly	*Papilio demoleus*
	13.	Rosy gypsy moth	*Lymantria mathura*
	14.	Indian honey bee	*Apis cerana indica*
	15.	Rock bee	*Apis dorsata*
	16.	Beet webworm moth	*Spoladea recurvalis*
	17.	Quaker butterfly	*Neopithecops zalmora*
	18.	Chocolate pansy	*Junonia iphita*
	19.	The Tiny grass blue	*Zizula hylax*
	20.	Silverline	*Cigaritis vulcanus*
	21.	Cucumber moth	*Diaphania indica*
	22.	Sugarcane looper	*Mocis frugalis*
	23.	The common evening brown	*Melanitis leda*
	24.	Green silk moth	*Thrlocha varians*
	25.	Peacock pansy	*Junonia almosa*

	26.	Common Pierrot	*Castaleus rosimon*
	27.	Common Branded Redeye	*Matapa aria*
Vertebrates	28.	Chicken bird	*Gallus gallus domesticus*
	29.	Dog	*Canis lupus familiaris*
	30.	Cat	*Felis catus*
	31.	Cattle	*Bos indicus*
	32.	Domestic water buffalo	*Bubalus bubalis*
	33.	Catla fish	*Labeo catla*
	34.	Rohu fish	*Labeo rohita*
	35.	Mrigal carp	*cirrhinus mrigala*
	36.	*Cyprinus rubrofuscus*	Cyprinidae
	37.	*Cyprinus carpio*	Cyprinidae
	38.	*Poecilia reticulata*	Poeciliidae
	39.	*Poecilia sphenops*	Poeciliidae
	40.	*Danio rerio*	Cyprinidae
	41.	*Pterophyllum scalare*	Cichlidae
	42.	*Carassius auratus*	Cyprinidae
	43.	*Cyprinus rubrofuscus var koi*	Cyprinidae

FAUNAL DIVERSITY

1. **Scientific name:** *Mantis religiosa*

CLASSIFICATION
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Dictyoptera
Family: mantidae
Genus: *Mantis*
Species: *religiosa*
LOCATION
Centurion University of technology and management, Parlakhen



GENERAL CHARACTERISTICS

Mantises are distributed worldwide in temperate and tropical habitats. They have triangular heads with bulging eyes supported on flexible necks. Their elongated bodies may or may not have wings, but all Mantidea have forelegs that are greatly enlarged and adapted for catching and gripping prey; their upright posture, while remaining stationary with forearms folded, has led to the common name praying mantis.

2. **Scientific name:** *Poekilocerus pictus*

CLASSIFICATION

Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Orthoptera
Family: Pyrgomorphidae
Genus: ***Poekilocerus***
Species: ***pictus***

LOCATION

Centurion University of technology and management, Parlakhemundi Campus.

GENERAL CHARACTERISTICS

Poekilocerus pictus is a large brightly coloured grasshopper found in the Indian subcontinent. Nymphs of the species are notorious for squirting a jet of liquid up to several inches away when grasped. The half-grown immature form is greenish-yellow with fine black markings and small crimson spots. The mature grasshopper has canary yellow and turquoise stripes on its body, green tegmina with yellow spots, and pale red hind wings. It changes its outward appearance by molting. The grasshopper feeds on the poisonous plant *Calotropis gigantea*.Upon slight pinching of the head or abdomen, the half-grown immature form ejects liquid in a sharp and sudden jet, with a range of two inches or more, from a dorsal opening between the first and second abdominal segments. The discharge is directed towards the pinched area and may be repeated several times. The liquid is pale and milky, slightly viscous and bad-tasting, containing cardiac glycosides that the insect obtains from the plant it feeds upon.

3. **Scientific name:** *Platymeris biguttatus*

CLASSIFICATION

Kingdom: Animalia

Phylum: Arthropoda

Class: Insecta

Order: Hemiptera

Family: Reduviidae

Genus: *Platymeris*

Species: *biguttatus*

LOCATION

Centurion University of technology and management, Parlakhemu

GENERAL CHARACTERISTICS

Platymeris biguttatus or two-spotted assassin bug is a venomous predatory true bug of west and southwest African origin ranging in size from 10–40 mm. As a true bug of the order hemiptera, it has needle like mouth parts designed for sucking juices out of plants or other insects instead of chewing. *P. biguttatus* has sharp stylets in its proboscis or rostrum used to pierce the exoskeleton of its prey. Saliva is then injected into the prey which liquifies its tissues, and the rostrum is then used to suck out the digested fluids. If disturbed, it is capable of a defensive bite considered to be more painful than a bee sting. It is also known to spit venom that can cause temporary blindness in humans

4. **Scientific name:** *Crocothemis servilia*

Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Odonata
Infraorder: Anisoptera
Family: Libellulidae
Genus: *Crocothemis*
Species: *servilia*

LOCATION

Centurion University of technology and management, Parlakhemundi Campus

GENERAL CHARACTERISTICS

It is a medium sized blood-red dragonfly with a thin black line along the mid-dorsal abdomen. Its eyes are blood-red above, purple laterally. Thorax is bright ferruginous, often blood-red on dorsum. Abdomen is blood-red, with a narrow black mid-dorsal carina. Anal appendages are blood-red. Female is similar to the male; but with olivaceous-brown thorax and abdomen. The black mid-dorsal carina is rather broad. It breeds in ponds, ditches, marshes, open swamps and rice fields.

5. **Scientific name:** *Pantala flavescens*

CLASSIFICATION

Kingdom:Animalia
Phylum:Arthropoda
Class: Insecta
Order: Odonata
Infraorder: Anisoptera
Family: Libellulidae
Genus: *Pantala*
Species: *flavescens*

LOCATION

Centurion University of technology and management, Parlakhemundi Campus.

GENERAL CHARACTERISTICS

The dragonfly is up to 4.5 cm long, reaching wingspans between 7.2 cm and 8.4 cm. The front side of the head is yellowish to reddish. The thorax is usually yellow to golden coloured with a dark and hairy line. There were also specimens with a brown or olive thorax. The abdomen has a similar colour as the thorax. The wings are clear and very broad at the base. There, too, there are some specimens with olive, brown and yellow wings. On Easter Island there are wandering gliders with black wings

6. Scientific name: *Orhtetrum sabina*

CLASSIFICATION

Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Odonata
Infraorder: Anisoptera
Family: Libellulidae
Genus: *Orthetrum*
Species: *sabina*

LOCATION

Centurion University of technology and management, Parlakhemundi

GENERAL CHARACTERISTICS

It is a medium-sized dragonfly with a wingspan of 60-85mm. Adults are grayish to greenish yellow with black and pale markings and green eyes. Its abdomen is greenish-yellow, marked with black. It is very similar to Orthetrum serapia in appearance, with both species appearing in northern Australia. Pale markings on segment four of the abdomen do not extend into the posterior section when viewed from above on Orthetrum sabina. Females are similar to males in shape, color and size; differing only in sexual characteristics. This dragonfly perches motionless on shrubs and dry twigs for long periods. It voraciously preys on smaller butterflies and dragonflies

7. **Scientific name:** *Archelestes grandis*

CLASSIFICATION
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Odonata
Suborder: Zygoptera
Family: Lestidae
Genus: *Archilestes*
Species: *grandis*

LOCATION
Centurion University of technology and management, Pa

GENERAL CHARACTERISTICS
The great spreadwing is one of the largest North American spreadwings, with a length of 2-2.4 inches and a wingspan of 3 inches. The thorax of the male is dull greenish bronze above it is a broad diagonal yellow stripe on sides. It is also the only species with a broad yellow racing stripe on the sides of thorax. The abdomen is dark with a blue-gray tip. Its eyes and face are blue. Females are similar to males but are more brown on the body. Her eyes are more of a paler blue than the male. The yellow stripe also occurs on the female great spreadwing. When females are laying eggs they may appear in a putty-color. It is much the same color as the withered leaves in which they lay eggs.

8. Scientific name: *Oryctes rhinoceros*

CLASSIFICATION
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Coleoptera
Family: Scarabaeidae
Subfamily: Dynastinae
Tribe: Oryctini
Genus: *Oryctes*
Species: *rhinoceros*

LOCATION
Centurion University of technology and management, Pa

GENERAL CHARACTERISTICS
The Asiatic rhinoceros beetle, coconut rhinoceros beetle or coconut palm rhinoceros beetle, (Oryctes rhinoceros) is a species of rhinoceros beetle of the family Scarabaeidae. O. rhinoceros attacks the developing fronds of raffia, coconut, oil, and other palms in tropical Asia and a number of Pacific islands. Damaged fronds show typical triangular cuts. The beetle kills the palms (particularly newly planted ones) when the growing point is destroyed during feeding. They also infest dead trunk debris.

9. **Scientific name:** *Dichotpmius carlolinus*

CLASSIFICATION
Kingdom: Animalia
Subphylum: Hexapoda
Class: Insecta
Order: Coleoptera
Suborder: Polyphaga
Superfamily: Scarabaeoidea
Subfamily: Scarabaeinae

Genus: *Dichotomius*
Species: *carolinus*

LOCATION
Centurion University of technology and management, Parlakhemundi Campus.

GENERAL CHARACTERISTICS
Dichotomius carolinus are commonly know as Dung Beetles. They are approximately 3/8" - 3/4" in size. The Dung Beetle gets it's name from it primary source of food, animal waste. There are three types of Dung Beetles which are classified by their behaviors. Tunnelers, dig through the manner and create elaborate shafts with different chambers for living, storage of dung, and for incubating larvae. Dwellers lay eggs inside the dung pats or just under dung pats. The last group, Rollers, are what Dichotomius carolinus belong to. Rollers, collect dung and compact it into a sphere. These beetles then roll the ball away from the and burry it to consume later, and as a source of food for eggs. Dichotomius carolinus are know to feed on other food sources, such as fungi, when fresh dung cannot be found. Dung Beetles exhibit bilateral symmetry, have six legs, and a specialized adaptations called elytra, which are hard covering which protect their delicate wings. Dung Beetles exhibit typical insect segmentation and have a head, thorax, and abdomen.

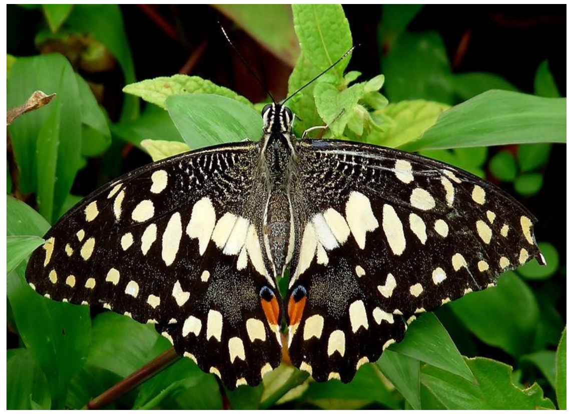
10. Scientific name: ***Anthia sexguttata***
CLASSIFICATION
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Coleoptera
Family: Carabidae
Genus: *Anthia*
Species: *sexguttata*
LOCATION
Centurion University of technology and management, P
GENERAL CHARACTERISTICS
Adults measure approximately 4 cm (1.5 inches), are bl (four over the elytra and two on the thorax). Other patterns are possib he larva has a flattened form, a large head capsule, and prominent mandibles.

11. Scientific name: *Zizeeria knysna*
CLASSIFICATION
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Lycaenidae
Genus: *Zizeeria*
Species: *knysna*
LOCATION
Centurion University of Technology and Management, Paralakhemur
GENERAL CHARACTERISTICS
These are the blue butterfly which are major nectar feeders.

12. Scientific name: *Lymantria* sp.
CLASSIFICATION
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Erebidae

Genus: *Lymantria*
Species: not sure
LOCATION
Centurion University of Technology and Management, Paralakhemundi Campus.
GENERAL CHARACTERISTICS
Attractive moths belonging to super family Noctuoidiae.

13. Scientific name: *Papilio demoleus*
CLASSIFICATION
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Papilionidae
Genus: Papilio
Species: P. demoleus



LOCATION
Centurion University of technology and management, Pa
GENERAL CHARACTERISTICS
Papilio demoleus is a common and widespread swallov utterfly lemon butterfly, lime swallowtail, and chequered swallo hich are usually citrus species such as the cultivated lime. Unlike most swallowtail butterflies, it does not have a prominent tail. The butterfly is a pest and invasive species, found from Asia to Australia.

14. Scientific name: *Lymantria mathura*
CLASSIFICATION
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Erebidae
Genus: *Lymantria*
Species: *mathura*

LOCATION
Centurion University of Technology and Management,
GENERAL CHARACTERISTICS
The wingspan is 40–50 mm for males and 70–90 mm f on *Terminalia*, *Shorea*, *Quercus*, *Mangifera*, *Eugenia* a ator of deciduous trees.

15. Scientific name: *Apis cerana indica*
CLASSIFICATION
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Hymenoptera
Family: Apidae
Genus: *Apis*

Species: *cerana indica*

LOCATION

Centurion University of Technology and Management, Paralakhemundi Campus.

GENERAL CHARACTERISTICS

They usually build multiple combed nests in tree hollows and man-made structures. These bees can adapt to living in purpose-made hives and cavities. Their nesting habit means that they can potentially colonize temperate or mountain areas with prolonged winters or cold temperatures.

16. Scientific name: *Apis dorsata*

CLASSIFICATION

Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Hymenoptera
Family: Apidae
Genus: *Apis*
Species: *dorsata*

LOCATION

Centurion University of Technology and Management, Pa

GENERAL CHARACTERISTICS

Highly ferocious rock bees with comparatively more hone

17. Scientific name: *Spoladea recurvalis*

Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Crambidae
Genus: *Spoladea*
Species: *recurvalis*

LOCATION

Centurion University of Technology and Management, Pa

GENERAL CHARACTERISTICS

Spoladea recurvalis, the **beet webworm moth** ... of the family Crambidae. It is found worldwide, bu... mm. The moth flies from May to September depending on the location. The larvae feed on spinach, beet, cotton, maize and soybean. They feed on the underside of the leaves protected by a slight web.

18. Scientific name: ***Neopithecops zalmora***

CLASSIFICATION

Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Lycaenidae
Genus: *Neopithecops*
Species: *zalmora*

LOCATION

Centurion University of Technology and Management, Pa

GENERAL CHARACTERISTICS

It is also known as Quaker. The larvae are known to feed on *Diospyros* (Ebenaceae) and many species of *Glycosmis* (Rutaceae) including *G. arborea*, *G. parviflora* and *G. pentaphylla*.

19. Scientific name: *Junonia iphita*
CLASSIFICATION
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Nymphalidae
Genus: *Junonia*
Species: *iphita*
LOCATION
Centurion University of Technology and Management, Paralakhemundi Campus.
GENERAL CHARACTERISTICS

It is a medium-sized lepidopteran which is also known as Chocolate pansy or Chocolate soldier. The wingspan is about 5–6 cm (2.0–2.4 in) and the female can be told apart from the male by white markings on the oblique line on the underside of the hindwing. The wavy lines on the underside of the wings vary from wet- to dry-season forms. Individuals maintain a territory and are usually found close to the ground level and often bask in the sun.

20. Scientific name: *Zizula hylax*
CLASSIFICATION

Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Lycaenidae
Genus: *Zizula*
Species: *hylax*

LOCATION
Centurion University of Technology and Management, P
GENERAL CHARACTERISTICS
The wingspan of the adults is about 1.5 centimetres (0.59 … a diameter of about 0.5 millimetres (0.020 in). They are lai… …llars are 0.7 centimetres (0.28 in) long, green with a dark red l… …g the sides. The sides are hairy, and the head is pale brown. The pupa is 0.7 cm long, hairy and green, and is attached to a stem or the underside of a leaf of a food plant.

21. Scientific name: *Cigaritis vulcanus*
CLASSIFICATION
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Lycaenidae
Genus: *Cigaritis*
Species: *vulcanus*

LOCATION
Centurion University of Technology and Management, Paralakhemundi Campus.
GENERAL CHARACTERISTICS
It is also known as Common Silvering. Their numbers peak during the south-west and north-east monsoons. It inhabits scrub land with sparse vegetation, hedge rows, scrub jungles and secondary forest.

22. Scientific name: *Diaphania indica*
CLASSIFICATION
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Crambidae
Genus: *Cigaritis*
Species: *vulcanus*

LOCATION
Centurion University of Technology and Managem
GENERAL CHARACTERISTICS
The wingspan is about 30 mm. Adults have translucent whitish wings with broad dark brown borders. The body is whitish below, and brown on top of head and thorax as well as the end of the abdomen. There is a tuft of light brown "hairs" on the tip of the abdomen, vestigial in the male but well developed in the female. It is formed by long scales which are carried in a pocket on each side of the 7th abdominal segment, from where they can be everted to form the tufts. Unfertilized females are often seen sitting around with the tuft fully spread, forming two flower-like clumps of scales, which move slowly to spread their pheromones.

23. Scientific name: *Mocis frugalis*
CLASSIFICATION
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Erebidae
Genus: *Mocis*
Species: *frugalis*

LOCATION
Centurion University of Technology and Management,
GENERAL CHARACTERISTICS
It is also known as Visitor. Its wingspan is 36–50 millimetres (1.4–2.0 in). Male with the hind tibia and tarsi clothed with long thick pile. It has a grey-brown body. Forewing with a diffused dark mark above the centre of vein 1; an oblique postmedial line pale inwardly, red brown outwardly; a submarginal series of black specks. Hindwing with postmedial and diffused submarginal lines. Some specimens have a black spot above inner margin of forewing before the middle.

24. Scientific name: *Melantis leda*
CLASSIFICATION
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Nymphalidae
Genus: *Melanitis*
Species: *leda*

LOCATION

Centurion University of Technology and Management, Paralakhemundi Campus.
GENERAL CHARACTERISTICS

It is known as “Common Evening Brown”. Resident butterflies are known to fight off visitors to the area during dusk hours. This chase behaviour is elicited even by pebbles thrown nearby. The caterpillars feed on a wide variety of grasses including rice (*Oryza sativa*), bamboos, *Andropogon*, *Rotboellia cochinchinensis*, *Brachiaria mutica*, *Cynodon*, *Imperata*, and millets such as *Oplismenus compositus*, *Panicum* and *Eleusine indica*

25. Scientific name: *Trilocha varians*
CLASSIFICATION
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Bombycidae
Genus: Trilocha
Species: varians
LOCATION
Centurion University of Technology and Managemen
GENERAL CHARACTERISTICS

The wingspan is 25–27 mm. There are two colour varieties in the species; *albicollis* is the greyish form and *varians* is the reddish form. Head, thorax and abdomen of males are pale or dark reddish brown. Forewings are pale reddish brown or greyish, with two antemedial curved waved lines. There is a dark patch on the outer margin below the apex. The costal edge is paler with cilia being dark reddish brown. Hindwings are pale or dark reddish brown or with greyish with outer reddish brown area. The postmedial line is indistinct. Ventral surface is paler with some dark red stripes.

26. Scientific name: *Junonia almana*
CLASSIFICATION
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Nymphalidae
Genus: *Junonia*
Species: *almana*
LOCATION
Centurion University of Technology and Management, Paralakh
GENERAL CHARACTERISTICS

The caterpillars of *Junonia almana* feed on a variety of plants, including *Hygrophila auriculata*, *Phyla nodiflora* and species in the genera *Acanthus*, *Barleria* and *Gloxinia*.

27. Scientific name: *Castaleus rosimon*
CLASSIFICATION
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Lycaenidae
Genus: *Castaleus*
Species: *rosimon*
LOCATION
Centurion University of Technology and Management
GENERAL CHARACTERISTICS

It is also known as "Common pierrot". Feeds on *Zizyphus jujuba* and is of a rough texture as if shagreened all over. It is of the usual woodlouse form, much flattened towards the anal segment which is very broad; head concealed; colour bright green with a double, dorsal, yellow line and the sides powdered with small yellow spots

28. Scientific name: *Matapa aria*
CLASSIFICATION
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Heperiidae
Genus: *Matapa*
Species: *aria*

LOCATION
Centurion University of Technology and Management
GENERAL CHARACTERISTICS

It is also known as "Common Red eye".

29. Scientific name: *Gallus gallus domesticus*
Common name: Chicken

CLASSIFICATION
Kingdom- Animalia
Phylum- Chordata
Class- Aves
Order- Galliformes
Family- Phasianidae
Genus- *Gallus*
Species-*gallus*
Subspecies- *G. g. domesticus*
LOCATION

Centurion University Of Technology and Management, Parlakhemundi Campus.

GENERAL CHARACTERISTICS

These are domesticated subspecies of the red junglefowl originally from Southeastern Asia.

30. Scientific name*: Canis lupus familiaris*

Common name: Dog

<u>**CLASSIFICATION**</u>

Kingdom- Animalia
Phylum- Chordata
Class- Mammalia
Order- Carnivora
Family- Canidae
Subfamily- Caninae
Genus- *Canis*
Species- *lupus*
Subspecies- *C. l. familiaris*

LOCATION

Centurion University Of Technology and Management, Parlakhemundi Campus.

GENERAL CHARACTERISTICS

The dogs are domesticated descendant of the wolf which is characterized by an upturning tail.

31. Scientific name*: Felis catus*

Common name: Cat

<u>**CLASSIFICATION**</u>

Kingdom- Animalia
Phylum- Chordata
Class- Mammalia
Order- Carnivora
Suborder- Feliformia
Family- Felidae
Subfamily- Felinae
Genus- *Felis*
Species- *catus*

LOCATION

Centurion University Of Technology and Management, Parlakhemundi Campus.

GENERAL CHARACTERISTICS

The cats are domestic species of small carnivorous mammals.

32. Scientific name: *Bos indicus*

Common name: Cow

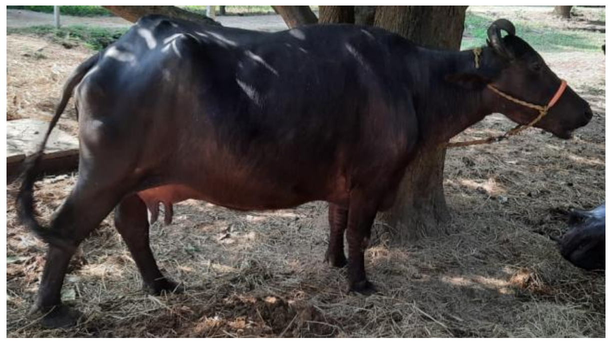
<u>**CLASSIFICATION**</u>

Kingdom- Animalia
Phylum- Chordata
Class- Mammalia
Order- Artiodactyla
Family- Bovidae
Subfamily- Bovinae
Genus- *Bos*
Species- *indicus*

LOCATION
Centurion University Of Technology and Management, Parlakhemundi Campus.
GENERAL CHARACTERISTICS
The zebu cattle / indicine cattle / humped cattle, is a species or subspecies of domestic cattle originating in the Indian sub-continent.

33. Scientific name: *Bubalus bubalis*

Common name: Buffalo (Water buffalo)



<u>CLASSIFICATION</u>
Kingdom- Animalia
Phylum- Chordata
Class- Mammalia
Order- Artiodactyla
Family- Bovidae
Subfamily- Bovinae
Genus- *Bubalus*
Species- *bubalis*

LOCATION
Centurion University Of Technology and Management, Parlakhemundi Campus.
GENERAL CHARACTERISTICS
The water buffalo (Bubalus bubalis), also called as domestic water buffalo / Asian water buffalo, is a large bovid originating in the Indian subcontinent and Southeast Asia.

34. *Labeo catla* (Hamilton, 1822)

Kingdom: Animalia
Phylum: Chordata
Sub-Phylum: Vertebrata
Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae
Genus: Labeo
Species: *L. catla*
Common name: Catla

General Characteristics
- Adults occur in rivers, lakes and culture ponds. Mature individuals breed in rivers. Surface and mid-water feeders, mainly omnivorous with juveniles feeding on aquatic and terrestrial insects, detritus and phytoplankton.
- Dorsal soft rays (total): 17; Anal spines: 0; Anal soft rays: 7 - 8. Body deep, with depth 2.5 to 3 times in standard length. Has a large, upturned mouth, with a prominent protruding lower jaw. Pectoral fins long, extending to pelvic fins; scales conspicuously large

35. ***Labeo rohita*** (Hamilton, 1822)

Kingdom: Animalia
Phylum: Chordata
Sub-Phylum: Vertebrata
Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae
Genus: Labeo
Species: *L. rohita*
Common name: Rohu

General characteristics

- Adults inhabit rivers. A diurnal species and usually solitary. They burrow occasionally. Feed on plants. Spawning season generally coincides with the southwest monsoon. Spawning occurs in flooded rivers. Fecundity varies from 226,000 to 2,794,000 depending upon the length and weight of the fish and weight of the ovary. Widely introduced outside its native range for stocking reservoirs and aquaculture.
- Dorsal fin with 12-14 1/2 branched rays; lower profile of head conspicuously arched; short dorsal fin with anterior branched rays shorter than head; 12-16 predorsal scales ; snout without lateral lobe.

36. Cirrhinus mrigala **(Hamilton, 1822)**

Kingdom: Animalia
Phylum: Chordata
Sub-Phylum: Vertebrata
Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae
Genus: Cirrhinus
Species: *C. mrigala*
Common name: Mrigal

General characteristics:

- It is endemic to Indo-Gangetic riverine systems, is one of the three Indian major carp species cultivated widely in Southeast Asian countries.
- Body bilaterally symmetrical and streamlined, its depth about equal to length of head; body with cycloid scales, head without scales; snout blunt, often with pores; mouth broad, transverse; upper lip entire and not continuous with lower lip, lower lip most indistinct; single pair of short rostral barbels

***37. Cyprinus rubrofuscus* Lacepède, 1803**

Kingdom: Animalia
Phylum: Chordata
Sub-Phylum: Vertebrata
Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae
Genus: Cyprinus
Species: ***C. rubrofuscus***
Common name: Amur carp

General characteristics:

- Body silvery with red pelvic, anal and lower caudal lobe or grey. Last simple anal ray bony and serrated posteriorly; with 4 barbels; branched dorsal rays 18-22.5.

38. *Cyprinus carpio* Linnaeus, 1758

Kingdom: Animalia
Phylum: Chordata

Sub-Phylum: Vertebrata
Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae
Genus: Cyprinus
Species: ***C. carpio***
Common name: Common carp

General characteristics:

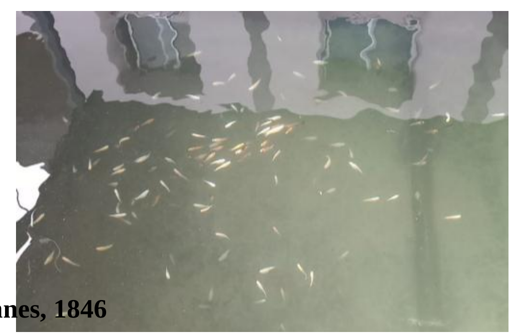
- Europe to Asia: Black, Caspian and Aral Sea basins. Introduced throughout the world. Wild stocks are only present naturally in rivers draining to the Black, Caspian and Aral Sea.
- Dorsal spines (total): 3 - 4; Dorsal soft rays (total): 17-23; Anal spines: 2-3; Anal soft rays: 5 - 6; Vertebrae: 36 - 37. Diagnosed from other cyprinid species in Europe by having the following characters: 2 pairs of barbels; dorsal fin with 15-20½ branched rays; caudal fin deeply emarginated.

39. *Poecilia reticulata* Peters, 1859

Kingdom: Animalia
Phylum: Chordata Actinopterygii
Order: Cyprinodontiformes
Family: Poecilidae
Genus: Poecilia
Species: *P. reticulata*
Common name: Guppy

General characteristics:

- Native to South America: Venezuela, Barbados, Trinidad, northern Brazil and the Guyanas.
- Found in various habitats, ranging from highly turbid water in ponds, canals and ditches at low elevations to pristine mountain streams at high elevations
- Males are about half the size of females with colorful tail and caudal fin; the anal fin is transformed into a gonopodium for internal fertilization
- No parental care is exercised and parents may even prey on their young.



40. *Poecilia sphenops* Valenciennes, 1846

Kingdom: Animalia
Phylum: Chordata
Sub-Phylum: Vertebrata
Class: Actinopterygii
Order: Cyprinodontiformes
Family: Poecilidae

Genus: *Poecilia*
Species: *P. sphenops*
Common name: Molly

General Characteristics

- Native to Central and South America: Mexico to Colombia.
- Feeds on worms, crustaceans, insects, plant matter. The black variety (Black molly) is a very popular aquarium fish and is marketed throughout the world. In the aquarium it feeds on green algae and also readily accepts dried food

41. *Danio rerio* (Hamilton, 1822)

Kingdom: Animalia
Phylum: Chordata
Sub-Phylum: Vertebrata
Class: Actinopterygii
Order: Cyprinodontiformes
Family: Poecilidae
Genus: *Danio*
Species: ***D. rerio***
Common name: Zebra fish

General Characteristics

- Native to Asia: Pakistan, India, Bangladesh, Nepal and Myanmar.
- Five uniformly, pigmented, horizontal stripes on the side of the body, all extending onto the end of caudal fin rays. Anal fin distinctively striped. Lateral line absent. Rostral barbels extend to anterior margin of orbit; maxillary barbels end at about middle of opercle. Branched anal fin rays 10-12. Vertebrae 31-32.
- Used as a model system (=organism) for developmental biology.

42. *Pterophyllum scalare* (Schultze, 1823)

Kingdom: Animalia
Phylum: Chordata
Sub-Phylum: Vertebrata
Class: Actinopterygii
Order: Cyprinodontiformes
Family: Poecilidae
Genus: *Pterophyllum*
Species: ***P. scalare***
Common name: Freshwater Angel Fish

General Characteristics

- Native to South America: Amazon River basin, in Peru, Colombia, and Brazil, along the Ucayali, Solimões and Amazon rivers.
- Body compressed and disc-shaped; dorsal and anal spiny rays increasing in length from anterior to posterior part of the fin; first branched rays also very long; body height at anal fin level 1.07 to 1.29 times in SL; body color silvery with dark vertical bars.
- Both male and female guard the eggs which are attached to the surface of aquatic vegetation in a nest area.

43. *Carassius auratus* (Linnaeus, 1758)

Kingdom: Animalia
Phylum: Chordata
Sub-Phylum: Vertebrata
Class: Actinopterygii
Order: Cyprinodontiformes
Family: Poecilidae
Genus: *Carassius*
Species: ***C. auratus***
Common name: Gold fish

General Characteristics:

- Native to Asia: central Asia and China
- Dorsal spines (total): 3 - 4; Dorsal soft rays (total): 14-20; Anal spines: 2-3; Anal soft rays: 4 - 7; Vertebrae: 30. Body stout, thick-set, caudal peduncle thick and short. Head without scales (Ref. 39167, 1998), broadly triangular, interorbital space broad, snout longer than eye diameter, maxillary reaching posterior nostril or not quite to eye.

44. *Cyprinus rubrofuscus* var *koi* Lacépède, 1803

Kingdom: Animalia
Phylum: Chordata
Sub-Phylum: Vertebrata
Class: Actinopterygii
Order: Cypriniformes
Family: Cyprinidae
Genus: Cyprinus
Species: *C. rubrofuscus*
Variety: *C. rubrofuscus* var *Koi*
Common Name: Koi carp

General characteristics:

- Amur carp (Cyprinus rubrofuscus) is a member of the cyprinid family species complex native to East Asia.
- Body silvery with red pelvic, anal and lower caudal lobe or grey. Last simple anal ray bony and serrated posteriorly; with 4 barbels; branched dorsal rays 18-22.5.

GREEN INITIATIVES AND WASTE MANAGEMENT AT CUTM

Centurion University of Technology and Management
Alluri Nagar, P.O. – R Sitapur, Via – Uppalada, Paralakhemundi,
Dist.: Gajapati – 761211, Odisha, India
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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 aquestionnaire. With the help of student volunteers and faculties of respective departmrnts the major partof 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

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SCHOOL OF APPLIED SCIENCES
CUTM
CENTURION UNIVERSITY OF TECHNOLOGY & MANAGEMENT

CONTENTS

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.

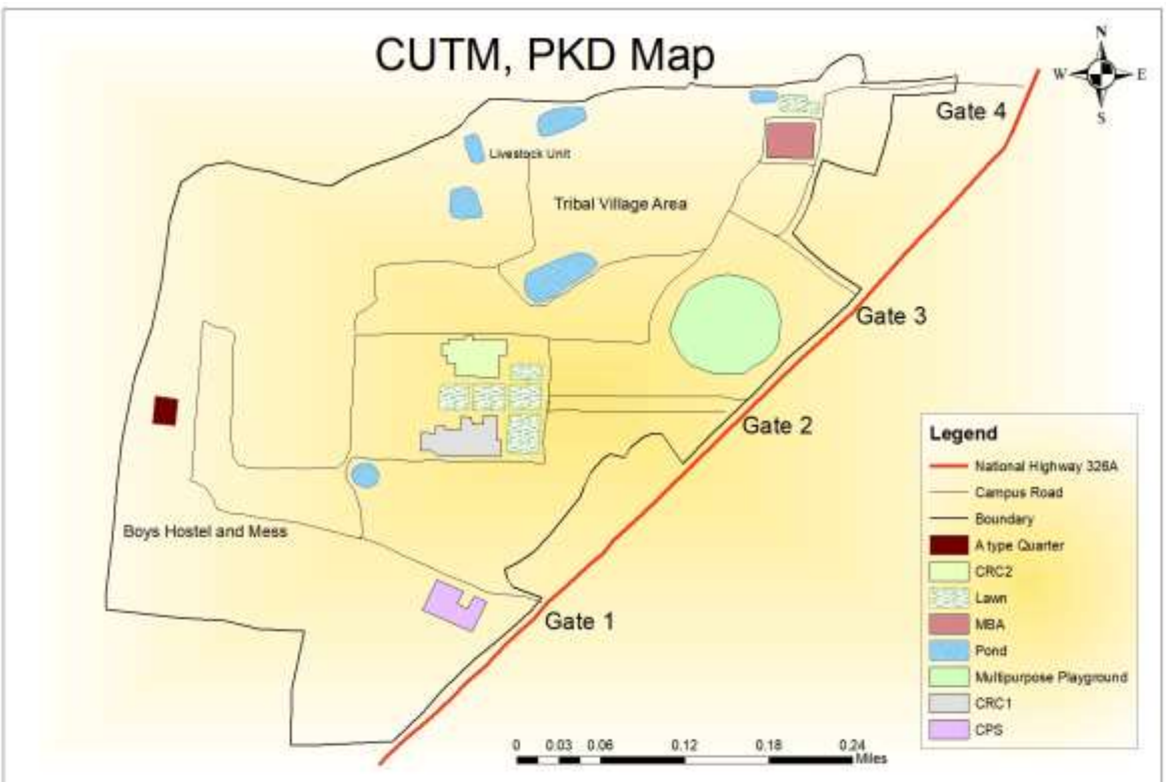
h. Water Quality: In general, is within the stipulated standards**,** though absence of coliform bacteria in all the samples tested indicates no possible contamination with sewage water.

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 2020)

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
20	1														
20	2														
20	3														
20	4														
20	5														
20	6														
20	7														
20	8														
20	9	32.2	25.4	27.9	0.0	0	38	33.4	24	23.9	28	6	0	0	0
20	10	31.9	23.0	26.4	0.0	0	196	34.2	9	18.0	29	15	0	0	0
20	11	30.9	19.4	24.0	0.0	3	174	33.9	21	14.6	30	10	0	0	0
20	12	29.9	14.7	20.9	0.0	32	110	32.4	7	10.8	23	1	0	0	0
		31.0	19.4	24.0	0.0	35	518	34.2	OCT	10.8	DEC	32	0	0	0

PRECIPITATION (mm)

YR	MO	TOTAL	DEP. FROM NORM	MAX OBS. DAY	DATE	DAYS OF RAIN OVER .2	2	20
20	1							
20	2							
20	3							
20	4							
20	5							
20	6							
20	7							
20	8							
20	9	20.3	0.0	9.1	27	4	2	0
20	10	202.7	0.0	107.4	13	11	7	2
20	11	30.5	0.0	13.2	11	6	3	0
20	12	2.0	0.0	0.3	7	8	0	0
		255.5	0.0	107.4	OCT	29	12	2

WIND SPEED (km/hr)

YR	MO	AVG.	HI	DATE	DOM DIR
20	1				
20	2				
20	3				
20	4				
20	5				
20	6				
20	7				
20	8				
20	9	1.8	32.2	27	NW
20	10	1.4	35.4	11	N
20	11	1.3	30.6	14	N
20	12	1.2	19.3	6	N
		1.3	35.4	OCT	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:

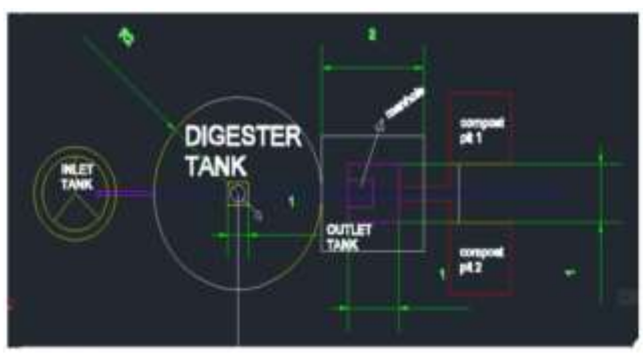
- Steps should be taken to use the food and vegetable waste as Biogas.
- The college has the complete data of food and vegetable waste from all the student mess.

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.

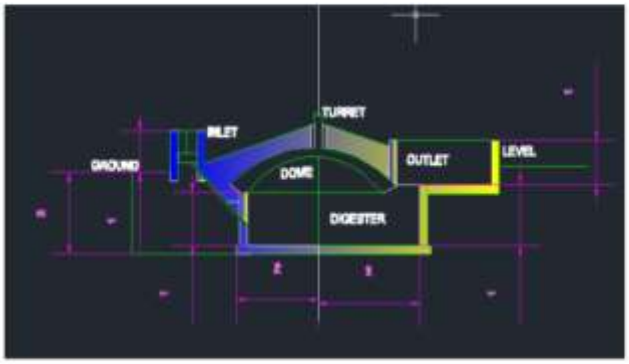
Categories	Vegetable waste (kg)	Food Waste (kg)
SOUTH MESS	913.54	568.61
NORTH MESS	3541.42	1593.81
ITI MESS	848.49	2196.97

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.

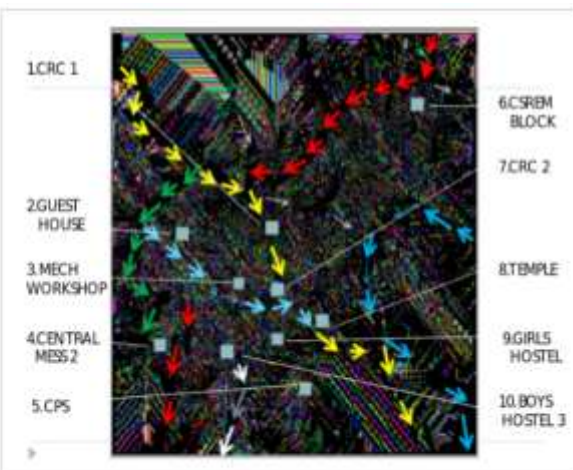
b) Indicator: Watershed Management

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.

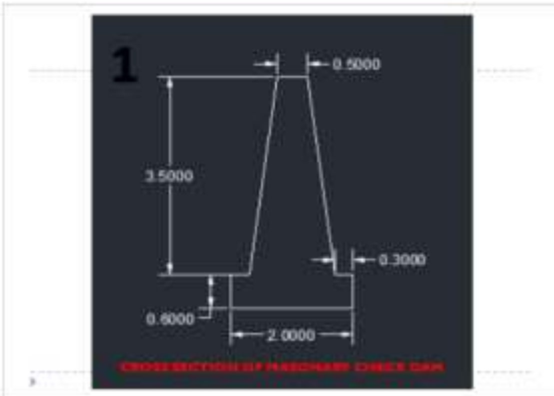
Performance: There are existing drainage in the college which are provided in each road side for proper drainage of rain water. The sloppy areas in the college are identified according to the flow of drain water with the help of contour maps. The college should construct check dams in the sloppy areas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

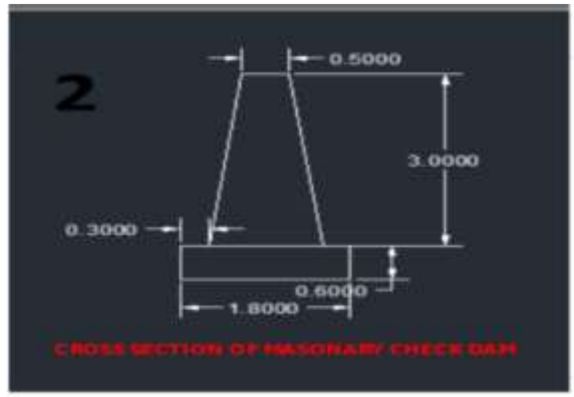
This enhances the ground water resources which can be used for the agricultural purpose of the college. In dry season the plants in the college get dried so we can water the plants by using this water. The water is not required to be treated and can be used directly for watering. This avoids the cost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



Natural Drainage network order map

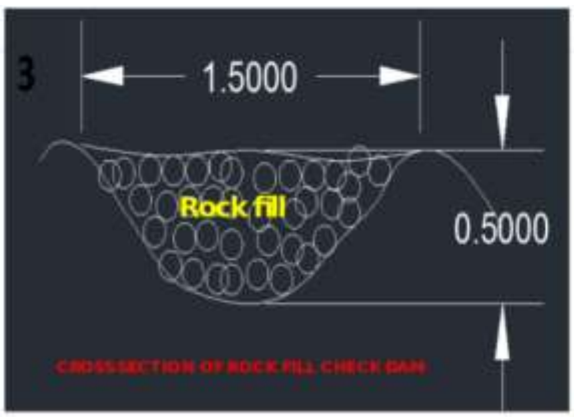
Location of check dam

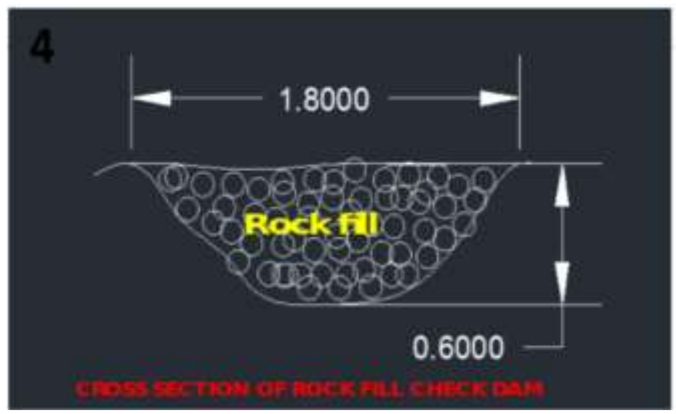




Check dam at location 1

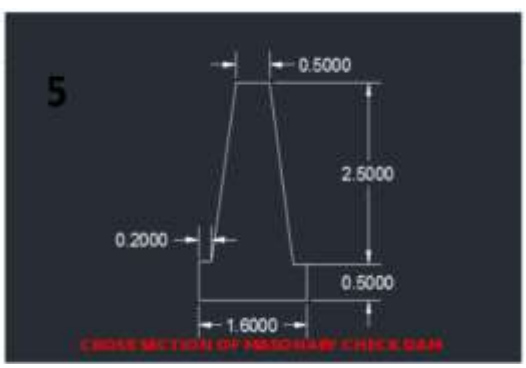
Check dam at location 2





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

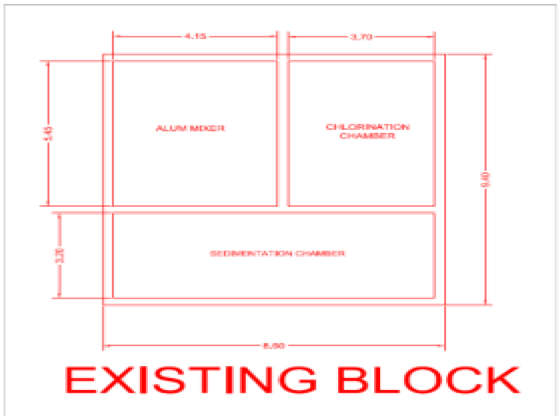
Goal: To use the waste water in an efficient way
Benchmark:

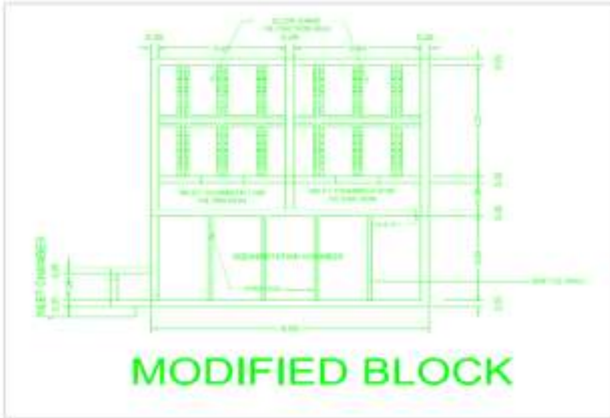
- The waste water collected from the bathrooms of the hostel will be treated to use for gardening of the plants.

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 tetraphylia*	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 basilicum var. thyrsiflora*	Lamiaceae	Leaves
48.	Arakha	*Calatropis gigantea*	Asclepiadaceae	Milky juice
49.	Multivitamin plant	*Sauropus androgynous*	Phyllanthaceae	Leaves
50.	Indian peony weed	*Centalia asiatica*	Apiaceae	Leaves
51	Bael	*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	*Argyreia 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. **In charge Name**: G. Prameela

3.**"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

4. **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.

5. 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

6. Training for Students

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

7. Outcome

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

8. Student's involvement in Unit

Application of Vermiwash for Tomato Crop

Application of Agniastra for Tomato Crop

Pruning of Tomato Crop

9. Trainings and Visits



Visit of NGO's members

Visit of NSDC Official Dr. Gipson Verghese

Visit of Punjab Minister and Prof. Mukti K Mishra

11. COMPOSTING UNIT AT PKD Campus:

1. **Faculty In charge:** Dr.Saurav Barman
2. **Incharge Name**: Mr. E.Sandeep Kumar
3. **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.

4. **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

5. **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
4. 2019-20 - 561

b. Students

- Each year B.Sc (Ag) students of MSSSoA undergo AELP programme on vermicomposting.
- Twenty four students of B.Sc(Ag) final year have undertook the AELP programme during 2016-17, 2017-18, 2018-19, 2019-20.

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.

6. 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.

7. 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.

8. Student's involvement in Unit

Chopping of leaves using Shredrer

Release of Earthworms in the Vermicompost pit

Watering the Vermicompost pit

9. 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 2019-20 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

14: Solar Electric Power Generation at CUTM-PKD campus:

Solar energy is defined as the transformation of energy that is present in the sun and is one of the renewable energies. Once the sunlight passes through the earth's atmosphere, most of it is in the form of visible light and infrared radiation. Plants use it to convert into sugar and starches and this process of conversion is known as photosynthesis. Solar cell panels are used to convert this energy into electricity. Solar power is the conversion of energy from sunlight into electricity, either directly using photovoltaics (PV), indirectly using concentrated solar power, or a combination. Concentrated solar power systems use lenses or mirrors and solar tracking systems to focus a large area of sunlight into a small beam. Photovoltaic cells convert light into an electric current using the photovoltaic effect.

Photovoltaics were initially solely used as a source of electricity for small and medium-sized applications, from the calculator powered by a single solar cell to remote homes powered by an off-grid rooftop PV system. Commercial concentrated solar power plants were first developed in the 1980s. As the cost of solar electricity has fallen, the number of grid-connected solar PV systems has grown into the millions and utility-scale photovoltaic power stations with hundreds of megawatts are being built. Solar PV is rapidly becoming an inexpensive, low-carbon technology to harness renewable energy from the Sun.

Solar Energy Advantages and Disadvantages

Advantages of solar energy are:

- Clean: It is considered to the cleanest form of energy as there is no emission of carbon dioxide like in case of fossil fuels which is one of the causes of global warming.
- Renewable: There is an ample amount of energy available on earth as long as the sun exists.
- Reliable: The energy can be stored in the batteries and so there is no question of unreliability.
- Reduction in utility costs.
- Free energy because it can be trapped easily.

Disadvantages of solar energy:

- The production is low during winters and on cloudy days.
- Installation and the initial cost of the materials are expensive.

- Space consumption is more.

Types of Solar Energy:

Solar energy can be classified into two categories depending upon the mode of conversion and type of energy it is converted into. Passive solar energy and active solar energy belongs to the mode of conversion and solar thermal energy, photovoltaic solar power and concentrating solar power. Passive solar energy: This refers to trapping sun’s energy without using any mechanical devices. Active solar energy: This uses mechanical devices to collect, store and distribute the energy. Solar thermal energy: This is the energy obtained by converting solar energy into heat. Photovoltaic solar power: This is the energy obtained by converting solar energy into electricity. Concentrating solar power: This is a type of solar thermal energy which is used to generate solar power electricity.

Solar Energy Project at CUTM:

Solar energy, the experiment on the efficiency of the solar heating working model is one of the easiest science experiment that you can prepare in your school fair science project. This working model is quick, simple and very informative. The result may vary if the project is performed outdoor due to the wind and weather condition, so it is recommended to conduct the experiment indoors. In this solar heater project, use reflectors to concentrating the solar energy in one small place to collect and store heat energy. In this experiment, you will see the efficiency of solar energy. The International Energy Agency projected in 2014 that under its "high renewables" scenario, by 2050, solar photovoltaics and concentrated solar power would contribute about 16 and 11 percent, respectively, of the worldwide electricity consumption, and solar would be the world's largest source of electricity. The productivity of solar power in a region depends on solar irradiance, which varies through the day and is influenced by latitude and climate. It also depends on the temperature, and the local soiling conditions. The locations with highest annual solar irradiance lie in the arid tropics and subtropics. Deserts lying in low latitudes usually have few clouds, and can receive sunshine for more than ten hours a day. Unlike fossil fuel based technologies, solar power does not lead to any harmful emissions during operation, but the production of the panels leads to some amount of pollution. This project have been initiated in the year of 2019-2020, successfully installed solar panels at Parlakhemundi campus in the year of 2019 and below are the details of the electrical diagrams of solar power which was installed at CRC-1, CRC-2, ITI, auditorium and MBA building (Fig-1 to Fig-

8).

Fig-1: Solar Panels Array Layout at CUTM-PKD campus:

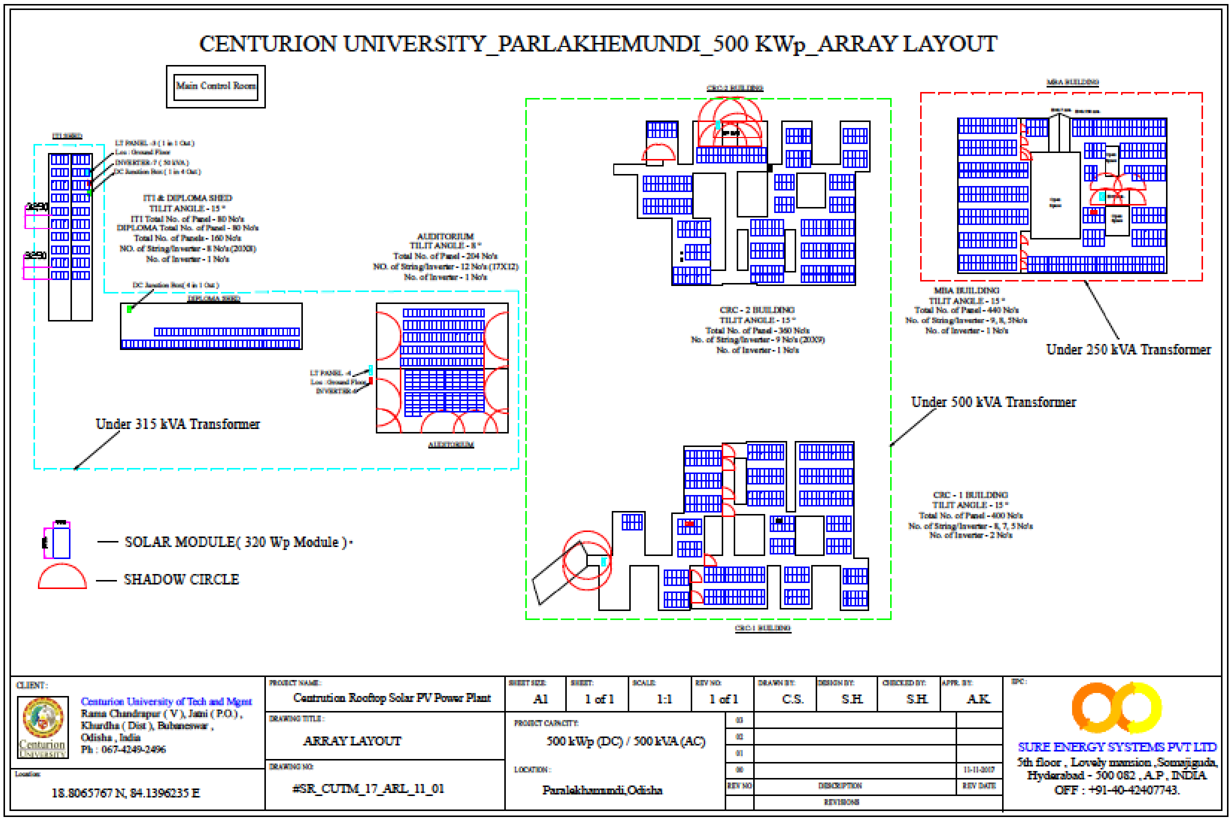


Fig-2: Solar Panel Earth Layout at CUTM- PKD campus

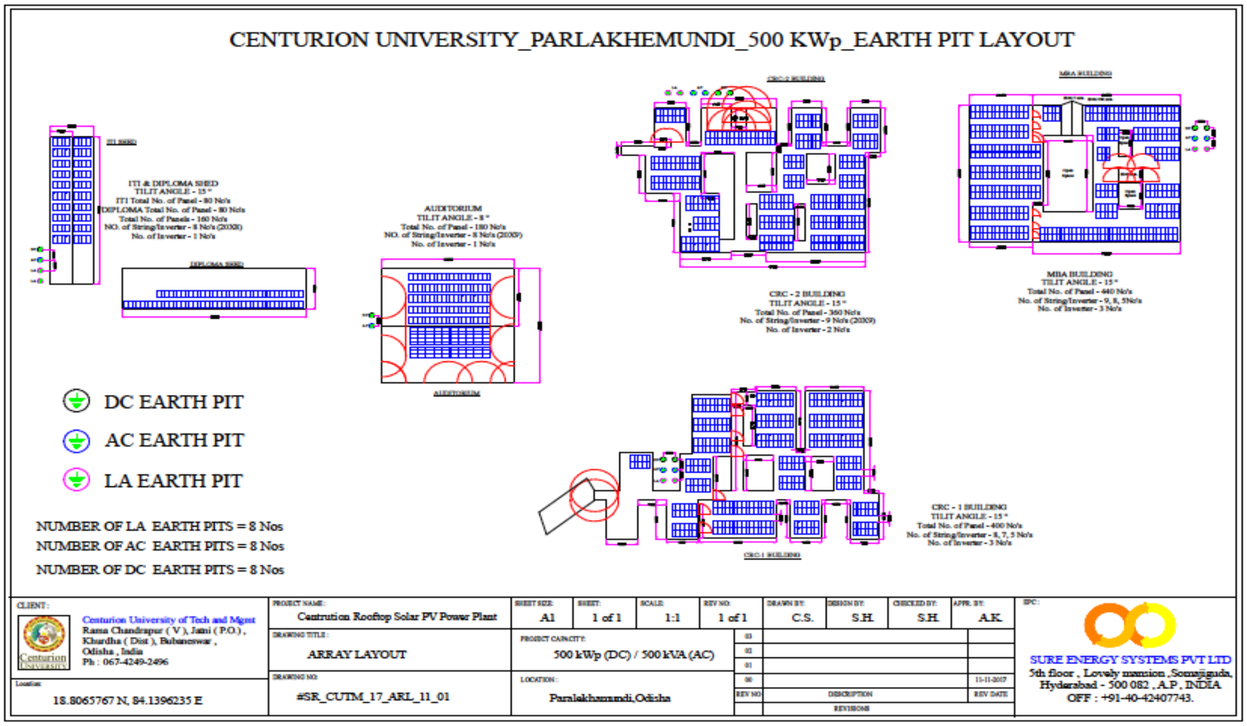


Fig-3: Solar Panels Location Layout at CUTM-PKD campus:

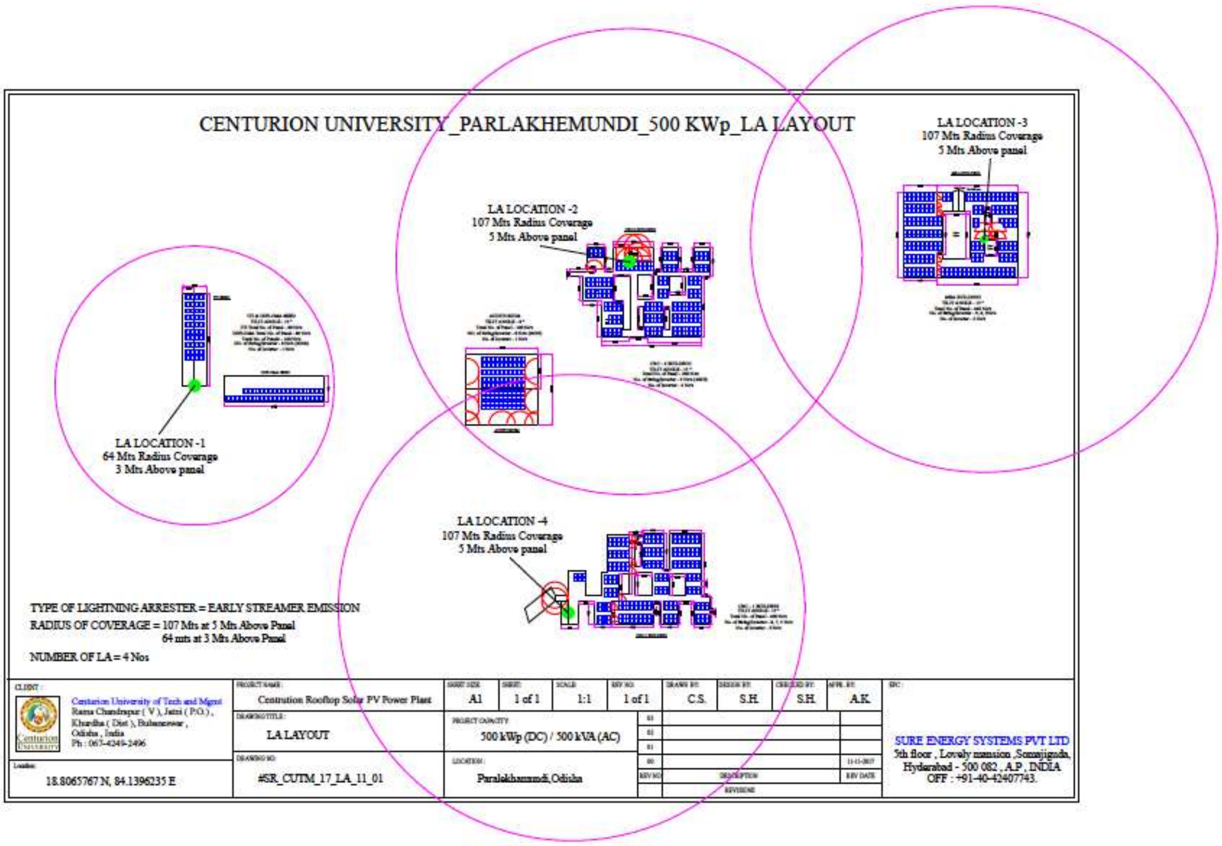


Fig-4: Solar Panels GI Routing Layout at CUTM-PKD campus:

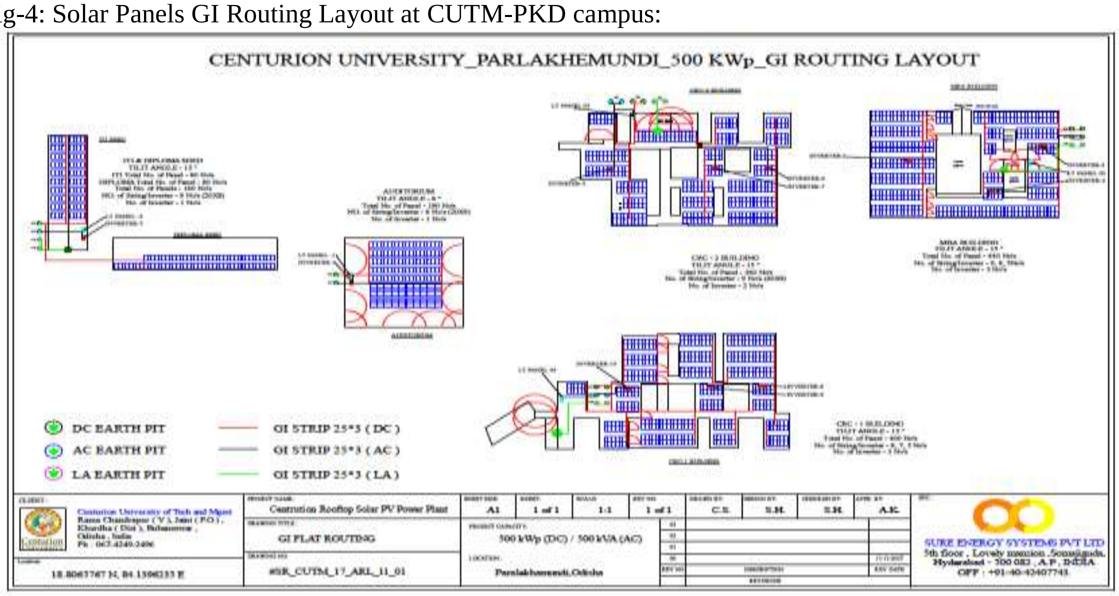


Fig-5: Solar Panels Single Line Diagram at CUTM-PKD campus:

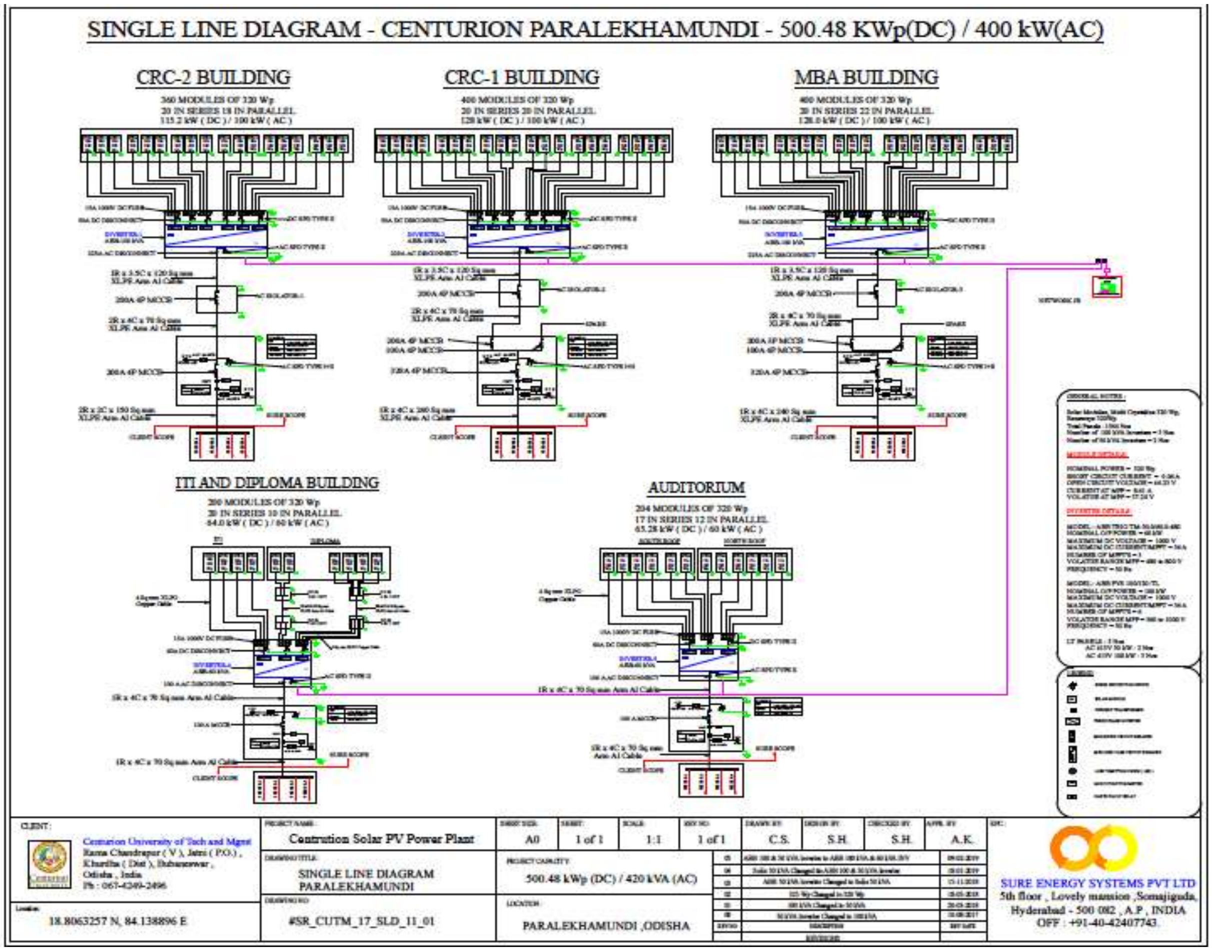


Fig-6: Solar Panels at CRC-1 roof top

Fig-7: Solar Panels at CRC-2 roof top

Fig-8: Solar Panels at MBA roof top:

GREEN INITIATIVES AND WASTE MANAGEMENT AT CUTM

Centurion University of Technology and Management
Alluri Nagar, P.O. – R Sitapur, Via – Uppalada, Paralakhemundi,
Dist.: Gajapati – 761211, Odisha, India
www.cutm.ac.in
2019-2020

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 aquestionnaire. With the help of student volunteers and faculties of respective departmrnts the major partof 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

Atia Arzoo

Dr. Atia Arzoo

R Mishra

Dr.Rukmini Mishra

Dr. Yashaswi Nayak

Dr. Sagarika Parida

Gyanranjan Mahalik

Dr. Gyanranjan Mahalik

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SCHOOL OF APPLIED SCIENCES ★ CENTURION UNIVERSITY OF TECHNOLOGY & MANAGEMENT ★ CUTM

CONTENTS

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

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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.

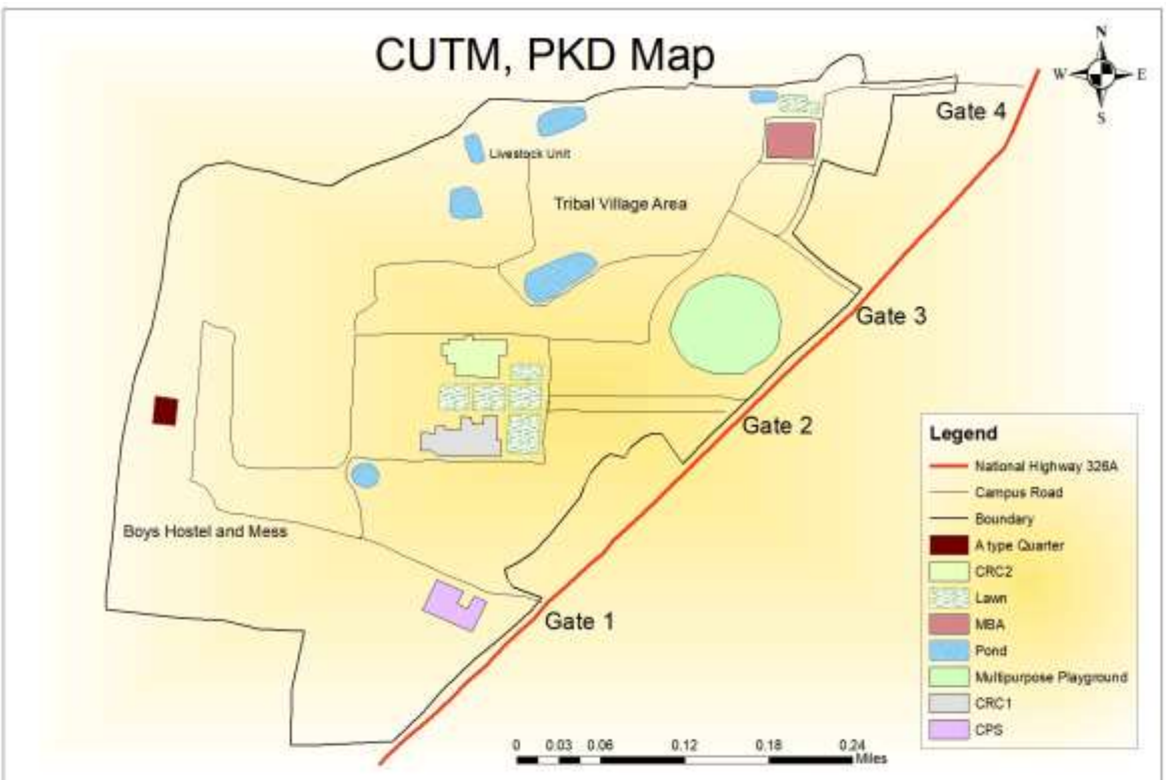
h. Water Quality: In general, is within the stipulated standards**,** though absence of coliform bacteria in all the samples tested indicates no possible contamination with sewage water.

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

5. METEOROLOGICAL PARAMETERS OF CUTM-PKD (Year 2020)

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
20	1														
20	2														
20	3														
20	4														
20	5														
20	6														
20	7														
20	8														
20	9	32.2	25.4	27.9	0.0	0	38	33.4	24	23.9	28	6	0	0	0
20	10	31.9	23.0	26.4	0.0	0	196	34.2	9	18.0	29	15	0	0	0
20	11	30.9	19.4	24.0	0.0	3	174	33.9	21	14.6	30	10	0	0	0
20	12	29.9	14.7	20.9	0.0	32	110	32.4	7	10.8	23	1	0	0	0
		31.0	19.4	24.0	0.0	35	518	34.2	OCT	10.8	DEC	32	0	0	0

PRECIPITATION (mm)

YR	MO	TOTAL	DEP. FROM NORM	MAX OBS. DAY	DATE	DAYS OF RAIN OVER .2	2	20
20	1							
20	2							
20	3							
20	4							
20	5							
20	6							
20	7							
20	8							
20	9	20.3	0.0	9.1	27	4	2	0
20	10	202.7	0.0	107.4	13	11	7	2
20	11	30.5	0.0	13.2	11	6	3	0
20	12	2.0	0.0	0.3	7	8	0	0
		255.5	0.0	107.4	OCT	29	12	2

WIND SPEED (km/hr)

YR	MO	AVG.	HI	DATE	DOM DIR
20	1				
20	2				
20	3				
20	4				
20	5				
20	6				
20	7				
20	8				
20	9	1.8	32.2	27	NW
20	10	1.4	35.4	11	N
20	11	1.3	30.6	14	N
20	12	1.2	19.3	6	N
		1.3	35.4	OCT	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:

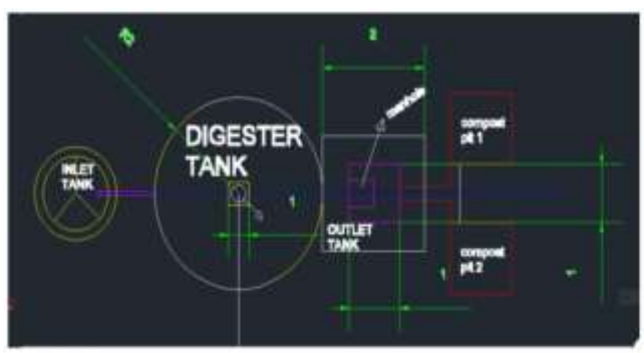
- Steps should be taken to use the food and vegetable waste as Biogas.
- The college has the complete data of food and vegetable waste from all the student mess.

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.

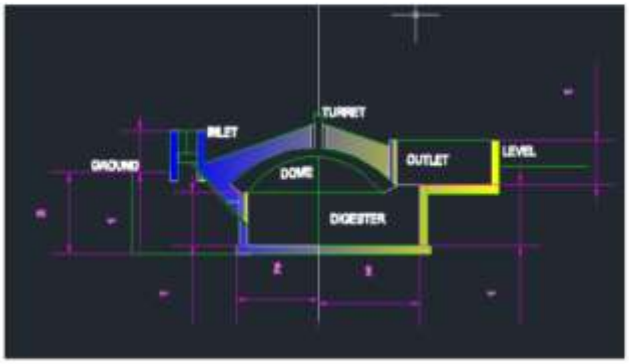
Categories	Vegetable waste (kg)	Food Waste (kg)
SOUTH MESS	913.54	568.61
NORTH MESS	3541.42	1593.81
ITI MESS	848.49	2196.97

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.

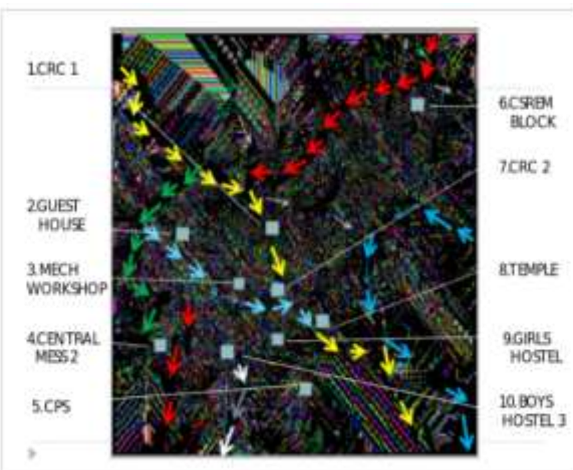
b) Indicator: Watershed Management

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.

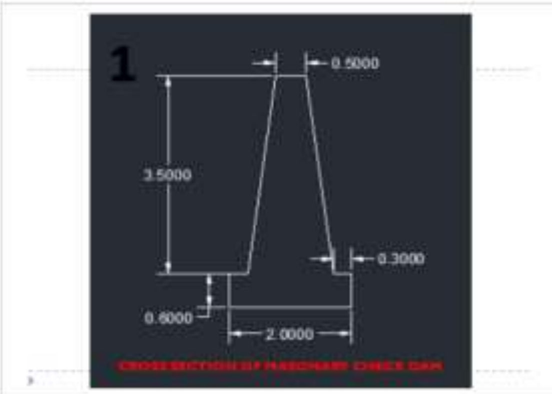
Performance: There are existing drainage in the college which are provided in each road side for proper drainage of rain water. The sloppy areas in the college are identified according to the flow of drain water with the help of contour maps. The college should construct check dams in the sloppy areas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

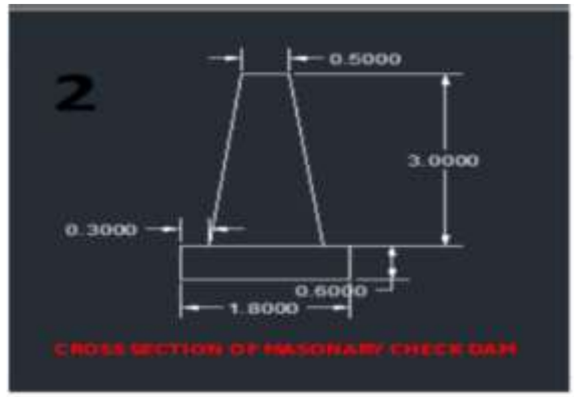
This enhances the ground water resources which can be used for the agricultural purpose of the college. In dry season the plants in the college get dried so we can water the plants by using this water. The water is not required to be treated and can be used directly for watering. This avoids the cost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



Natural Drainage network order map

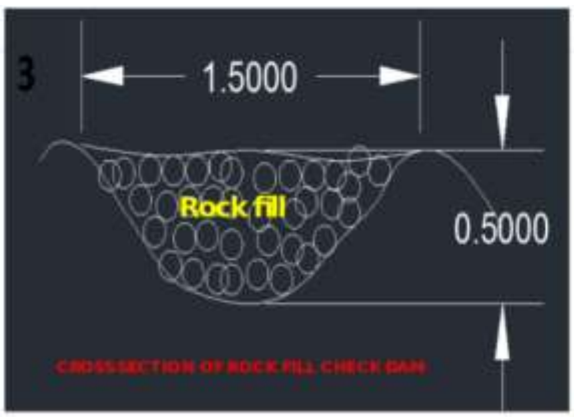
Location of check dam

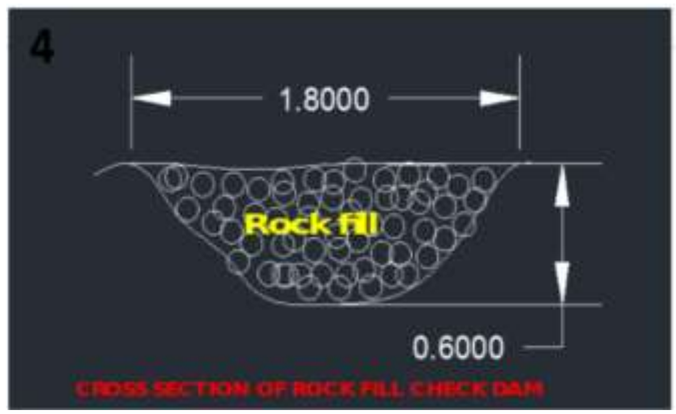




Check dam at location 1

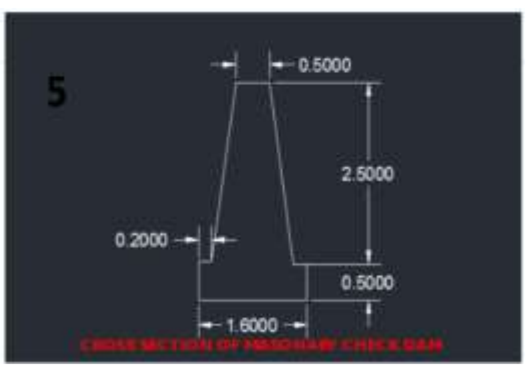
Check dam at location 2





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

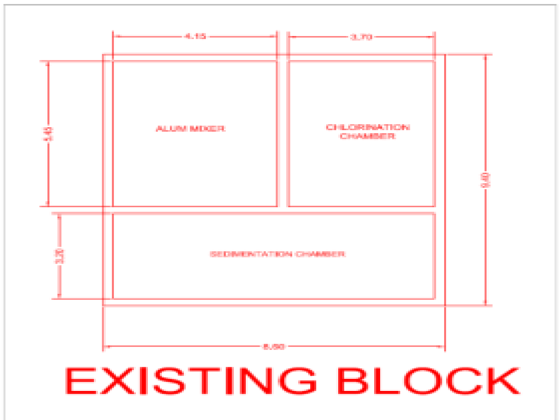
Goal: To use the waste water in an efficient way
Benchmark:

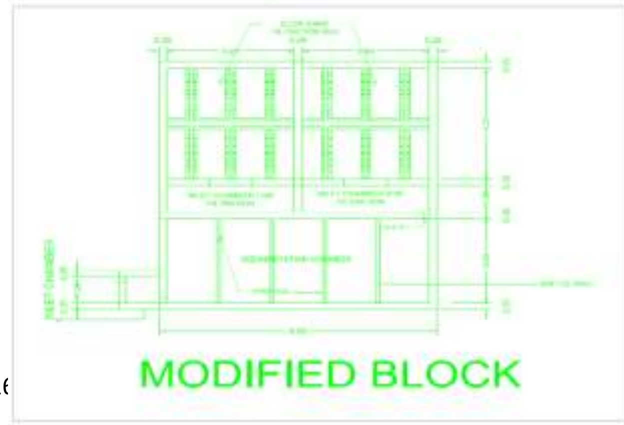
- The waste water collected from the bathrooms of the hostel will be treated to use for gardening of the plants.

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 basilicum 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	Bael	*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	*Argyreia 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. **In charge Name**: G. Prameela

3.**"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

4. **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.

5. 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

6. Training for Students

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

7. Outcome

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

8. Student's involvement in Unit

Application of Vermiwash for Tomato Crop

Application of Agniastra for Tomato Crop

Pruning of Tomato Crop

9. Trainings and Visits



Visit of NGO's members

Visit of NSDC Official Dr. Gipson Verghese

Visit of Punjab Minister and Prof. Mukti K Mishra

11. COMPOSTING UNIT AT PKD Campus:

1. **Faculty In charge:** Dr.Saurav Barman
2. **Incharge Name**: Mr. E.Sandeep Kumar
3. **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.

4. **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

5. **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
4. 2019-20 - 561

b. Students

- Each year B.Sc (Ag) students of MSSSoA undergo AELP programme on vermicomposting.
- Twenty four students of B.Sc(Ag) final year have undertook the AELP programme during 2016-17, 2017-18, 2018-19, 2019-20.

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.

6. 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.

7. 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.

8. Student's involvement in Unit

Chopping of leaves using Shredrer

Release of Earthworms in the Vermicompost pit

Watering the Vermicompost pit

9. 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 2019-20 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

14: Solar Electric Power Generation at CUTM-PKD campus:

Solar energy is defined as the transformation of energy that is present in the sun and is one of the renewable energies. Once the sunlight passes through the earth's atmosphere, most of it is in the form of visible light and infrared radiation. Plants use it to convert into sugar and starches and this process of conversion is known as photosynthesis. Solar cell panels are used to convert this energy into electricity. Solar power is the conversion of energy from sunlight into electricity, either directly using photovoltaics (PV), indirectly using concentrated solar power, or a combination. Concentrated solar power systems use lenses or mirrors and solar tracking systems to focus a large area of sunlight into a small beam. Photovoltaic cells convert light into an electric current using the photovoltaic effect.

Photovoltaics were initially solely used as a source of electricity for small and medium-sized applications, from the calculator powered by a single solar cell to remote homes powered by an off-grid rooftop PV system. Commercial concentrated solar power plants were first developed in the 1980s. As the cost of solar electricity has fallen, the number of grid-connected solar PV systems has grown into the millions and utility-scale photovoltaic power stations with hundreds of megawatts are being built. Solar PV is rapidly becoming an inexpensive, low-carbon technology to harness renewable energy from the Sun.

Solar Energy Advantages and Disadvantages

Advantages of solar energy are:

- Clean: It is considered to the cleanest form of energy as there is no emission of carbon dioxide like in case of fossil fuels which is one of the causes of global warming.
- Renewable: There is an ample amount of energy available on earth as long as the sun exists.
- Reliable: The energy can be stored in the batteries and so there is no question of unreliability.
- Reduction in utility costs.
- Free energy because it can be trapped easily.

Disadvantages of solar energy:

- The production is low during winters and on cloudy days.
- Installation and the initial cost of the materials are expensive.

- Space consumption is more.

Types of Solar Energy:

Solar energy can be classified into two categories depending upon the mode of conversion and type of energy it is converted into. Passive solar energy and active solar energy belongs to the mode of conversion and solar thermal energy, photovoltaic solar power and concentrating solar power. Passive solar energy: This refers to trapping sun’s energy without using any mechanical devices. Active solar energy: This uses mechanical devices to collect, store and distribute the energy. Solar thermal energy: This is the energy obtained by converting solar energy into heat. Photovoltaic solar power: This is the energy obtained by converting solar energy into electricity. Concentrating solar power: This is a type of solar thermal energy which is used to generate solar power electricity.

Solar Energy Project at CUTM:

Solar energy, the experiment on the efficiency of the solar heating working model is one of the easiest science experiment that you can prepare in your school fair science project. This working model is quick, simple and very informative. The result may vary if the project is performed outdoor due to the wind and weather condition, so it is recommended to conduct the experiment indoors. In this solar heater project, use reflectors to concentrating the solar energy in one small place to collect and store heat energy. In this experiment, you will see the efficiency of solar energy. The International Energy Agency projected in 2014 that under its "high renewables" scenario, by 2050, solar photovoltaics and concentrated solar power would contribute about 16 and 11 percent, respectively, of the worldwide electricity consumption, and solar would be the world's largest source of electricity. The productivity of solar power in a region depends on solar irradiance, which varies through the day and is influenced by latitude and climate. It also depends on the temperature, and the local soiling conditions. The locations with highest annual solar irradiance lie in the arid tropics and subtropics. Deserts lying in low latitudes usually have few clouds, and can receive sunshine for more than ten hours a day. Unlike fossil fuel based technologies, solar power does not lead to any harmful emissions during operation, but the production of the panels leads to some amount of pollution. This project have been initiated in the year of 2019-2020, successfully installed solar panels at Parlakhemundi campus in the year of 2019 and below are the details of the electrical diagrams of solar power which was installed at CRC-1, CRC-2, ITI, auditorium and MBA building (Fig-1 to Fig-

8).

Fig-1: Solar Panels Array Layout at CUTM-PKD campus:

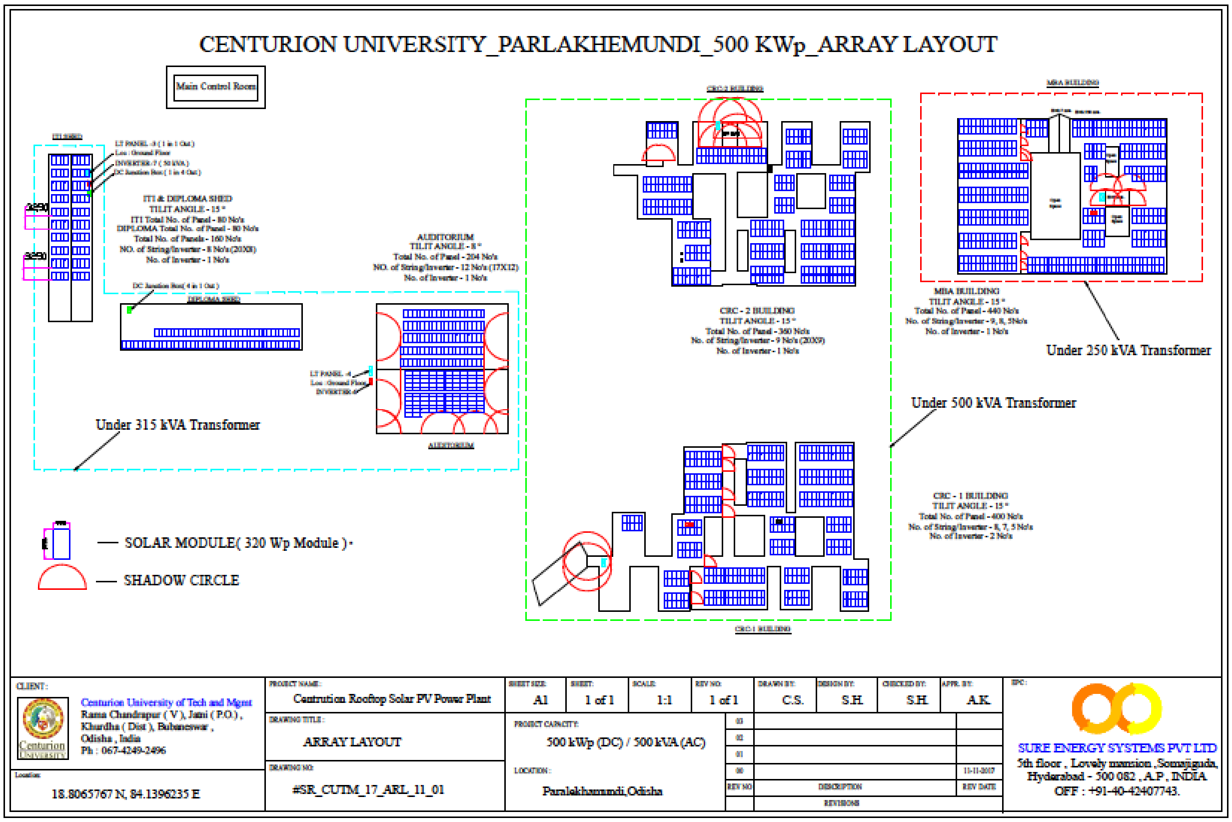


Fig-2: Solar Panel Earth Layout at CUTM- PKD campus

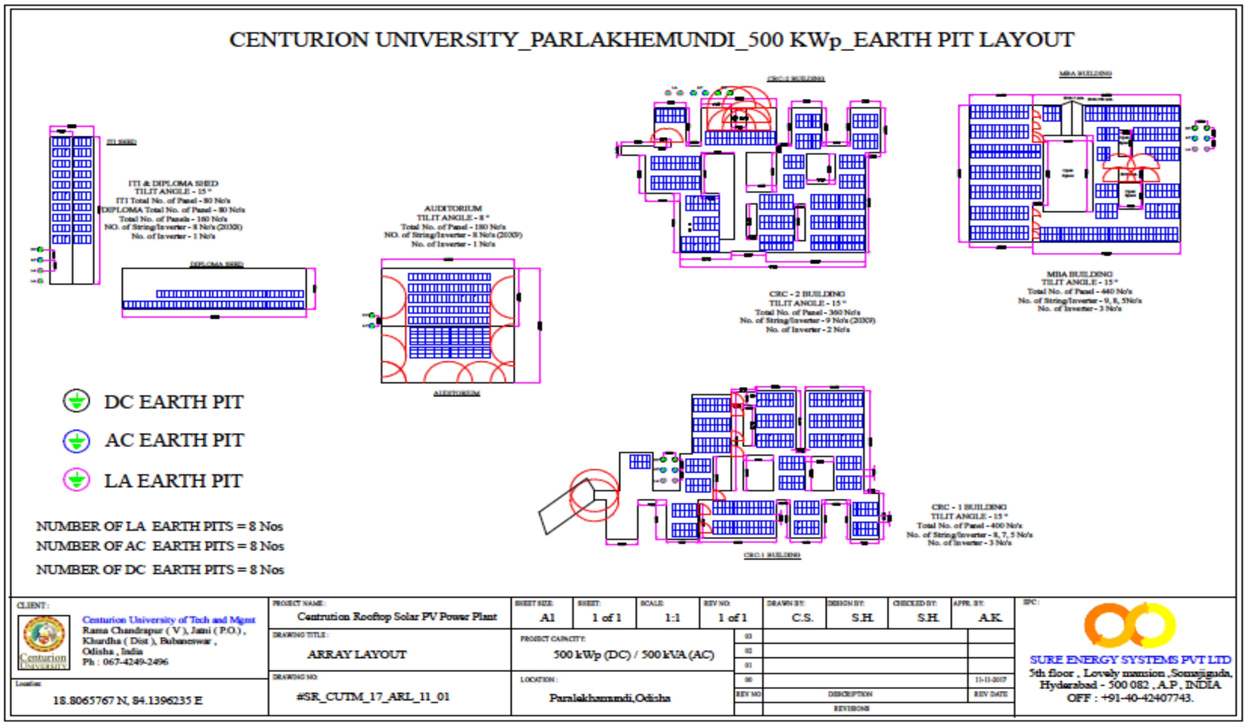


Fig-3: Solar Panels Location Layout at CUTM-PKD campus:

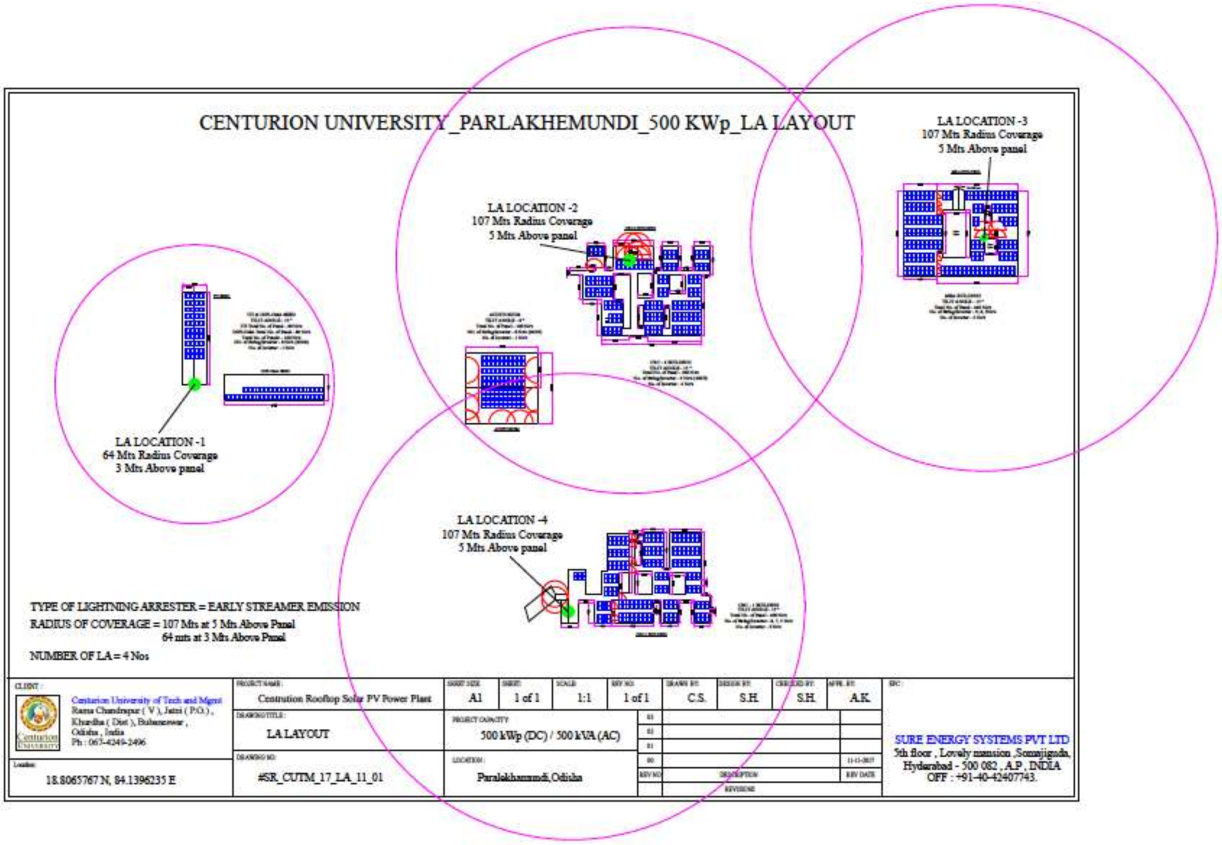


Fig-4: Solar Panels GI Routing Layout at CUTM-PKD campus:

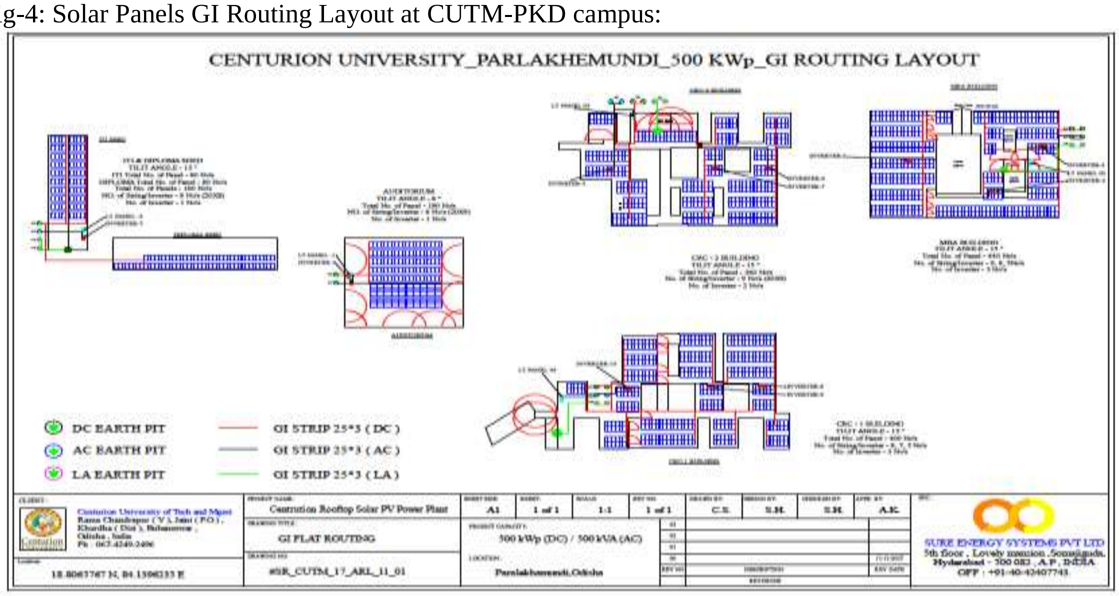


Fig-5: Solar Panels Single Line Diagram at CUTM-PKD campus:

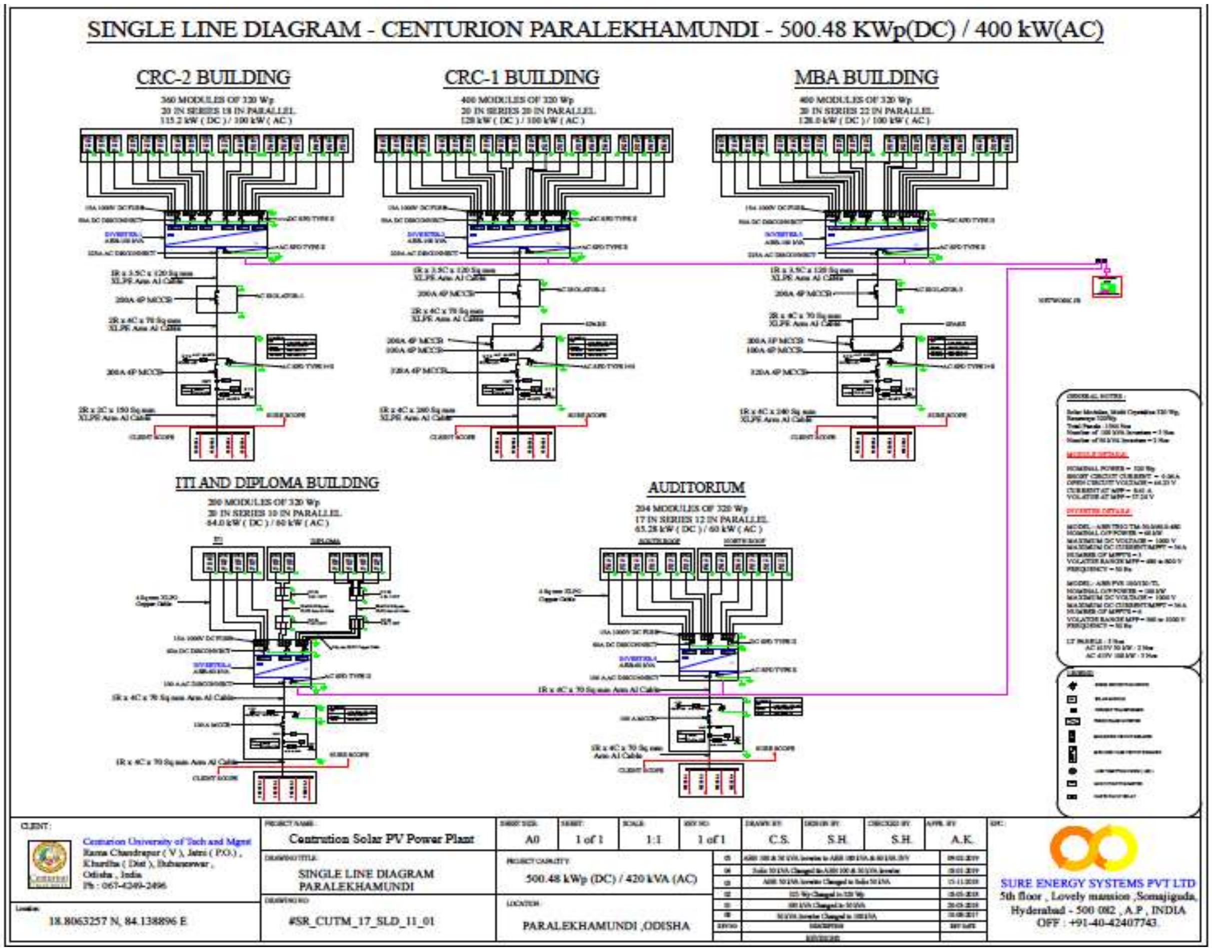


Fig-6: Solar Panels at CRC-1 roof top

Fig-7: Solar Panels at CRC-2 roof top

Fig-8: Solar Panels at MBA roof top:

GREEN INITIATIVES AND WASTE MANAGEMENT AT CUTM

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

Centurion University of Technology and Management
Alluri Nagar, P.O. – R Sitapur, Via – Uppalada, Paralakhemundi,
Dist.: Gajapati – 761211, Odisha, India
www.cutm.ac.in
2018-2019

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 aquestionnaire. With the help of student volunteers and faculties of respective departmrnts the major partof 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

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SCHOOL OF APPLIED SCIENCES
CUTM
CENTURION UNIVERSITY OF TECHNOLOGY & MANAGEMENT

CONTENTS

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

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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.

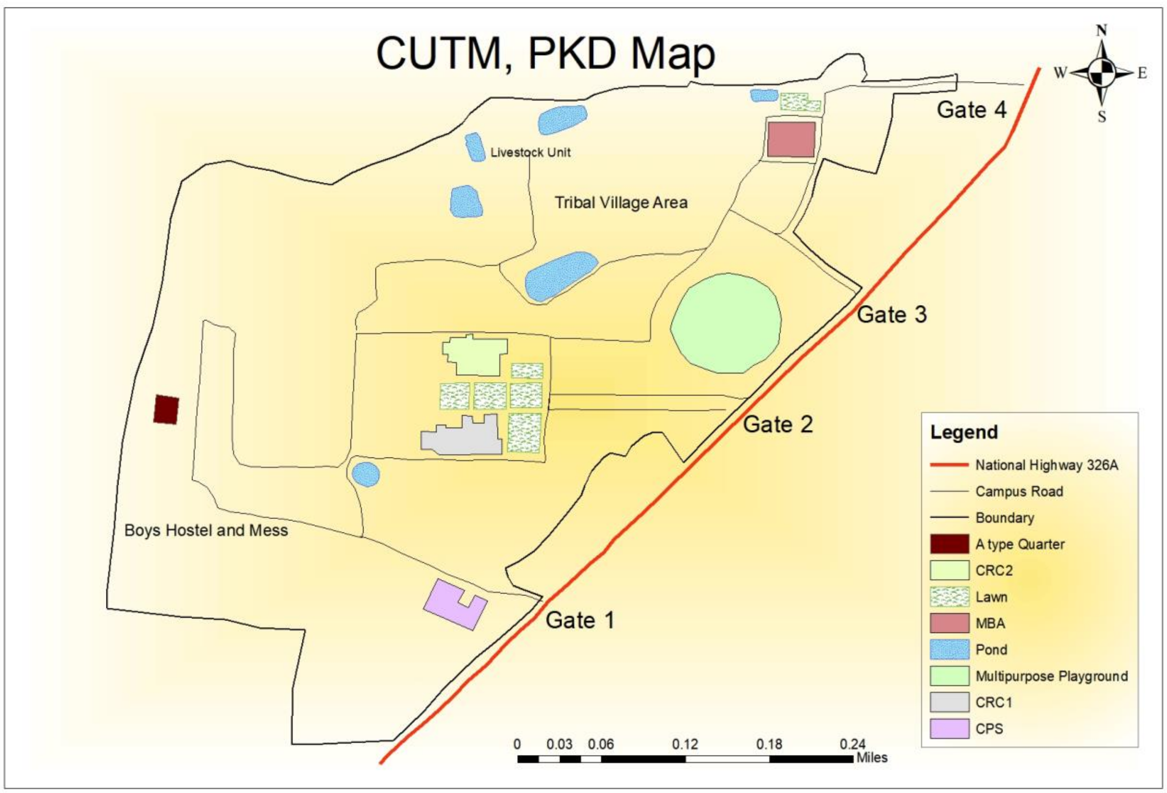
h. Water Quality: In general, is within the stipulated standards**,** though absence of coliform bacteria in all the samples tested indicates no possible contamination with sewage water.

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

5. METEOROLOGICAL PARAMETERS OF CUTM-PKD (January 2019 TO Till Date)

ANNUAL CLIMATOLOGICAL SUMMARY

NAME: MSSSOA, cutm parlakhamundi, ODISHA CITY: STATE:
ELEV: 0 m LAT: 18° 48' 25" N LONG: 84° 08' 25" W

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

YR	MO	MEAN MAX	MEAN MIN	MEAN	DEP. FROM NORM	HEAT DEG DAYS	COOL DEG DAYS	HI	DATE	LOW	DATE	MAX >=32	MAX <=0	MIN <=0	MIN <=-18
19	1	28.1	14.7	20.4	0.0	19	61	31.1	24	12.8	30	0	0	0	0
19	2	32.0	19.1	24.6	0.0	5	135	37.3	22	12.1	1	11	0	0	0
19	3	35.1	23.5	28.2	0.0	0	279	38.7	30	21.5	26	29	0	0	0
19	4	38.0	25.0	30.3	0.0	0	300	41.2	16	21.4	17	26	0	0	0
19	5	38.0	25.5	30.7	0.0	2	368	41.7	25	13.3	3	30	0	0	0
19	6	36.5	27.5	31.2	0.0	0	385	42.9	12	23.5	4	29	0	0	0
19	7	32.8	25.8	28.7	0.0	0	320	37.3	16	23.4	25	20	0	0	0
19	8	32.0	25.4	28.1	0.0	0	285	35.9	11	23.8	31	18	0	0	0
19	9	28.5	25.9	26.8	0.0	0	37	30.1	4	25.1	1	0	0	0	0
19	10														
19	11														
19	12														
		34.2	23.8	28.1	0.0	26	2169	42.9	JUN	12.1	FEB	163	0	0	0

PRECIPITATION (mm)

YR	MO	TOTAL	DEP. FROM NORM	MAX OBS. DAY	DATE	DAYS OF RAIN OVER .2	2	20
19	1	0.0	0.0	0.0	1	0	0	0
19	2	34.5	0.0	33.8	28	2	1	1
19	3	6.3	0.0	4.3	3	3	1	0
19	4	17.0	0.0	15.5	21	3	1	0
19	5	41.9	0.0	10.4	13	8	5	0
19	6	77.5	0.0	50.0	21	10	5	1
19	7	202.7	0.0	47.5	13	18	14	3
19	8	377.2	0.0	92.7	7	17	13	7
19	9	36.8	0.0	24.9	5	3	3	1
19	10							
19	11							
19	12							
		794.0	0.0	92.7	AUG	64	43	13

WIND SPEED (km/hr)

YR	MO	AVG.	HI	DATE	DOM DIR
19	1	1.3	20.9	18	S
19	2	2.2	45.1	28	WNW
19	3	2.9	41.8	31	WNW
19	4	3.7	53.1	21	WNW
19	5	4.3	62.8	27	WNW
19	6	3.7	35.4	28	NNW
19	7	3.1	51.5	17	NNW
19	8	2.2	48.3	25	NNW
19	9	1.2	19.3	5	NNW
19	10				
19	11				
19	12				
		2.9	62.8	MAY	NNW

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. <u>NOISE LEVEL CHART AT CUTM PKD CAMPUS</u> *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:

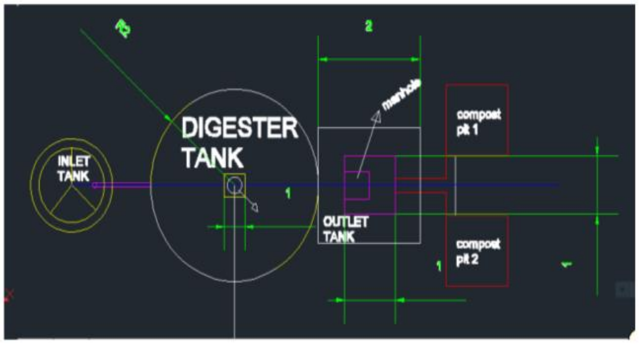
- Steps should be taken to use the food and vegetable waste as Biogas.
- The college has the complete data of food and vegetable waste from all the student mess.

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.

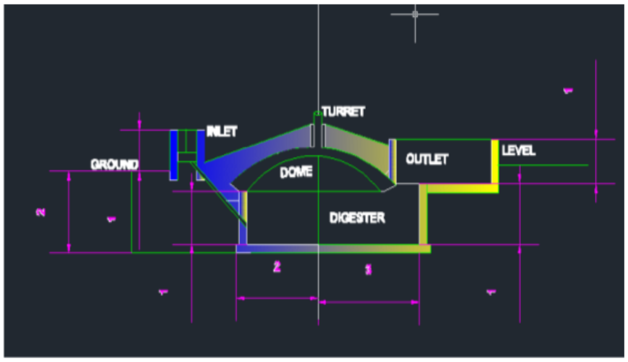
Categories	Vegetable waste (kg)	Food Waste (kg)
SOUTH MESS	913.54	568.61
NORTH MESS	3541.42	1593.81
ITI MESS	848.49	2196.97

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.

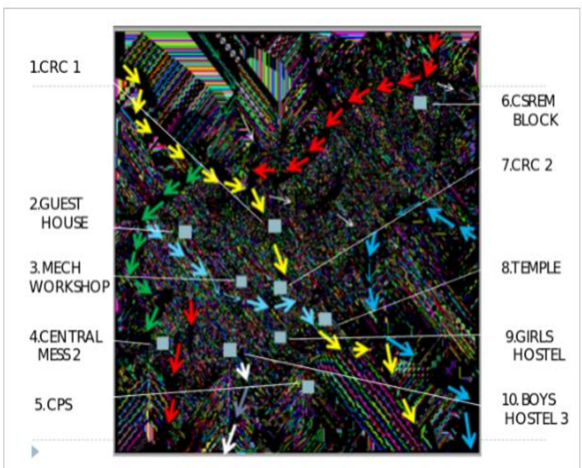
b) Indicator: Watershed Management

Goal: To control soil erosion
Benchmark:

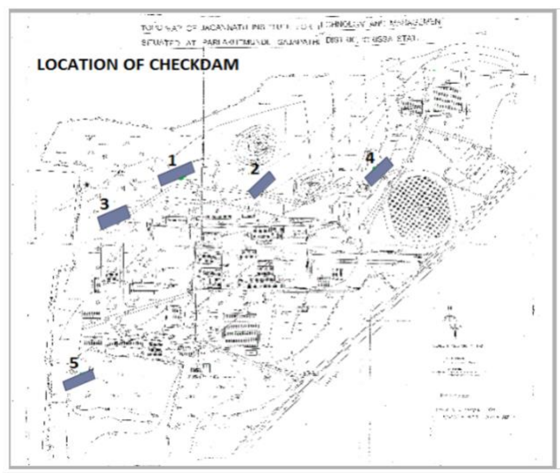
- The college should take steps towards land stabilization by way of controlling soil erosion through construction of check dams in the sloppy areas.
- This will eventually enhance the ground water resources.

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.

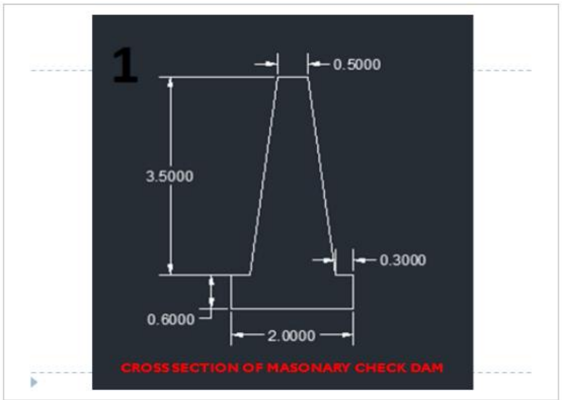
This enhances the ground water resources which can be used for the agricultural purpose of the college. In dry season the plants in the college get dried so we can water the plants by using this water. The water is not required to be treated and can be used directly for watering. This avoids the cost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



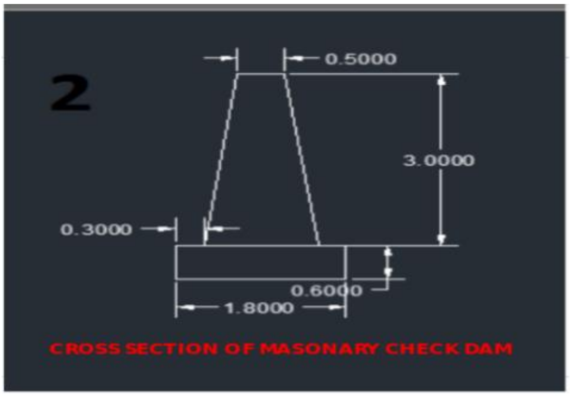
Natural Drainage network order map



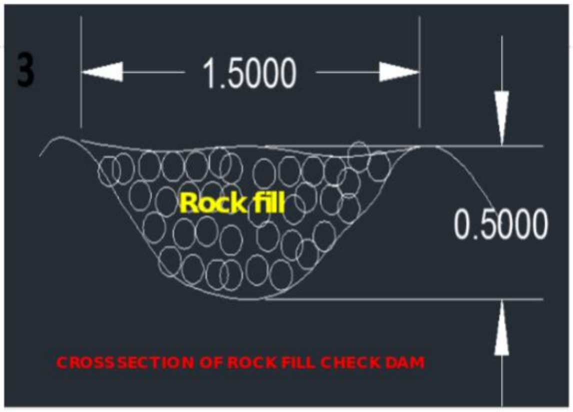
Location of check dam



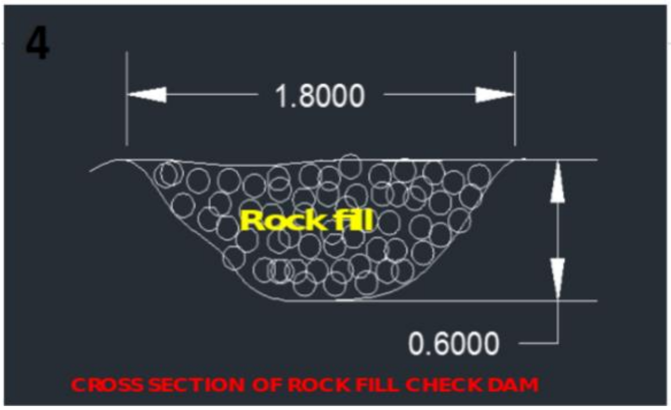
Check dam at location 1



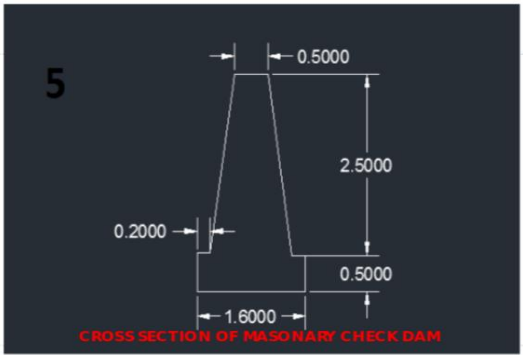
Check dam at location 2



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

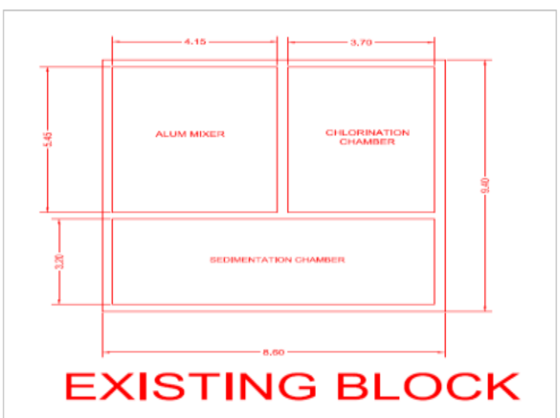
Goal: To use the waste water in an efficient way
Benchmark:

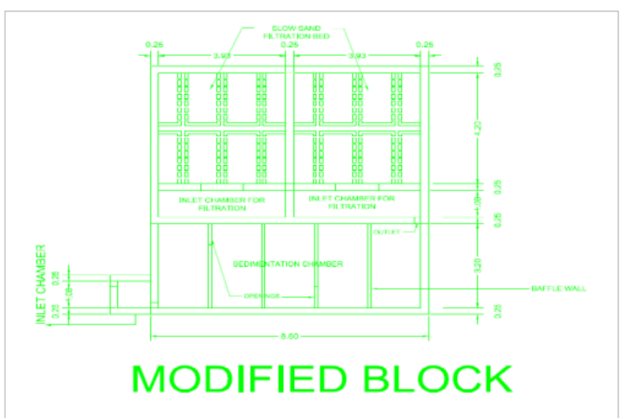
- The waste water collected from the bathrooms of the hostel will be treated to use for gardening of the plants.

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

SL.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	Bael	*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. **In charge Name**: G. Prameela

3.**"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

4. **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.

5. 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

6. Training for Students

- Each year B.Sc.(Ag) students of MSSSoA undergo AELP programme on Organic Research Farm
- Sixteen students of B.Sc. (Ag) final year have undertook the AELP programme during 2016-17, 2017-18, 2018-19.

7. Outcome

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

8. Student's involvement in Unit

Application of Vermiwash for Tomato Crop

Application of Agniastra for Tomato Crop

Pruning of Tomato Crop

9. Trainings and Visits

Visit of NGO's members

Visit of NSDC Official Dr. Gipson Verghese

Visit of Punjab Minister and Prof. Mukti K Mishra

11. COMPOSTING UNIT AT PKD Campus:

1. **Faculty In charge:** Dr.Saurav Barman
2. **Incharge Name**: Mr. E.Sandeep Kumar
3. **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.

4. **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

5. **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.
- Twenty four students of B.Sc(Ag) final year have undertook the AELP programme during 2016-17, 2017-18, 2018-19.

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.

6. 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.

7. 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.

8. Student's involvement in Unit

Chopping of leaves using Shredrer

Release of Earthworms in the Vermicompost pit

Watering the Vermicompost pit

9. 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

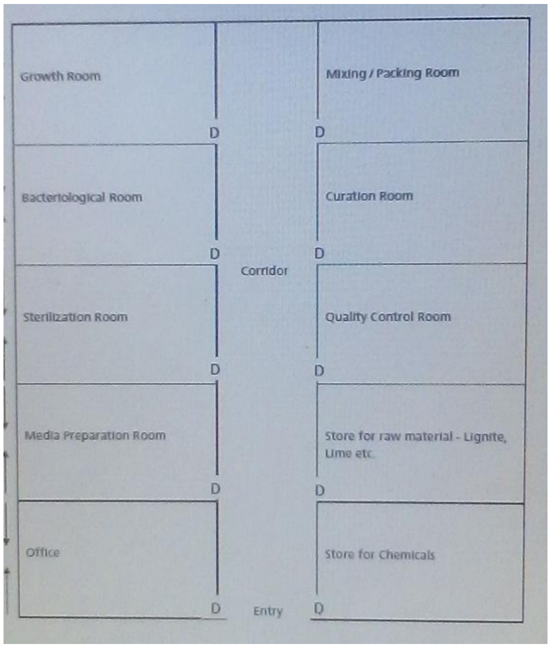
Objectives:

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

14: Solar Electric Power Generation at CUTM-PKD campus:

Solar energy is defined as the transformation of energy that is present in the sun and is one of the renewable energies. Once the sunlight passes through the earth's atmosphere, most of it is in the form of visible light and infrared radiation. Plants use it to convert into sugar and starches and this process of conversion is known as photosynthesis. Solar cell panels are used to convert this energy into electricity. Solar power is the conversion of energy from sunlight into electricity, either directly using photovoltaics (PV), indirectly using concentrated solar power, or a combination. Concentrated solar power systems use lenses or mirrors and solar tracking systems to focus a large area of sunlight into a small beam. Photovoltaic cells convert light into an electric current using the photovoltaic effect.

Photovoltaics were initially solely used as a source of electricity for small and medium-sized applications, from the calculator powered by a single solar cell to remote homes powered by an off-grid rooftop PV system. Commercial concentrated solar power plants were first developed in the 1980s. As the cost of solar electricity has fallen, the number of grid-connected solar PV systems has grown into the millions and utility-scale photovoltaic power stations with hundreds of megawatts are being built. Solar PV is rapidly becoming an inexpensive, low-carbon technology to harness renewable energy from the Sun.

Solar Energy Advantages and Disadvantages

Advantages of solar energy are:

- Clean: It is considered to the cleanest form of energy as there is no emission of carbon dioxide like in case of fossil fuels which is one of the causes of global warming.
- Renewable: There is an ample amount of energy available on earth as long as the sun exists.
- Reliable: The energy can be stored in the batteries and so there is no question of unreliability.
- Reduction in utility costs.
- Free energy because it can be trapped easily.

Disadvantages of solar energy:

- The production is low during winters and on cloudy days.
- Installation and the initial cost of the materials are expensive.

- Space consumption is more.

Types of Solar Energy:

Solar energy can be classified into two categories depending upon the mode of conversion and type of energy it is converted into. Passive solar energy and active solar energy belongs to the mode of conversion and solar thermal energy, photovoltaic solar power and concentrating solar power. Passive solar energy: This refers to trapping sun's energy without using any mechanical devices. Active solar energy: This uses mechanical devices to collect, store and distribute the energy. Solar thermal energy: This is the energy obtained by converting solar energy into heat. Photovoltaic solar power: This is the energy obtained by converting solar energy into electricity. Concentrating solar power: This is a type of solar thermal energy which is used to generate solar power electricity.

Solar Energy Project at CUTM:

Solar energy, the experiment on the efficiency of the solar heating working model is one of the easiest science experiment that you can prepare in your school fair science project. This working model is quick, simple and very informative. The result may vary if the project is performed outdoor due to the wind and weather condition, so it is recommended to conduct the experiment indoors. In this solar heater project, use reflectors to concentrating the solar energy in one small place to collect and store heat energy. In this experiment, you will see the efficiency of solar energy. The International Energy Agency projected in 2014 that under its "high renewables" scenario, by 2050, solar photovoltaics and concentrated solar power would contribute about 16 and 11 percent, respectively, of the worldwide electricity consumption, and solar would be the world's largest source of electricity. The productivity of solar power in a region depends on solar irradiance, which varies through the day and is influenced by latitude and climate. It also depends on the temperature, and the local soiling conditions. The locations with highest annual solar irradiance lie in the arid tropics and subtropics. Deserts lying in low latitudes usually have few clouds, and can receive sunshine for more than ten hours a day. Unlike fossil fuel based technologies, solar power does not lead to any harmful emissions during operation, but the production of the panels leads to some amount of pollution. This project have been initiated in the year of 2018, successfully installed solar panels at Parlakhemundi campus in the year of 2019 and below are the details of the electrical diagrams of solar power which was installed at CRC-1, CRC-2, ITI, auditorium and MBA building (Fig-1 to Fig-8).

Fig-1: Solar Panels Array Layout at CUTM-PKD campus:

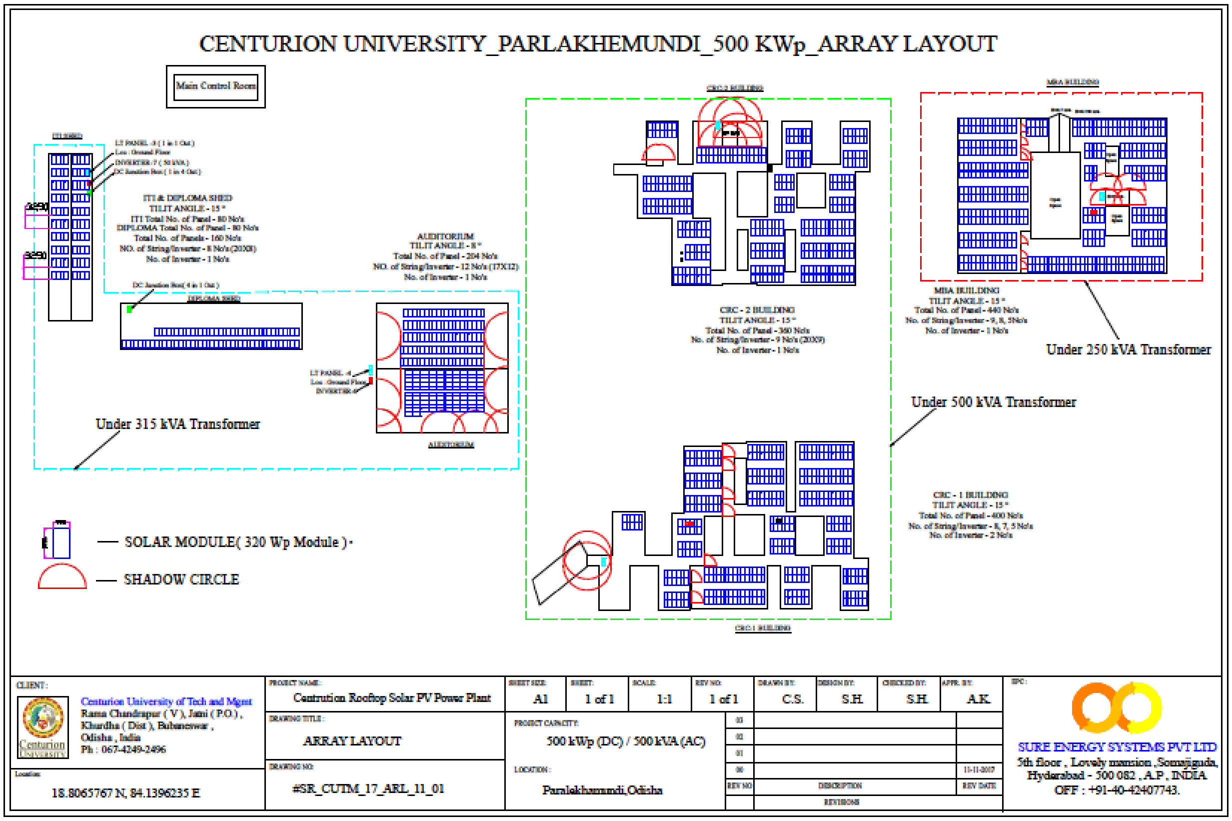


Fig-2: Solar Panel Earth Layout at CUTM- PKD campus

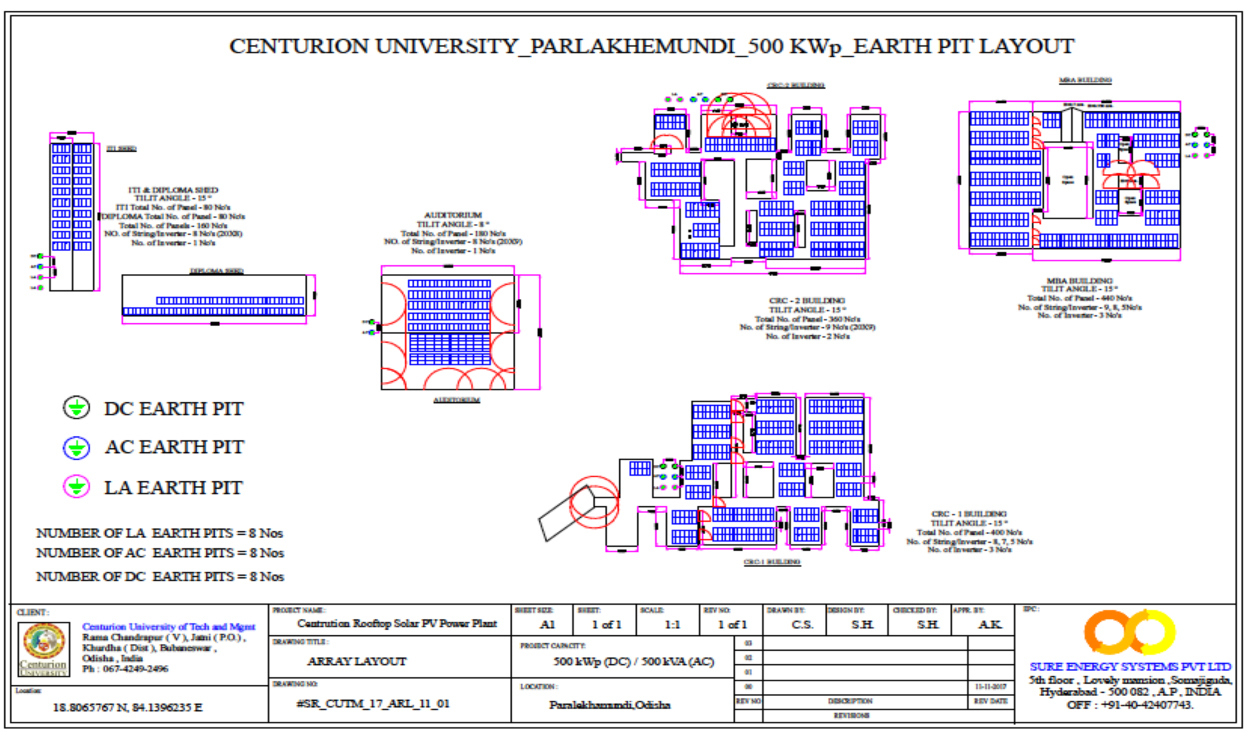


Fig-3: Solar Panels Location Layout at CUTM-PKD campus:

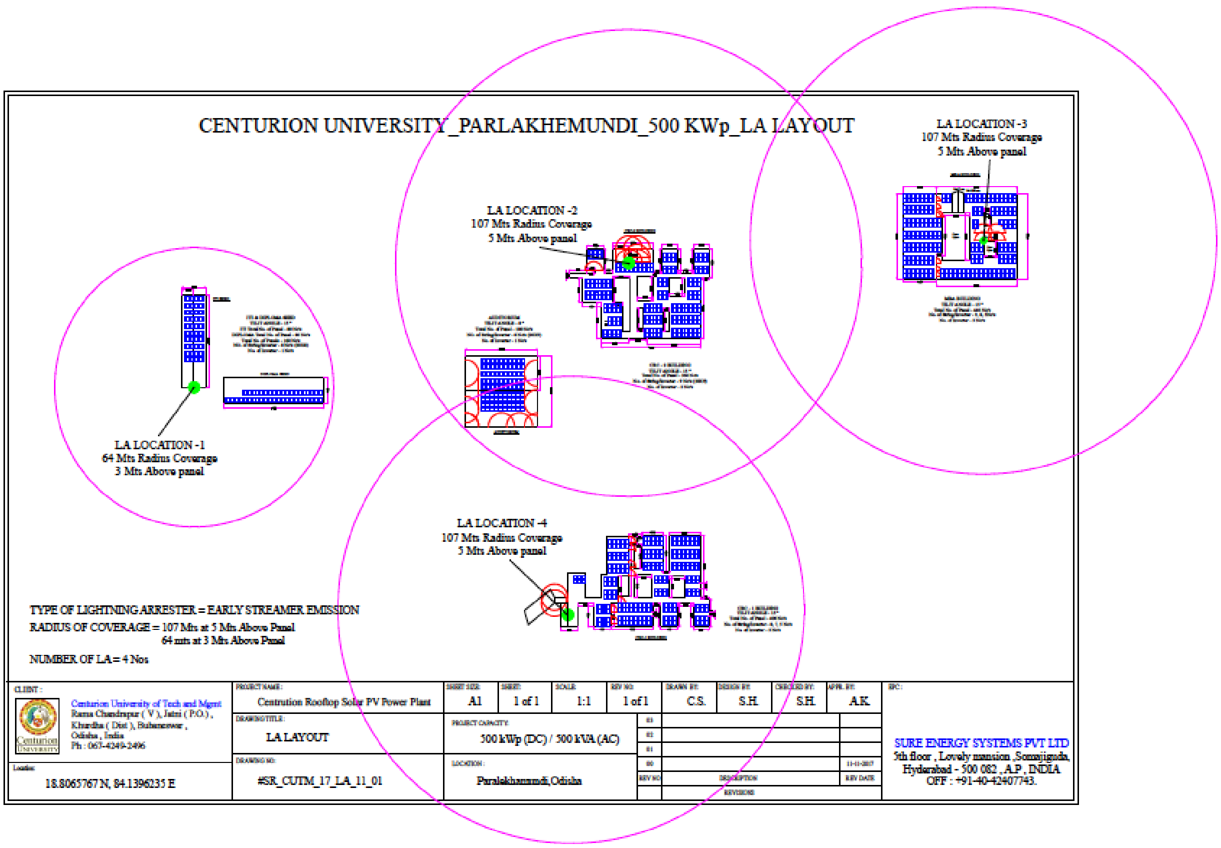


Fig-4: Solar Panels GI Routing Layout at CUTM-PKD campus:

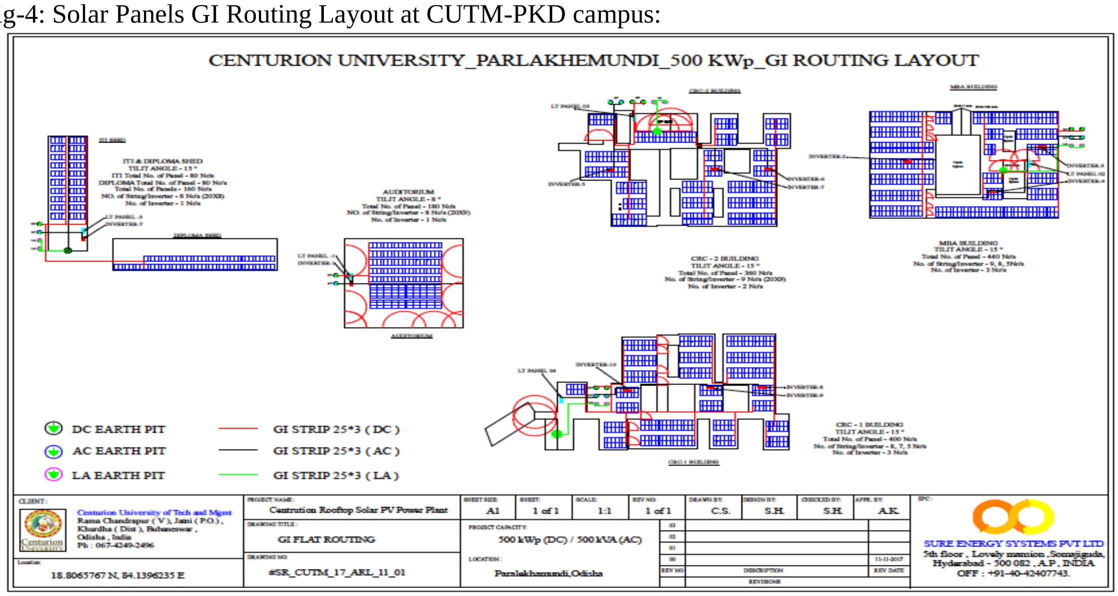


Fig-5: Solar Panels Single Line Diagram at CUTM-PKD campus:

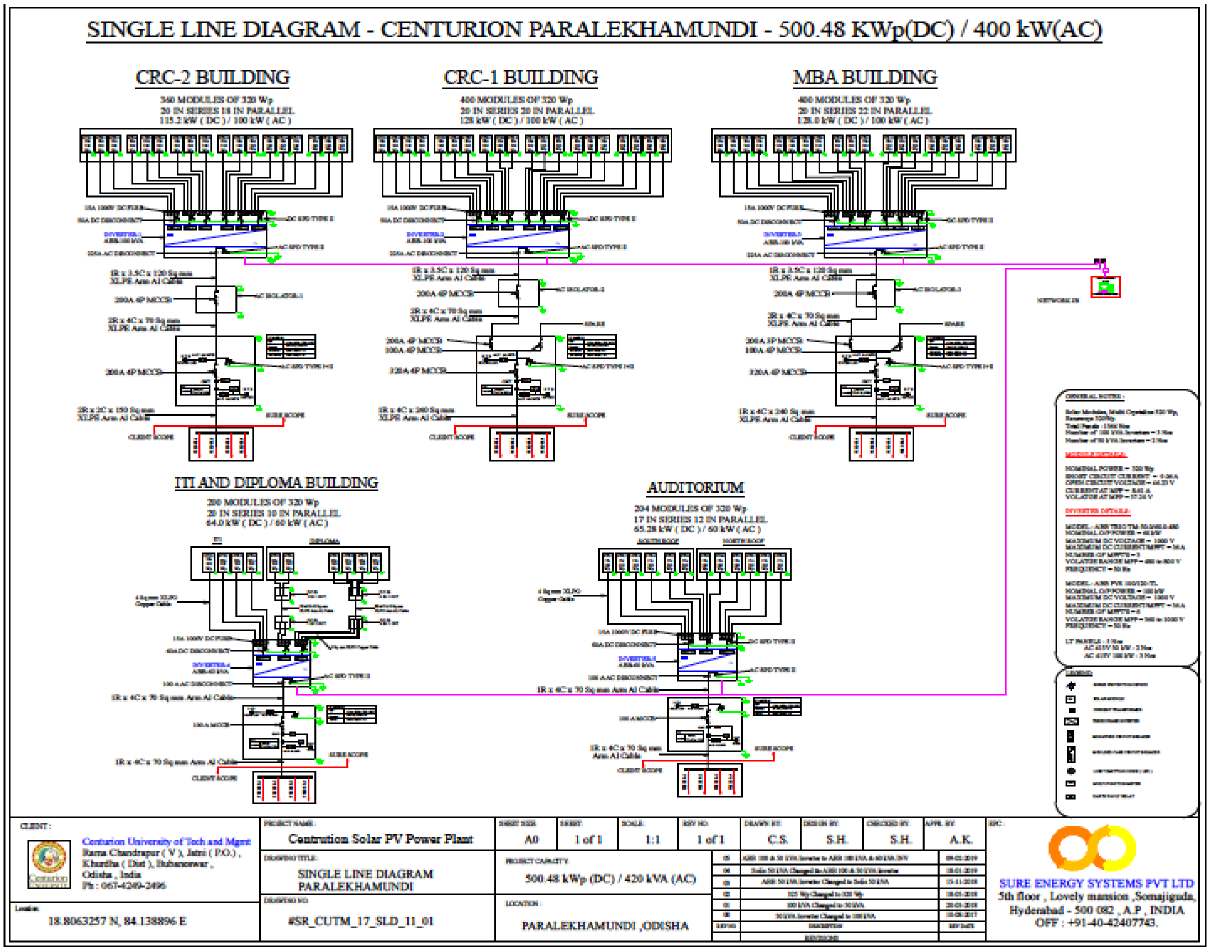


Fig-6: Solar Panels at CRC-1 roof top

Fig-7: Solar Panels at CRC-2 roof top

Fig-8: Solar Panels at MBA roof top:

GREEN INITIATIVES AND WASTE MANAGEMENT AT CUTM

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2017

CONTENTS

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 aquestionnaire. With the help of student volunteers and faculties of respective departmrnts the major partof 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

Dr. Yashaswi Nayak **Dr. Sagarika Parida**

Gyanranjan Mahalik

Dr. Gyanranjan Mahalik **Dr. Siba Prasad Parida**

SCHOOL OF APPLIED SCIENCES ★ CENTURION UNIVERSITY OF TECHNOLOGY & MANAGEMENT ★ CUTM

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.

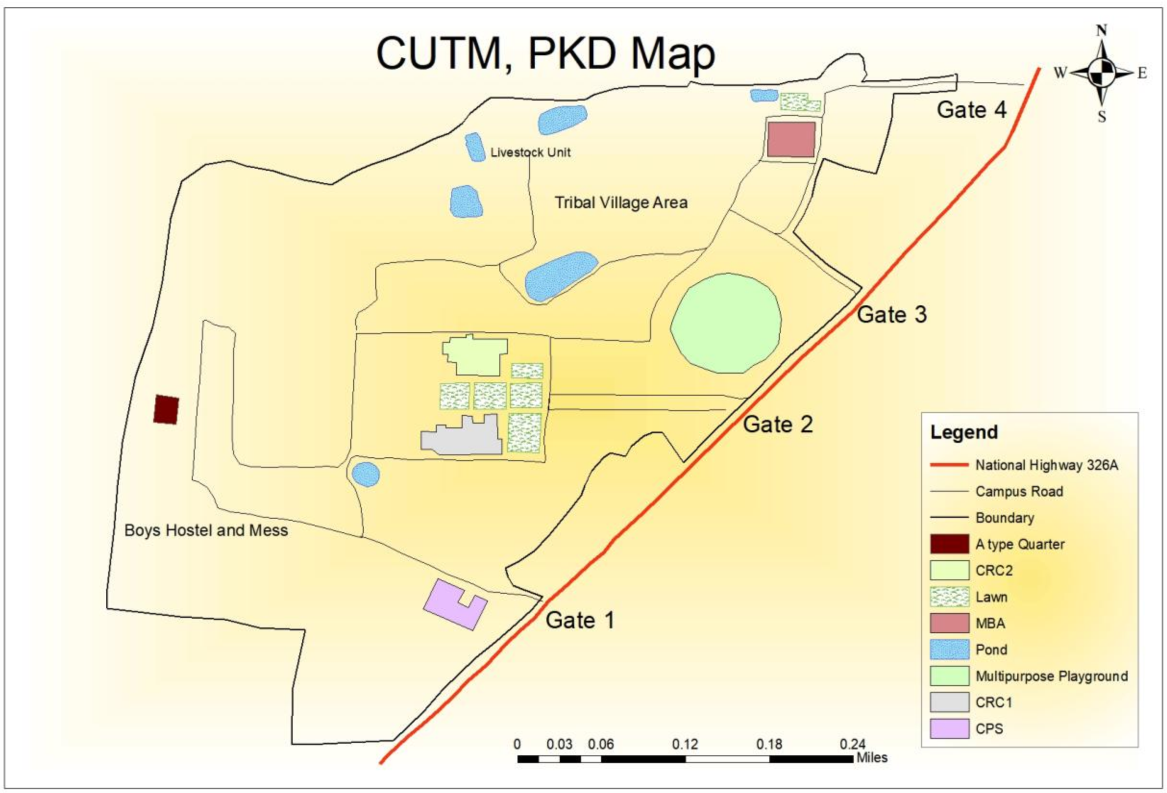
h. Water Quality: In general, is within the stipulated standards**,** though absence of coliform bacteria in all the samples tested indicates no possible contamination with sewage water.

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. 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.

6. <u>NOISE LEVEL CHART AT CUTM PKD CAMPUS</u> *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).

7. 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:

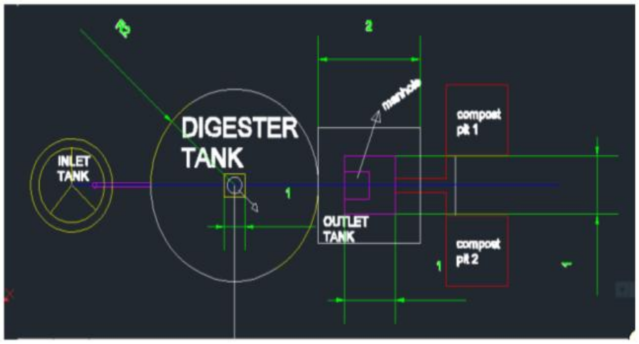
- Steps should be taken to use the food and vegetable waste as Biogas.
- The college has the complete data of food and vegetable waste from all the student mess.

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.

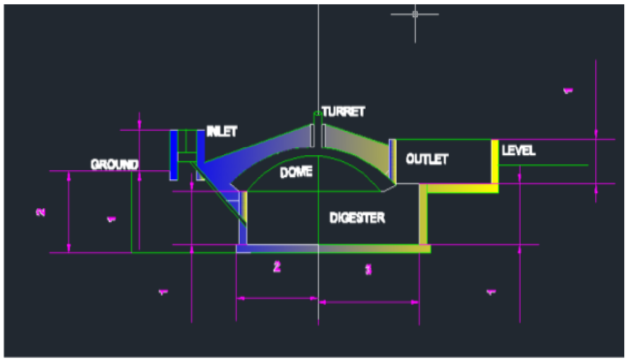
Categories	Vegetable waste (kg)	Food Waste (kg)
SOUTH MESS	913.54	568.61
NORTH MESS	3541.42	1593.81
ITI MESS	848.49	2196.97

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

Food waste and cowdung digester (Biogas plant) for generation Biogas in tribal village, CUTM Parlakhemundi campus.

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.

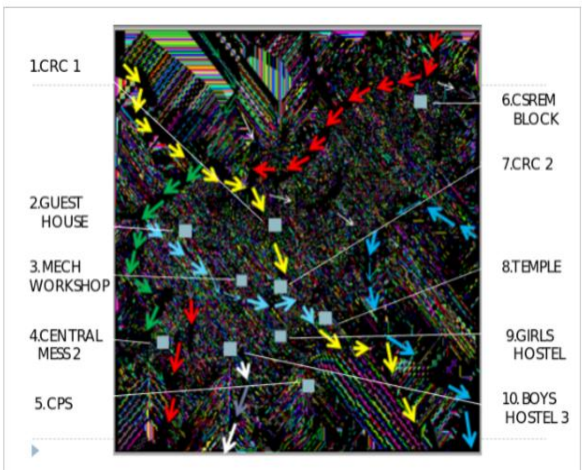
b) Indicator: Watershed Management

Goal: To control soil erosion
Benchmark:

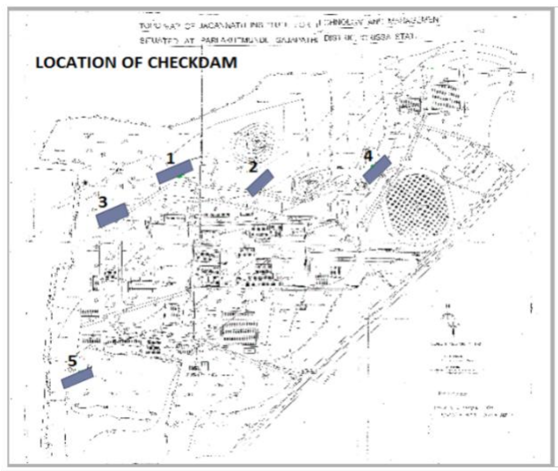
- The college should take steps towards land stabilization by way of controlling soil erosion through construction of check dams in the sloppy areas.
- This will eventually enhance the ground water resources.

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.

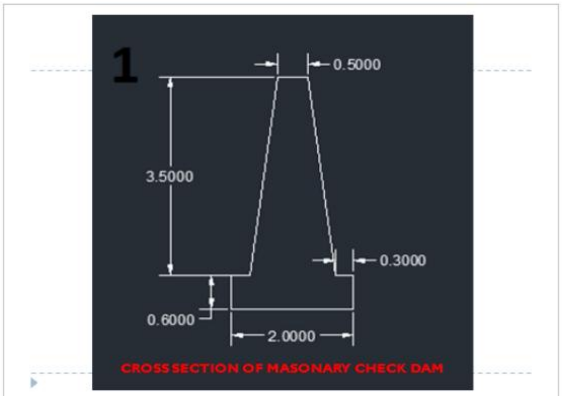
This enhances the ground water resources which can be used for the agricultural purpose of the college. In dry season the plants in the college get dried so we can water the plants by using this water. The water is not required to be treated and can be used directly for watering. This avoids the cost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



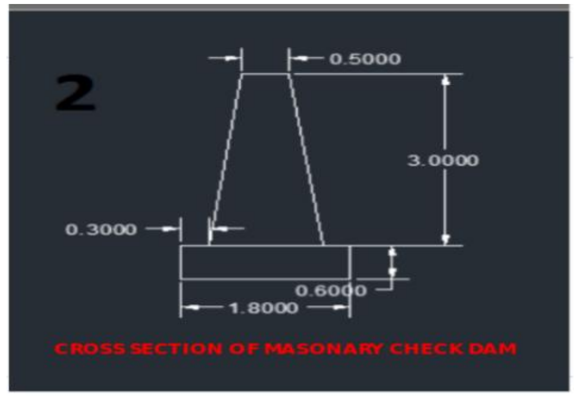
Natural Drainage network order map



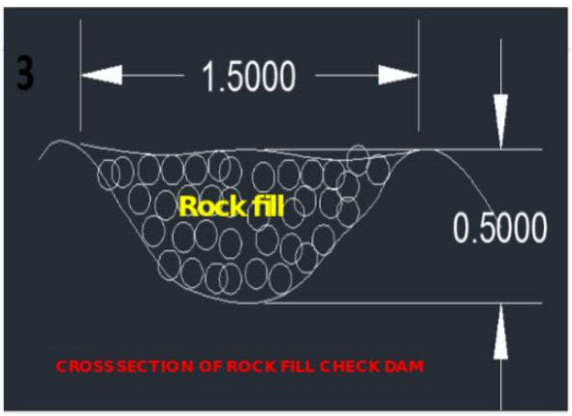
Location of check dam



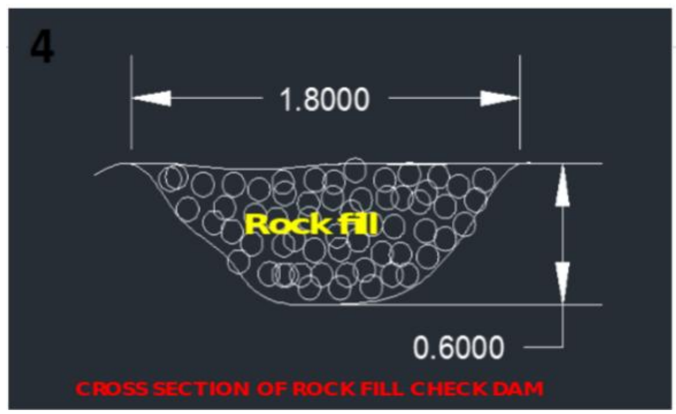
Check dam at location 1



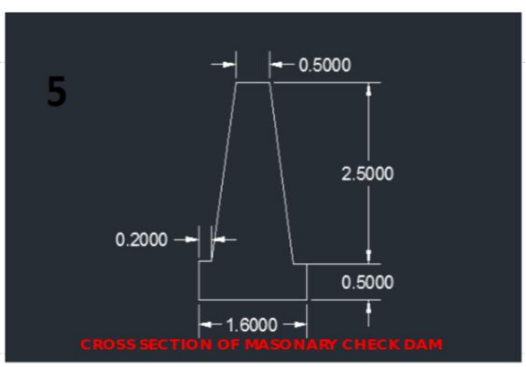
Check dam at location 2



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

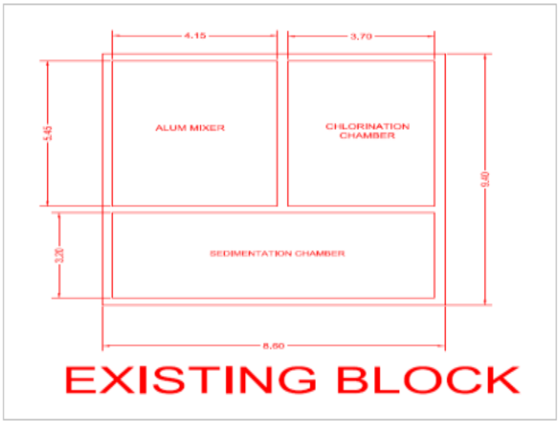
Goal: To use the waste water in an efficient way
Benchmark:

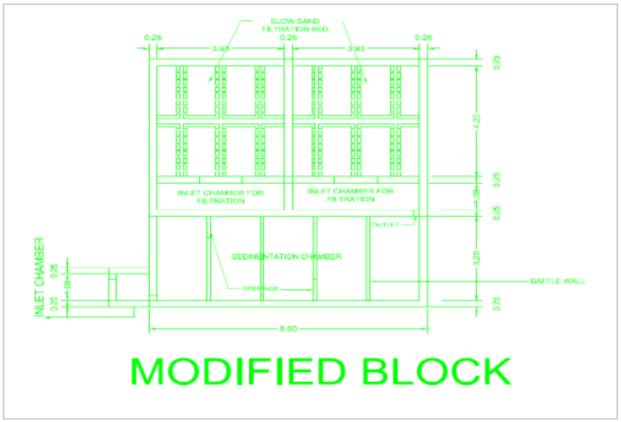
- The waste water collected from the bathrooms of the hostel will be treated to use for gardening of the plants.

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.

8. 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	Bael	*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

9. ORGANIC RESEARCH FARM at CUTM-PKD Campus:

1. Faculty In charge: Dr. Saurav Barman

2. **In charge Name**: G. Prameela

3.**"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

4. **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.

5. 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

6. Training for Students

- Each year B.Sc.(Ag) students of MSSSoA undergo AELP programme on Organic Research Farm
- Sixteen students of B.Sc. (Ag) final year have undertook the AELP programme during 2016-17, 2017-18.

7. Outcome

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

8. Student's involvement in Unit

Application of Vermiwash for Tomato Crop

Application of Agniastra for Tomato Crop

Pruning of Tomato Crop

9. Trainings and Visits



Visit of NGO's members

Visit of NSDC Official Dr. Gipson Verghese

Visit of Punjab Minister and Prof. Mukti K Mishra

10. COMPOSTING UNIT AT PKD Campus:

1. **Faculty In charge:** Dr.Saurav Barman
2. **Incharge Name**: Mr. E.Sandeep Kumar
3. **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.

4. **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

5. **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

b. Students

- Each year B.Sc (Ag) students of MSSSoA undergo AELP programme on vermicomposting.
- Twenty four students of B.Sc(Ag) final year have undertook the AELP programme during 2016-17, 2017-18.

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.

6. 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.

7. 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.

8. Student's involvement in Unit

Chopping of leaves using Shredrer

Release of Earthworms in the Vermicompost pit

Watering the Vermicompost pit

9. Trainings and Visits

Training on Vermicompost in Barlanda Village

Visit of Foreigners to the Unit

Visit of NSDC official Dr.Gipson Verghese

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

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

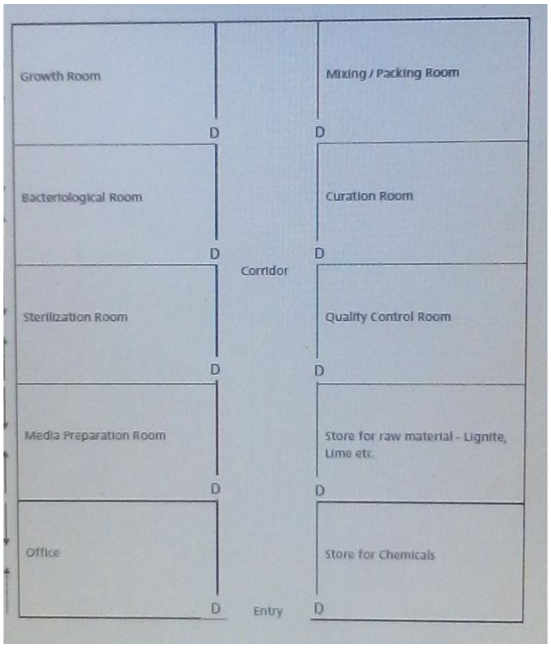
Objectives:

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

12. 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

CUTM, Parlakhemundi campus is located at a unique landscape dotted with hills, plateaus and most importantly substantial cover of green vegetation. In fact the campus boasts of varieties of different plant species and sub-species pertaining to the Eastern, South-eastern and Southern Indian flavour. Primary objective of the plant census project as per Green Campus Audit is aimed at taking stock of the campus's biodiversity and ensuring protection of it green areas. The census is also aimed at encouraging JITM community awareness of the need for tree conservation with campus people's participation. This is one of the ways to be connected to the environment. Tree conservation and protection and management of greenery have emerged as a focus area for the environmental ministry with the exponential rise of the urban population. Thus it was thought to carry out the plant census project by identification of the trees, know about the varieties and document them so that we have a clear idea about the green cover in the campus.

Information received from the plant census report would enable JITM to know it's campus better, have a better idea about the varieties of plants/trees available in the campus, take part in preservation or conservation of the trees and most importantly contribute towards generating awareness among campus residents and visitors towards better environmental management.

Keeping in mind the goal of the project MS Swaminathan School of Agriculture involved it's team of students and faculties to embark upon the Herculean task of plant census by walking across the entire campus spanning over 140 acres of land to capture the "green" data. Period of data generation took place between 7th of July to 10th of July 2017. Average temperature during the above mentioned period was 36^{0}C with average humidity being 80%.

Figure 1: Google map of JITM campus

Census team followed the campus google map and divided the total area in 5 blocks to do the job block wise. Each block included mango orchards, buildings like hostels, residential quarters, college buildings, water bodies and other areas. It was seen from the google map that the JITM campus (Figure 1) is rich in green

The team's plan of work was as follows:

(a) Visit the campus blockwise and identify the trees and plants with the help of faculties and

local experts.
(b) Generation of a code system for the different tree and plant species for example, for mango "M" was used to demarcate the species. The different varieties were identified and given a code too for example, Banganpalli variety which is very much prevalent in Andhra Pradesh and neighbouring Odisha was given a code of "B". The numbers of plants were given in ascending order starting from one for example the first Banganpalli variety of mango was given a code of MB1.Similarly for different plants different differentiable codes were provided without any overlapping.
(c) Codes of plants were written in red paint on the tree bark to be substituted soon with a Zinc plate carrying all the information regarding the tree, its variety and number.
(d) Since there was a variety of mango plants being present in the campus one team was documenting mangoes while other teams were busy with non-mango plants in the campus. Teams were busy in census process all of the four days as shown in figures (Figure 2-4)

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, RAYAGADA CAMPUS, ODISHA (2021-22)

2021-22

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 aquestionnaire. With the help of student volunteers and faculties of respective departmrnts the major partof 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

Atia Arzoo

Dr. Atia Arzoo

R Mishra

Dr.Rukmini Mishra

Y. N.

Dr. Yashaswi Nayak

Dr. Sagarika Parida

Gyanranjan Mahalik

Dr. Gyanranjan Mahalik

S. P. Parida

Dr. Siba Prasad Parida

SCHOOL OF APPLIED SCIENCES * CENTURION UNIVERSITY OF TECHNOLOGY & MANAGEMENT * CUTM

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.

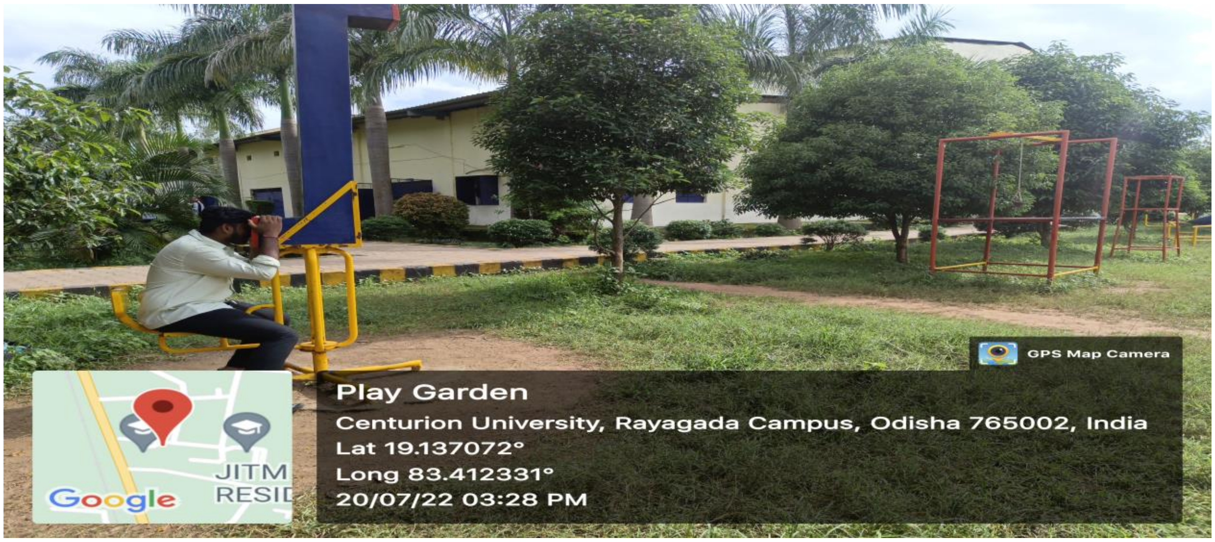
g. Waste management: Land filling is the general waste management strategy adopted by the University and there is no management plan for managing inorganic waste, especially plastics. So polythene use has been banned completely. All the departments are now following green charter and started avoiding 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	Toilets: Men, Women, Differently abled	Overall remarks
1	Pharmacy Block (New building)	C	G	√	G	√	√	G
2	Old building +2 Science and Girls hostel	C	G	√	G	NA	√	G
3	Boys Hostel	C	G	√	G	NA	√	G
4	Multipurpose Hall	C	A	√	NA	√	√	G
5	Canteen	C	A	√	NA	√	√	G
6	Gram Tarang Building	CS	G	√	NA	NA	√	G

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

SOME PHOTOGRAPHS SHOWING ECOFRIENDLY ENVIRONMENT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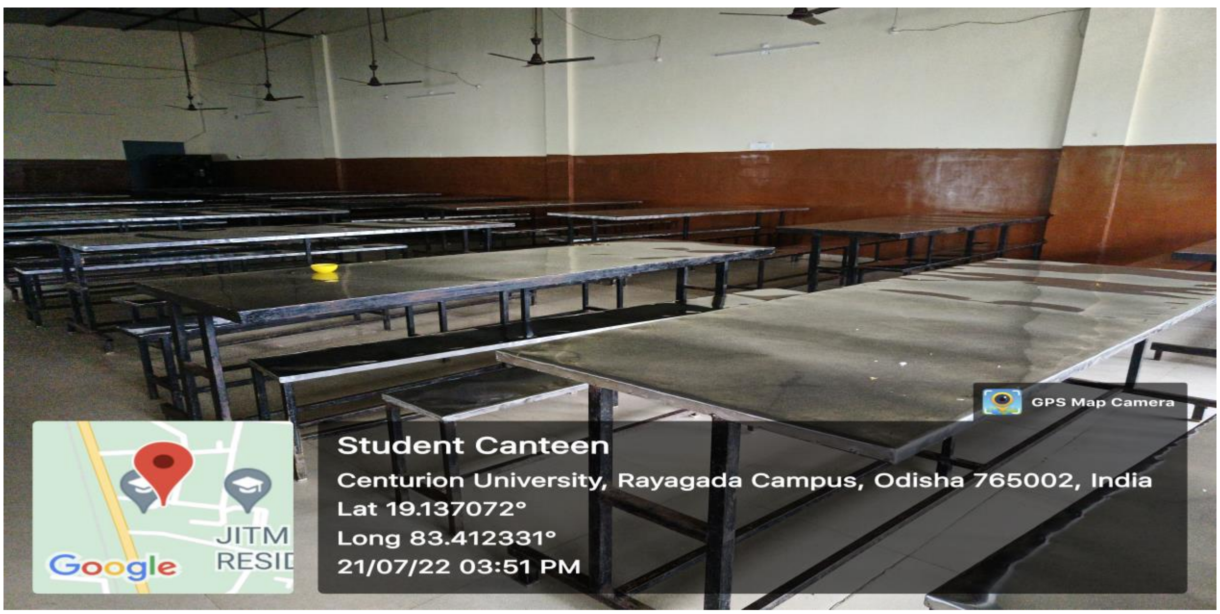
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Energy Management

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.

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. Faunal and floral diversity reports are given below.

REPORT ON FLORA AND FAUNAL DIVERSITY

CUTM campus Audit aims to address the need for more comprehensive and focused Education Training and Holistic Development of an institution. In the world of advanced researches and globalization an audit programme of the institution provides knowledge about the detailed working of the various campus entities and the scope for betterment in areas of education and environmental action programmes. The outcome of green audit programmes give an insight into better running of the institution and judicious utilization of its available resources, their improvement, quality enhancement and conservation and spreading the information through awareness programmes. Such practices help building holistic personality of pupils and the faculty members and is imperative towards shaping the way of "Action Learning" programme and its successful implementation.

Situated in the mineral rich southern part of Odisha, Rayagada is a district of meadows, forests, waterfalls and terraced valleys, inhabited by many primitive tribal groups. The scenic beauty and heritage of the land is an unexplored paradise. Spread over 15 acres of land this campus provides skill integrated education in the region.

Methodology followed

Campus biodiversity study programme was conducted by Dr. Siba Prasad Parida, Associate Prof. Department of Zoology and Dr. Gyanranjan Mahalik, Associate Prof., Department of Botany, The different plants in the campus were identified and recorded. Their medicinal values were identified. Similarly, the avifauna, mammals were studied in the campus. The identification was done following the expert guidance of faculty members and relevant literatures viz. Hooker (1872-97), Bingham (1897, 1903), Prain (1905) and Ali (2003). The photographs were taken in DSLR camera.

The Campus although located in the heart of the city maintains its greenery. Survey conducted by the faculty members of Zoology and Botany department identified about 85 plant species of various genera. Most of the recorded species have medicinal importance.

Floral diversity:

Sl. No.	Local Name	Common English name	Scientific Name	Family
1	Karanja	Pongamia	*Millettia pinnata*	Fabaceae
2	Sala Chakhunda	American sicklepod	*Senna occidentalis*	Fabaceae
3	Gambhari	Candhar tree	*Gmelina arborea*	Lamiaceae

4	Tarata	Lemonwood	*Pittosporum eugenioides*	Pittosporaceae
5	Thuja	White-cedar	*Thuja occidentalis*	Cupressaceae
6	Jamun	Black plum,	*Syzygium cumini*	Myrtaceae
7	Kagajphula	Bougainvillea	*Bougainvillea glabra*	Nyctaginaceae
8	Neem	Indian lilac	*Azadirachta indica*	Meliaceae
9	Barakoli	Indian plum	*Ziziphus jujuba*	Rhamnaceae
10	Kamini	Orange jasmine	*Murraya paniculata*	Rutaceae
11	Aurocaria	Christmas tree	*Araucaria columnaris*	Araucariaceae
12	Chatiana	Scholar tree	*Mimosa pudica*	Fabaceae
13	Tridax	Tridax daisy	*Tridax procumbens*	Asteraceae
14	Dimiri	Cluster fig	*Ficus racemosa*	Moraceae
15	Pokasungha	Little ironweed	*Vernonia cinerea*	Asteraceae
16	Patali	Yellow Snake tree	*Stereospermum suaveolens*	Bignoniaceae
17	Golap	Rose	*Rosa Rubiginosa*	Rosaceae
18	Alovera			
19	Minitagar	Pinwheel flower	*Tabernaemontana divaricata*	Apocynaceae
20	Badi kunduri	Ivy gourd	*Coccinia grandis*	Cucurbitaceae
21	Nerium	Rosebay	*Nerium oleander*	Apocynaceae
22	Duba	Couch grass	*Cynosurus dactylon*	Poaceae
23	Mutha	Nut grass	*Cyperus rotundus*	Cyperaceae
24	Rajanigandha	Bone flower	*Agave amica*	Asparagaceae
25	Hirita	Hairy spurge	*Euphorbia hirta*	Euphorbiaceae
26	Cassia tora	*Cassia*	*Cassia tora*	Fabaceae
27	Pokosunga		*Ageratum conyzoides*	Asteraceae
28	Laja koli	Touch-me-not	*Mimosa pudica*	Fabaceae
29	Paunji lata			
30	Mango	Mango	*Mangifera indica*	Anacardiaceae
31	Bajramuli	Flannel weed	*Sida cordifolia*	Malvaceae
32	Table golap	*Table* rose	*Portulaca grandiflora*	Portulacaceae
33	Bhui amla	Gale of the wind	*Phyllanthus niruri*	Phyllanthaceae
34	Khada saga	Redroot pigweed	*Amaranthus dubius*	Amaranthaceae
35	Sebati	White rose	*Chrysanthemum indicum*	Asteraceae
36	Baula	Spanish cherry	*Mimusops elengi*	Sapotaceae
37	Katha champa	Magnolia	*Magnolia champaca*	Magnoliaceae
38	Bada chakunda	Coffee senna	*Senna occidentalis*	Fabaceae
39	Radhachuda	Peacock flower	*Caesalpinia pulcherrima*	Fabaceae
40	Krushna cuda	Royal poinciana	*Delonix regia*	Fabaceae
41	Kaneer	Yellow oleander	*Cascabela thevetia*	Apocynaceae
42	Bajramuli	Flannel weed	*Sida cordifolia*	Malvaceae
43	Exora	Red ixora	*Ixora coccinea*	Rubiaceae
44	Arakha	Crown flower	*Calotropis gigantea*	Apocynaceae
45	Lantana	Lantana	*Lantana camara*	Verbenaceae

46	Coconut	Coconut palm	*Cocos nucifera*	Arecaceae
47	Bottle palm	Bottle palm	*Hyophorbe lagenicaulis*	Arecaceae
48	Mahalimba	Spanish cherry	*Mimusops elengi*	Sapotaceae
49	Sisoo	Indian rosewood	*Dalbergia sissoo*	Fabaceae
50	Peepal	Sacred fig	*Ficus religiosa*	Moraceae
51	Bel	Stone apple	*Aegle marmelos*	Rutaceae
52	Amla	Indian gooseberry	*Phyllanthus emblica*	Phyllanthaceae
53	Sir amla	Indian gooseberry	*Phyllanthus acidus*	Phyllanthaceae
54	Panasa	Jack tree	*Artocarpus heterophyllus*	Moraceae
55	Gangasiuli	Night-flowering Jasmine	*Nyctanthes arbor-tristis*	Oleaceae
56	Jaiphala	Nutmeg	*Myristica fragrans*	Myristicaceae
57	Raktachandan	Red sanders	*Pterocarpus santalinus*	Fabaceae
58	Tulsi	*Holy basil*	*Ocimum sactum*	Lamiaceae
59	Nageswar	Cobra saffron	*Mesua ferrea*	Calophyllaceae
60	Aleicha	Cardamom	*Elettaria cardamomum*	Zingiberaceae
61	Bhrusnaga	Curry leaves	*Murraya koenigii*	Rutaceae
62	Angoor	Grape vine	*Vitis Vinifera*	Vitaceae
63	Karamanga	Star fruit	*Averrhoa carambola*	Oxalidaceae
64	Arakha (violet)	Milkweed flower	*Calotropis gigantea*	Apocynaceae
65	Bamboo	Giant grasses	*Bambusa vulgaris*	Poaceae
66	Mandara	Hibiscus	*Hibiscus rosa-sinensis*	Malvaceae
67	Karpura tulasi	Camphor basil	*Ocimum tenuiflorum*	Lamiaceae
68	Leechi	*Litchi*	*Litchi chinensis*	Sapindaceae
69	Banana	Banana	*Musa acuminata*	Musaceae
70	Sajana chuin	Drumstick tree	*Moringa oleifera*	Moringaceae
71	Sapeta	Chikoo	*Manilkara zapota*	Sapotaceae
72	Baigana	Black bell egg plant	*Solanum melongena*	Solanaceae
73	Dudura	Thorn apple	*Datura stramonium*	Solanaceae
74	Kajubadam	Cashew nut	*Anacardium occidentale*	Anacardiaceae
75	Sapuri	*Pineapple*	*Ananas comosus*	Bromeliaceae
76	Podina	Wild *mint*	*Mentha arvensis*	Lamiaceae
77	Khaira	Acacias	*Acasia catechu*	Leguminosae
78	Malli	Summer bloom	*Jasminum grandiflorum*	Oleaceae
79	Teak\Sagwan tree	Teak	*Tectona grandis*	Lamiaceae
80	Tagara	Mushakbala	*Valeriana wallichii*	Valerianaceae
81	Croton	Colourful-leaved plant	*Croton variegatum*	Euphorbiaceae
82	Saru	Cocoyam	*Colocasia esculenta*	Araceae
83	Ashok	Asoca tree	*Saraca asoca*	Fabaceae
84	Mahogany	Honduran mahogany	*Swietenia mahagoni*	Meliaceae
85	Kusuma	Ceylon oak	*Schleichera oleosa*	Sapindaceae
86	Ou	elephant apple	*Dillenia indica*	Dilleniaceae
87	Katha badam	Bengal almond	*Terminalia catappa*	Combretaceae

Faunal Diversity

Birds

Sl.No	Common name	Zoological name	Conservation status (IUCN)
1	Black drongo	*Dicrurus macrocercus*	Least Concern
2	Purple sunbird	*Cinnyris asiaticus*	Least Concern
3	Greater coucal	*Centropus sinensis*	Least Concern
4	Black kite	*Milvus migrans*	Least Concern
5	Blue rock pigeon	*Columba livia*	Least Concern
6	Pond heron	*Ardeola grayii*	Least Concern
7	Cattle egret	*Bubulcus ibis*	Least Concern
8	Common crow	*Corvus splendens*	Least Concern
9	Common hawk-cuckoo	*Hierococcyx varius*	Least Concern
10	Spotted owlet	*Athene brama*	Least Concern
11	White breasted kingfisher	*Halcyon smyrnensis*	Least Concern
12	Common myna	*Acridotheres tristis*	Least Concern
13	Koel	*Eudynamys scolopaceus*	Least Concern
14	Black winged kite	*Elanus caeruleus*	Least Concern
15	Red vented bulbul	Pycnonotus cafer	Least Concern
16	Laughing dove	*Spilopelia senegalensis*	Least Concern

Reptiles

Sl no	Common name	Zoological name	Conservation status
	Common garden lizard	*Calotes versicolor*	Least concern
	Bark gecko	*Hemidactylus leschenaultii*	Least concern
	Spotted house	*Hemidactylus*	Least concern

	gecko	*brookii*	

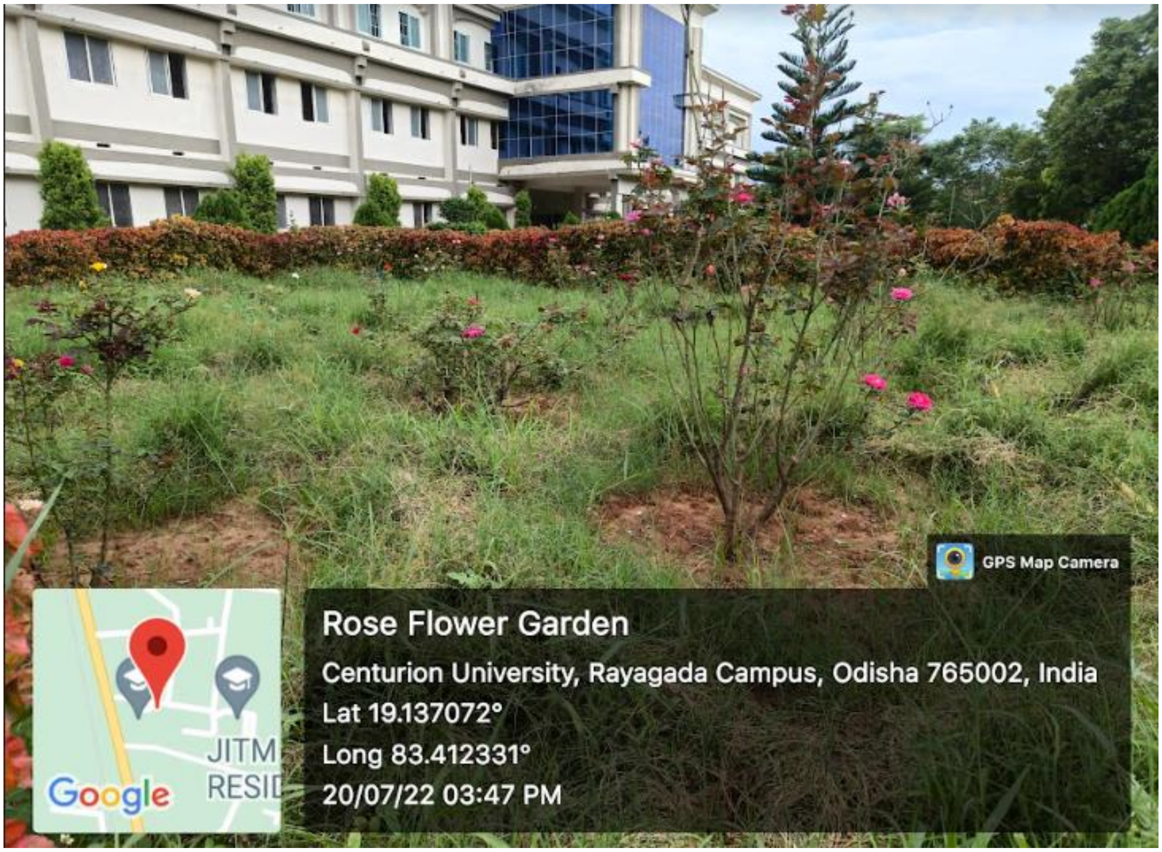
Mammals

Sl no	Common name	Zoological name	Conservation status
1	Dog	*Canis lupus familiaris*	
2	Cat	*Felis catus*	

Invertebrates

Sl no	Common name	Zoological name	Conservation status
	Honey bee	*Apis mellifera*	Least concern
	Twany coaster butterfliy	*Acraea terpsicore*	Least concern
	Common grass yellow butterfly	*Eurema hecabe*	Least concern
	Plain tiger butterfly	*Danaus chrysippus*	Least concern
	Carpenter bee	*Xylocopa sp.*	

SOME PHOTOGRAPHS SHOWING GREENERY OF THE CAMPUS


GPS Map Camera
Rose Flower Garden
Centurion University, Rayagada Campus, Odisha 765002, India
Lat 19.137072°
Long 83.412331°
20/07/22 03:47 PM
JITM
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Google


GPS Map Camera
Banana Garden
Centurion University, Rayagada Campus, Odisha 765002, India
Lat 19.137072°
Long 83.412331°
20/07/22 03:21 PM
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RESID
Google

Green Agenda in Syllabus

Sl. No.	Department/School	Environmental education Syllabus	Green research	Green Clubs	Animal Experiments	Ethics committee?	Extention related to Environment
1	SoAS	√	√	√	NA	√	√
2	SoAPH	√	√	√	√	√	√
3	SoPLS	√	√	√	√	√	√

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.
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.

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.

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	7.4	7.6	7.4
2	Electrical conductivity	mho/cm	2.25	0.468	0.248	0.266
3	Total suspended solid	mg/l	NS	0.016	0.032	0.014

4	Total dissolved solid	mg/l	500	0.022	0.014	0.032
5	Total solid	mg/l	----	0.038	0.046	0.046
6	Silicon	Ppm	2	00	00	00
7	Phosphorus	Ppm	5	00	00	00
8	Chlorine	Ppm	250	3.8	2.7	8.6
9	Calcium	Ppm	75	5.4	17.1	16.5
10	Iron	Ppm	0.3	0.02	0.04	00
11	Cobalt	Ppm	NS	00	00	00
12	Tin	Ppm	NS	00	00	0.22
13	Chromium	Ppm	0.1	00	0.01	00
14	Nickel	Ppm	0.02	00	00	00
15	Cadmium	Ppm	0.005	00	00	00
16	Lead	Ppm	0.01	00	00	00
17	Copper	Ppm	1.5	00	00	00
18	Water	**%**		99.846	99.897	99.886

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	DON’T
Collect waste, rubbish and debris within the school and dispose as per set frequency.	**DO NOT** let waste and trash accumulate within the premises.
Dispose all waste as per guidelines.	**DO NOT** dispose waste outside or near parking lots, playground, drainage, swimming pool, ditches or any other location where they can damage the environment.
Keep all equipment clean; do not allow a build-up of wastes.	**DO NOT** let equipment get damaged or rusted; replace if unsuitable for further use.
Oversee contractors to ensure that correct procedures are followed and SOP guidelines are complied with.	**DO NOT** let contractors conduct maintenance in conflict with proper procedures and guidelines; monitor closely.
Impose Penalty on defaulters for littering/spitting/open urinating within the university premises or near the boundary walls	**DO NOT** allow littering, spitting, open urination or any other practices that affect the cleanliness and aesthetics of the premises.
Conduct surprise inspections of the schools to ensure a clean, hygienic and healthy environment for members and staff.	**DO NOT** allow accumulation of unnecessary wastes anywhere.
Involve students and staff in such a manner that they voluntarily contribute towards cleanliness.	**DO NOT** overcharge students in the name providing cleaner and hygienic surroundings.

Solid waste Treatment (Including biodegradable, Non-Biodegradable and kitchen composting pit)

Solid wastes are collected in different bins placed at various locations in the campus. Biodegradables wastes are used for composting while Non-biodegradable wastes are handed over to the municipality for safe disposal. Improper disposal of municipal solid waste can create unsanitary conditions, and these conditions in turn can lead to pollution of the environment and to outbreaks of vector-borne diseases, that can be spread byrodents and insects. The kitchen waste is decomposed in a composting pit.

Non-Biodegradable wastes are handed over to Rayagada Municipality Corporation but we are using solid biodegradable waste for composting.

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	Pharmacy Block (New 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	Old building +2 Science and Girls hostel	L	L	L	N				
3	Boys Hostel	L	L	L	N				
4	Multipurpose Hall	L	H	L	L				
5	Canteen	H	H	L	L				
6	Gram Tarang Building	M	M	L	L				

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

SOME PHOTOGRAPHS SHOWING WASTE MANAGEMENT