

# ENERGY AUDIT REPORT | 2023





692F,12TH A CROSS BEL LAYOUT, BENGALURU – 560091  
(ISO/IEC 17020:2012, ISO 9001:2015, ISO 14001:2015 Certified Organisation &  
Ministry of MSME registered organisation)

# Certificate of Energy Audit

THIS CERTIFICATE IS PRESENTED TO

## **MANGALAM COLLEGE OF ENGINEERING**

This is to certify that Mangalam College of Engineering has successfully undergone 'Energy Audit' on  
on 2nd January, 2024 and assessed the electrical energy conservation, energy saving measures,  
policies and standards in the campus were found to be excellent.

This certificate is valid till 31st December, 2024

Ref. No: GA / ENERGY AUDIT / 02 / 02 / 24

**DR NISCHAY N GOWDA**

Founder & Director – Green Aura

CERTIFIED ISO EMS-LA, IGBC - AP,  
US GREEN BUILDING COUNCIL - GREEN ASSOCIATE  
GLOBAL DOCTORATE, SWITZERLAND.







# Green Audit Certificate

This certificate is awarded to **Mangalam College of Engineering, Mangalam Hills, Vettimukal P.O, Ettumanoor, Kottayam, Kerala, 686631** in recognition of their commitment and efforts towards environmental sustainability.

As a result of the Green Audit conducted on **23<sup>rd</sup> Dec 2023**, it has been determined that **Mangalam College of Engineering** has implemented a range of effective environmental sustainability practices in line with National Building Code 2016 –Part-11.

This certificate is valid for following scope of activities:

**Green Audit**  
**Energy Audit**  
**Environment Audit**

Audit Date : 23<sup>rd</sup> Dec 2023  
Certificate No. : 1B05323B20000162  
Issuance Date : 2<sup>nd</sup> Jan 2024

Signature  
Maneet Dewan  
Director

**PQMS Quality Services Private Limited**  
SCO-21, 4<sup>th</sup> Floor, Feroze Gandhi Market, Ludhiana-141001 (Punjab)  
Email: [info@qualityindia.in](mailto:info@qualityindia.in) website: [www.qualityindia.in](http://www.qualityindia.in)







**Energy Audit Report  
Mangalam College of Engineering,  
Year 2023**



# ENERGY AUDIT REPORT 2023



**CONSULTATION REPORT**  
**Mangalam College of Engineering**  
Kottayam, Kerala.



**Submitted to:**  
Principal,  
Mangalam College of Engineering  
Mangalam Hills, Vettimukkal P.O.,  
Ettumanoor, Kottayam, Kerala - 686631



**Audited by:**  
Green Aura,  
692F, 12th A cross Bel layout,  
Bengaluru- 560091.



**Energy Audit Report  
Mangalam College of Engineering,  
Kottayam, Kerala, Year 2023**



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## ACKNOWLEDGEMENT

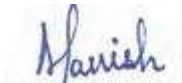
**GREEN AURA**, Bengaluru, Karnataka takes this opportunity to appreciate & thank the management **Mangalam College of Engineering, Kerala** for giving us an opportunity to conduct energy audit for the buildings of the college.

We are indeed touched by the helpful attitude and co-operation of all faculties and technical staff, who rendered their valuable assistance and co-operation the course of study.

### Energy Audit Team

The study team consisted of senior technical executives from Green Aura, and the audit spanned multiple visits from November to December 2023.

- **Dr. Nischay N Gowda**, Founder & Director Green Aura, Bengaluru.  
Lead Auditor PQMS Quality Services Pvt Ltd. (IGBC-AP and LEED-Green Associate).
- **Mr. Manish Walecha**, Certified Energy Auditor (EA-34073/23).
- **Mr. Sachin Kumawat**, Certified Energy Manager (EM-300475/23).
- **Mr. Akash Kumar**, Engineer.



**Manish Walecha**  
[Certified Energy Auditor]  
EA-34073/23



**Dr Nischay N Gowda**,  
Director



## **EXECUTIVE SUMMARY**

The executive summary of the energy audit report furnished in this section briefly gives the identified energy conservation measures in the college.

### **ENERGY INITIATIVE TAKEN BY COLLEGE MANAGEMENT**

- **SOLAR PHOTOVOLTAIC ROOFTOP PLANT INSTALLATION**

College has total installed total 100 KWp grid connected solar roof top system.

**It's Appreciable.** Total solar unit generation is 82,440 Units Jan-2023 to Nov-2023.

### **AREAS FOR IMPROVEMENT**

- **POWER FACTOR IMPROVEMENT**

The average power factor is was 0.94. It is recommended to maintain the power factor 0.995 or unity.

- **LIGHTING SYSTEM**

- Replacement of “conventional T-12 (40 Watt)” tube light by Energy Efficient LED lighting fixture T-5 (18Watt or 20 Watt) in college, have great potential for energy saving.
- Installation of “timer control on straight light and focus light on building” recommended for energy saving in the campus.
- Installation of motion sensor in non-working area (wash room, electrical room. etc.) recommended for energy saving in the campus.

- **CEILING FAN.**

It is recommended to replace “conventional ceiling fan (80 Watt)” by energy efficient star rated BLDC based i.e. energy efficient fan (28 Watt) in college building etc. It has great potential for energy saving.

- **AIR CONDITIONER (WINDOW AND SPLIT)**

Replacement of “Window and Split AC (1500 to 2000 Watt)” by energy efficient 5 star rated AC (750 to 560 Watt) in all building, Guest house, class rooms, and faculties cabin etc. It has great potential of energy saving.

- **IOT BASED ENERGY MONITORING SYSTEM IN PLACE OF SUB METER: -**

Installation of “Cloud based (IoT based) energy monitoring system” including harmonic measurement (total voltage and current harmonic distortion %) in every building. It will be good initiative for energy monitoring by management.

- **ENERGY MANAGEMENT WORKSHOP AND TRAINING**
- Develop energy management policies for college. Establish a procurement policy that is energy saving and eco-friendly.
- Conduct awareness and training programs for faculty, student and non-teaching staffs. Conduct seminars, workshops and exhibitions on energy management education. Involve All Stakeholders - Encourage involvement of government, founder members, and industry for supporting interdisciplinary research, education, policy formation, and information exchange in energy management system

### ENERGY CONSERVATION MEASURES FOR ELECTRICAL SYSTEM

| Case Study | Section         | Identification                           | Observation  | Recommendation   | Annual energy saving (kWh) | Annual cost saving (Rs.) | Investment (Rs.) | Simple payback Period |
|------------|-----------------|--|--|--|----------------------------|--------------------------|------------------|-----------------------|
| 1          | Lighting System | 1440 No. FTL tube light                  | Power consumption by T-12 LED (08 to 10-watt blast power ) | Replacement of conventional (T-12) with (T-5 Watt)                                   | 46,080                     | 7,14,240                 | 360,000          | 6 Month               |
| 2          | Ceiling Fan     | 1002 No ceiling fan working with 80 Watt | Power consumption by existing ceiling fan (80 Watt)        | Replacement of 80W conventional ceiling fan by 28W BLDC energy efficient ceiling fan | 50,019                     | 7,75,308                 | 20,04,000        | 2.7 Year              |



## **CHAPTER-01 INTRODUCTION OF ENERGY AUDIT**

### **1.1 About Energy Audit**

An energy audit is a systematic process of evaluating and analyzing the energy consumption and efficiency of a building, facility, or organization to identify opportunities for energy savings and improved energy performance. The primary goal of an energy audit is to assess how energy is used, wasted, or potentially conserved within a given system or operation.

1. **Identify Energy Consumption:** - Determine how and where energy is being used within a facility or organization, including electricity, natural gas, heating oil, water, and other energy sources.
2. **Quantify Energy Efficiency:** - Assess the efficiency of energy-consuming systems and equipment, such as HVAC (heating, ventilation, and air conditioning) systems, lighting, appliances, and industrial processes.
3. **Identify Energy Conservation Measures (ECMs):**- Identify specific opportunities to reduce energy consumption and improve energy efficiency. This may involve upgrading equipment, optimizing operations, or implementing energy-efficient technologies
4. **Estimate Cost Savings:** - Calculate potential energy and cost savings associated with implementing recommended ECMs. This helps organizations prioritize energy-saving initiatives based on return on investment (ROI).
5. **Prioritize Recommendations:** - Present a list of recommendations, along with their associated costs and benefits, to help stakeholders make informed decisions about which energy-saving measures to pursue.
6. **Promote Sustainability:** -Energy audits can contribute to sustainability efforts by reducing greenhouse gas emissions and environmental impact, which is particularly important in the context of climate change mitigation

The GREEN AURA, Bangalore, Karnataka carried out the energy audit at the site to find loopholes in the energy consumption pattern for Mangalam College of Engineering. A technical report has been prepared as per the data basis & need of the requirement of the project.



## Energy Audit Report Mangalam College of Engineering, Kottayam, Kerala, Year 2023



### 1.2 Objectives of Energy Auditing

The primary object of an energy audit is to assess and analyze the energy usage and efficiency of a building, facility, or process. Energy audits are conducted to achieve several specific goals and objectives, including

1. Identify Energy Efficiency Opportunities.
2. Fixing of energy saving potential targets for individual cost centers
3. To reduce operational costs.
4. To reduce energy consumption per unit product output.
5. Improve Energy Performance.
6. Relating energy inputs and production output
7. To find and apply effective planning for more effective use of energy throughout the industry works.
8. Identifying potential areas thermal and electrical energy efficiency.

### 1.3 Energy Audit Methodology

An energy audit is a systematic process of evaluating and analyzing energy usage in a facility or organization to identify opportunities for energy efficiency improvements. The goal of an energy audit is to reduce energy consumption, lower energy costs, and minimize environmental impacts. There are different levels of energy audits, ranging from a basic walkthrough audit to a comprehensive investment-grade audit.

#### 1. Preparation and Planning

- Define the scope and objectives of the energy audit.
- Gather historical energy consumption data and utility bills.
- Assemble a team of auditors with expertise in energy systems, including HVAC, lighting, electrical, and building envelope.
- Obtain building plans, equipment manuals, and other relevant documentation.
- Schedule the audit and secure necessary permissions and access to facilities

#### 2. Site Assessment

- Conduct a walkthrough of the facility to understand its layout, systems, and operations.
- Identify and document key energy-consuming equipment and systems.
- Collect data on operating hours, temperature settings, and occupancy patterns.
- Note any maintenance issues or equipment malfunctions that may affect energy efficiency.
- Perform basic energy benchmarking to compare the facility's energy performance with industry standards or similar facilities



## Energy Audit Report Mangalam College of Engineering, Kottayam, Kerala, Year 2023



### 3. Data Collection and Analysis

- Install energy monitoring equipment, such as data loggers, to track energy usage in real-time if necessary.
- Collect data on energy consumption for each identified system and equipment.
- Analyze energy bills to determine cost breakdown and seasonal variations.
- Calculate energy consumption and efficiency metrics (e.g., kWh, BTUs, Energy Use Intensity, etc.).
- Identify energy waste, anomalies, or deviations from expected performance.

### 4. Data Collection and Analysis

- Develop a list of energy-saving recommendations based on the audit findings.
- Prioritize recommendations based on cost-effectiveness, payback period, and potential energy savings.
- Provide detailed specifications for implementing each recommendation, including estimated costs and potential incentives or rebates.
- Consider both low-cost/no-cost measures (behavioral changes, maintenance improvements) and capital-intensive measures (equipment upgrades, retrofits)

### 5. Reporting and Documentation

- Compile the audit findings, recommendations, and supporting data into a comprehensive audit report.
- Include a summary of potential energy savings, estimated costs, and return on investment (ROI) for each recommendation.
- Present the report to key stakeholders, such as management, facility operators, and decision-makers.

### 6. Monitoring and Verification

- After implementing energy-saving measures, monitor energy consumption to verify actual savings.
- Adjust operations and maintenance practices as needed to maintain energy efficiency.
- Periodically review and update the energy management plan to ensure continuous improvement.





## **CHAPTER-02 POWER SUPPLY SYSTEM**

### **2.1 Transformer**

The power supply for the college is taken from Kerala State Electricity Board Limited with the help of 11 KV, T II (B). There is one Step down transformer capacity is 400 KVA. The contract demand of the college is 200 KVA. The details are given in following table.

| <b>Sr. No.</b> | <b>Items</b>            | <b>Technical Specification</b>  |
|----------------|-------------------------|---------------------------------|
| 1              | Make                    | Unipower Transformers Pvt. Ltd. |
| 2              | Year                    | 2005                            |
| 3              | Rating (KVA)            | 400                             |
| 4              | Voltage (HV/ LV)        | 11000/433                       |
| 5              | Current Rating (HV/ LV) | 21/ 534                         |
| 6              | Frequency (Hz)          | 50                              |
| 7              | Impedance at 75°C (%)   | 4.7                             |
| 8              | Vector group            | Dyn-11 9                        |
| 9              | Type of cooling         | ONAN                            |



**1000 KVA Transformer**



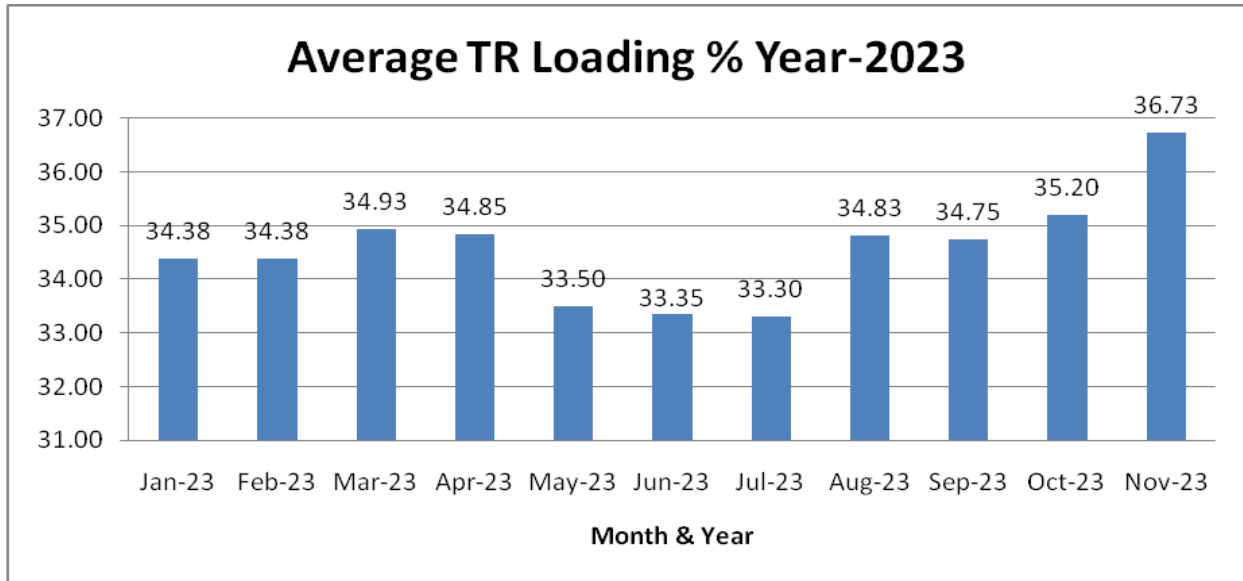


**Energy Audit Report**  
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**Loading of the Transformer: -**

| Sr. No.                     | Month & Year | Maximum Demand (KVA) | TR Loading % |
|-----------------------------|--------------|----------------------|--------------|
| 1                           | Jan-23       | 137.5                | 34.38        |
| 2                           | Feb-23       | 137.5                | 34.38        |
| 3                           | Mar-23       | 139.7                | 34.93        |
| 4                           | Apr-23       | 139.4                | 34.85        |
| 5                           | May-23       | 134                  | 33.50        |
| 6                           | Jun-23       | 133.4                | 33.35        |
| 7                           | Jul-23       | 133.2                | 33.30        |
| 8                           | Aug-23       | 139.3                | 34.83        |
| 9                           | Sep-23       | 139                  | 34.75        |
| 10                          | Oct-23       | 140.8                | 35.20        |
| 11                          | Nov-23       | 146.9                | 36.73        |
| <b>Average TR Loading %</b> |              |                      | <b>34.56</b> |



**Observation: -**

- Transformer loading is 34.56 % which is low. It should be maintaining within range 45 % to 50%.



## 2.2 DG SETS

The college campus has 01 Nos. of DG set and the capacity is 380 KVA. It supplies emergency power during the grid power failure.

| Sr. No. | Parameter         | Technical Specification of DG set |
|---------|-------------------|-----------------------------------|
| 1       | Make              | POWERICA (CMMINS)                 |
| 2       | Capacity (KVA)    | 380 KVA                           |
| 3       | Rated Voltage     | 415 V                             |
| 4       | Full load current | 529A                              |
| 5       | Power factor      | 8                                 |
| 6       | RPM               | 1500                              |
| 7       | Phase             | 3                                 |



**DG Set (380 KVA)**

### 2.3 GRID CONNECTED SOLAR PHOTOVOLTAIC SYSTEM (100 KWp)

There is a 100 KWp solar photovoltaic rooftop grid-connected system installed on various buildings. System details are given below:

#### Solar plant details

| Sr. No | Description                 | Technical Specification   |
|--------|-----------------------------|---------------------------|
| 1      | <b>Plant Information</b>    |                           |
| 1.1    | Plant capacity              | 100 KWp                   |
| 1.2    | Locations                   | College campus            |
| 1.3    | Latitude & Longitude        | 30.340085 N & 77.876712 E |
| 2      | <b>PV Panel Details</b>     |                           |
| 2.1    | Make                        | Vikram solar              |
| 2.2    | Panel Type                  | Poly-crystalline          |
| 2.3    | Panel Wattage               | 320 Wp                    |
| 2.4    | No of PV Panels             | 315                       |
| 2.5    | Total Capacity              | 100 KWp                   |
| 3      | <b>Inverter Information</b> |                           |
| 3.1    | Make                        | DELTA                     |
| 3.2    | Model                       | RPI M50A                  |
| 3.3    | Capacity                    | 50 KVA                    |
| 3.4    | Quantity                    | 2 (50 KVA )               |

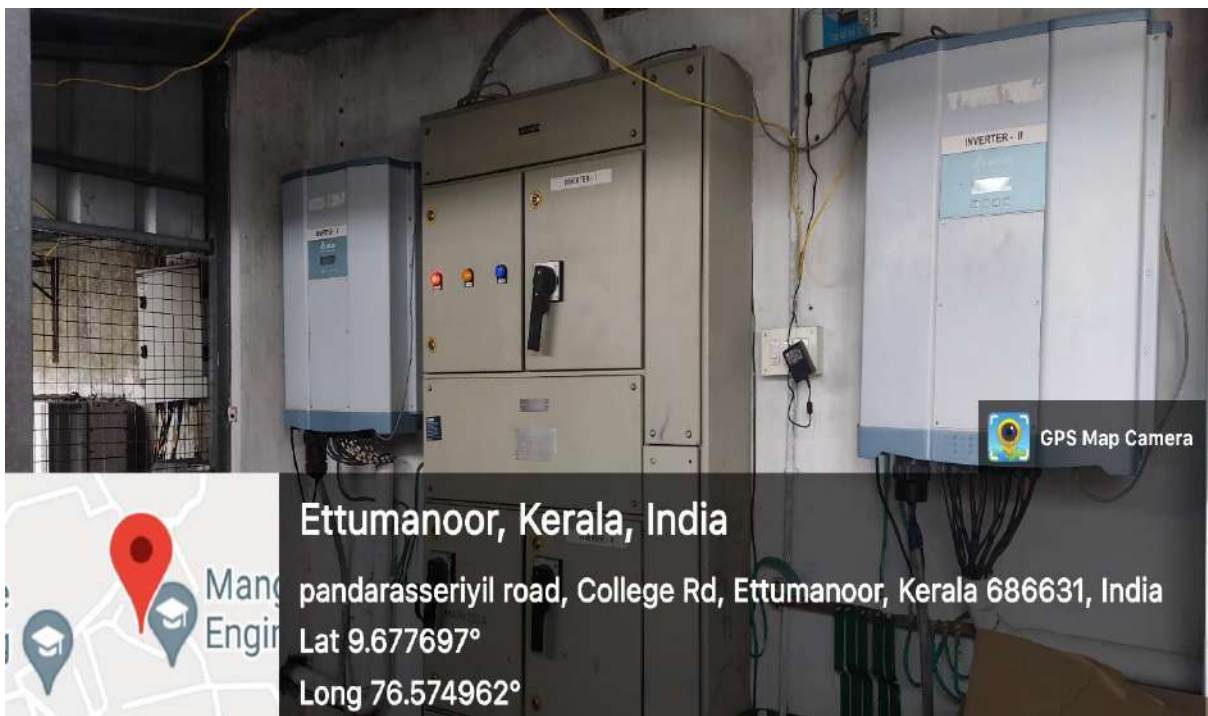




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**Solar panel**



**Solar Inverter**

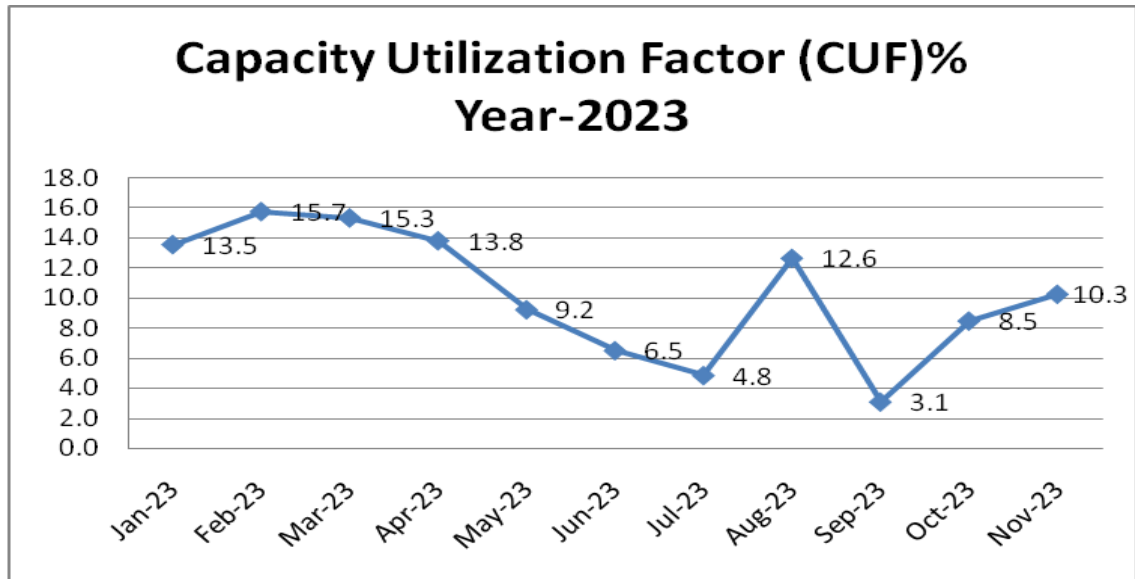


**Energy Audit Report  
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**Solar unit generation Year-2023: -**

| Sr. No.      | Month & Year | Solar Unit Generation (KWp) | No of Days | Capacity Utilization factor (CUF)% |
|--------------|--------------|-----------------------------|------------|------------------------------------|
| 1            | Jan-23       | 10,080                      | 31         | 13.5                               |
| 2            | Feb-23       | 10,580                      | 28         | 15.7                               |
| 3            | Mar-23       | 11,400                      | 31         | 15.3                               |
| 4            | Apr-23       | 9,940                       | 30         | 13.8                               |
| 5            | May-23       | 6,860                       | 31         | 9.2                                |
| 6            | Jun-23       | 4,680                       | 30         | 6.5                                |
| 7            | Jul-23       | 3,600                       | 31         | 4.8                                |
| 8            | Aug-23       | 9,400                       | 31         | 12.6                               |
| 9            | Sep-23       | 2,220                       | 30         | 3.1                                |
| 10           | Oct-23       | 6,300                       | 31         | 8.5                                |
| 11           | Nov-23       | 7,380                       | 30         | 10.3                               |
| <b>Total</b> |              | <b>82,440</b>               | <b>334</b> | <b>10.3</b>                        |



**Observation: -**

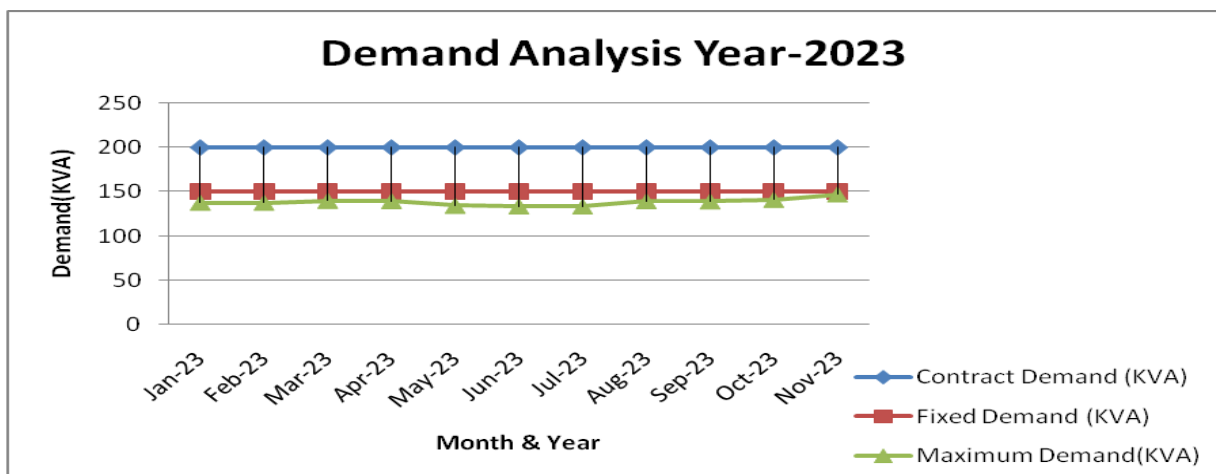
- College has installed 100 KWp solar system
- Total solar unit generation is 82,440 KWp in the year-2023. And CUF is 10.3 %.



**CHAPTER-03**  
**ENERGY CONSUMPTION ANALYSIS**

Energy audit team was analysed Electricity bills of Jan-23 to Nov-23. The details of sanctioned load 200 KVA are as below.

| Sr. No. | Month & Year | Contract Demand (KVA)       | Billing Demand (KVA) | Maximum Demand (KVA) |
|---------|--------------|-----------------------------|----------------------|----------------------|
| 1       | Jan-23       | 200                         | 150                  | 137.5                |
| 2       | Feb-23       | 200                         | 150                  | 137.5                |
| 3       | Mar-23       | 200                         | 150                  | 139.7                |
| 4       | Apr-23       | 200                         | 150                  | 139.4                |
| 5       | May-23       | 200                         | 150                  | 134                  |
| 6       | Jun-23       | 200                         | 150                  | 133.4                |
| 7       | Jul-23       | 200                         | 150                  | 133.2                |
| 8       | Aug-23       | 200                         | 150                  | 139.3                |
| 9       | Sep-23       | 200                         | 150                  | 139                  |
| 10      | Oct-23       | 200                         | 150                  | 140.8                |
| 11      | Nov-23       | 200                         | 150                  | 146.9                |
|         |              | <b>Minimum Demand (KVA)</b> |                      | <b>133.2</b>         |
|         |              | <b>Maximum Demand (KVA)</b> |                      | <b>146.9</b>         |
|         |              | <b>Average Demand (KVA)</b> |                      | <b>138.25</b>        |



Graphical Presentation of Demand analysis year-2023

**Observation:**

It was observed that the contract demand of the campus is 200 KVA. There is a variation in maximum demand. It is a maximum of 146.9 KVA in the Month of Nov-2023 and a minimum of 133.2 KVA in Jul - 2023



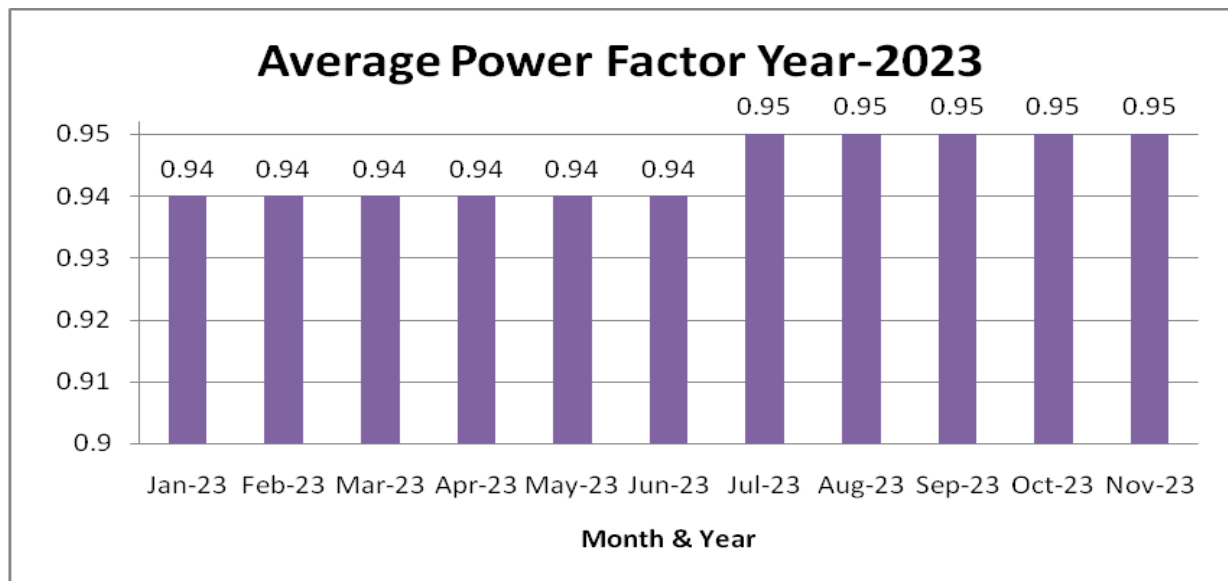


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**Monthly Power factor analysis Year-2023**

| Sr. No.      | Month & Year | Power Factor |
|--------------|--------------|--------------|
| 1            | Jan-23       | 0.94         |
| 2            | Feb-23       | 0.94         |
| 3            | Mar-23       | 0.94         |
| 4            | Apr-23       | 0.94         |
| 5            | May-23       | 0.94         |
| 6            | Jun-23       | 0.94         |
| 7            | Jul-23       | 0.95         |
| 8            | Aug-23       | 0.95         |
| 9            | Sep-23       | 0.95         |
| 10           | Oct-23       | 0.95         |
| 11           | Nov-23       | 0.95         |
| <b>Total</b> |              | <b>0.94</b>  |



**Graphical representation of average power factor year 2023**

**Observation:**

The average power factor was 0.94 form Jan -2023 to Nov -2023. It is recommended to maintain power factor unity or 0.995



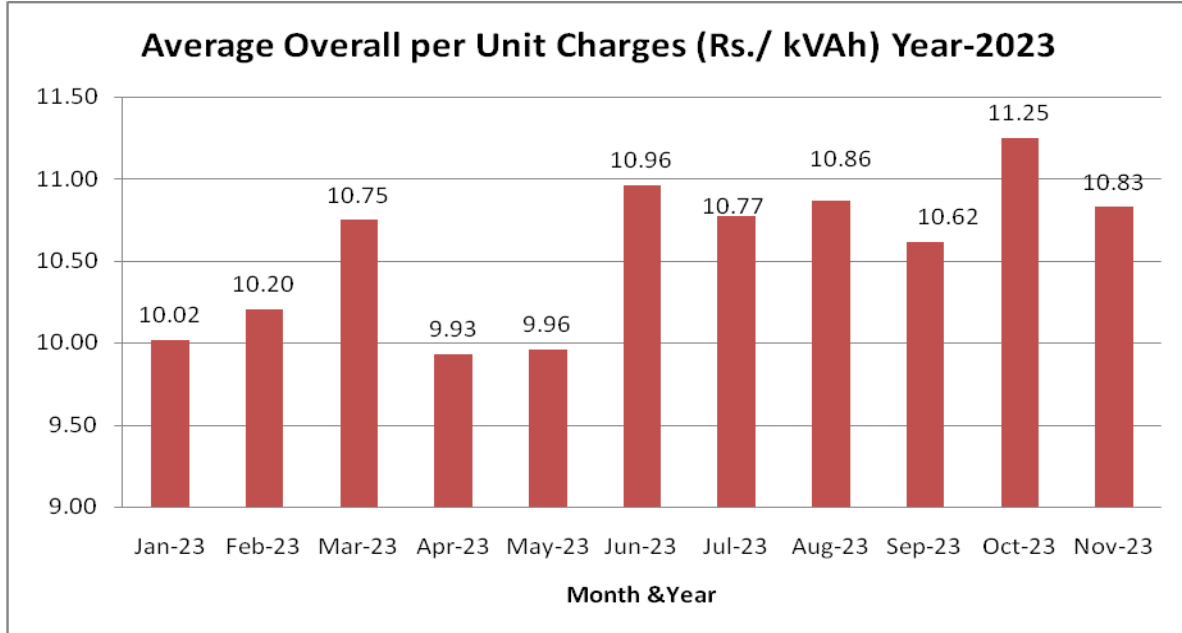
## Energy Audit Report Mangalam College of Engineering, Kottayam, Kerala, Year 2023



### Monthly electrical energy consumption 2023

The monthly electrical consumption for the campus is given in the table.

| Sr. No.      | Month & Year | Unit Consumption (KVAh) | Amount (Rs.)     | Overall per unit charges (Rs. / kVAh) |
|--------------|--------------|-------------------------|------------------|---------------------------------------|
| 1            | Jan-23       | 28,314                  | 2,83,588         | 10.02                                 |
| 2            | Feb-23       | 28,518                  | 2,90,941         | 10.20                                 |
| 3            | Mar-23       | 33,303                  | 3,57,930         | 10.75                                 |
| 4            | Apr-23       | 29,535                  | 2,93,327         | 9.93                                  |
| 5            | May-23       | 28,764                  | 2,86,536         | 9.96                                  |
| 6            | Jun-23       | 36,681                  | 4,02,024         | 10.96                                 |
| 7            | Jul-23       | 34,065                  | 3,67,010         | 10.77                                 |
| 8            | Aug-23       | 32,388                  | 3,51,881         | 10.86                                 |
| 9            | Sep-23       | 35,586                  | 3,77,773         | 10.62                                 |
| 10           | Oct-23       | 33,726                  | 3,79,417         | 11.25                                 |
| 11           | Nov-23       | 32,382                  | 3,50,633         | 10.83                                 |
| <b>Total</b> |              | <b>3,53,262</b>         | <b>37,41,060</b> | <b>10.56</b>                          |



**Graphical representation of actual per-unit charges for the year -2023**

### Observation:

It was found that total energy consumption from Jan-23 to Nov-23 was 3, 53,262 units. The average annual energy charge is Rs 10.56 /kVAh.



## CHAPTER-04 CONNECTED LOAD SYSTEM

### 4.1 Lighting Details of the campus are as below

| Sr. No    | Location/ Name of Building | Electrical Equipments | Rated Power (Watt) | Quantity No. |
|-----------|----------------------------|-----------------------|--------------------|--------------|
| 1         | Main building              | Tube Light (FTL)      | 40                 | 324          |
|           |                            | LED                   | 20                 | 6            |
|           |                            | Ceiling Fan           | 60                 | 211          |
|           |                            | Exhaust Fan           | 150                | 14           |
|           |                            | Split AC              | 1.5                | 14           |
|           |                            | PC                    | 75                 | 237          |
|           |                            | Camera                | 35                 | 52           |
|           |                            | Printer               | 75                 | 31           |
|           |                            | Photocopy M/c         | 550                | 2            |
|           |                            | water purifier        | 25                 | 2            |
| PROJECTOR | 30                         | 18                    |                    |              |

| Sr. No | Location/ Name of Building | Electrical equipment | Rated Power (Watt) | Quantity No. |
|--------|----------------------------|----------------------|--------------------|--------------|
| 1      | New building               | Tube Light (FTL)     | 40                 | 318          |
|        |                            | Ceiling Fan          | 60                 | 184          |
|        |                            | Exhaust Fan          | 150                | 8            |
|        |                            | Split AC             | 1.5                | 8            |
|        |                            | PC                   | 75                 | 269          |
|        |                            | Camera               | 35                 | 20           |
|        |                            | Printer              | 75                 | 21           |
|        |                            | water purifier       | 25                 | 2            |
|        |                            | PROJECTOR            | 30                 | 36           |



**Energy Audit Report**  
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| Sr. No    | Location/ Name of Building | Electrical Equipment | Rated Power (Watt) | Quantity No. |
|-----------|----------------------------|----------------------|--------------------|--------------|
| 1         | CBSE                       | Tube Light (FTL)     | 40                 | 158          |
|           |                            | Tube Light (LED)     | 20                 | 4            |
|           |                            | Ceiling Fan          | 60                 | 126          |
|           |                            | Exhaust Fan          | 150                | 8            |
|           |                            | Split AC             | 1.5                | 3            |
|           |                            | PC                   | 75                 | 4            |
|           |                            | Printer              | 75                 | 4            |
|           |                            | water purifier       | 25                 | 2            |
| PROJRCTOR | 30                         | 2                    |                    |              |

| Sr. No | Location/ Name of Building | Electrical Equipment | Rated Power (Watt) | Quantity No. |
|--------|----------------------------|----------------------|--------------------|--------------|
| 1      | Poly Technique             | Tube Light (FTL)     | 40                 | 72           |
|        |                            | Ceiling Fan          | 60                 | 60           |
|        |                            | Exhaust Fan          | 150                | 6            |
|        |                            | Split AC             | 1.5                | 1            |
|        |                            | PC                   | 75                 | 4            |
|        |                            | Printer              | 75                 | 4            |
|        |                            | water purifier       | 25                 | 1            |
|        |                            | PROJERCTOR           | 30                 | 6            |

| Sr. No | Location/ Name of Building | Electrical Equipment | Rated Power (Watt) | Quantity No. |
|--------|----------------------------|----------------------|--------------------|--------------|
| 1      | State School               | Tube Light (FTL)     | 40                 | 60           |
|        |                            | Ceiling Fan          | 60                 | 48           |
|        |                            | Exhaust Fan          | 150                | 4            |
|        |                            | PC                   | 75                 | 4            |
|        |                            | Printer              | 75                 | 3            |
|        |                            | water purifier       | 25                 | 2            |
|        |                            | PROJERCTOR           | 30                 | 2            |



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**Mangalam College of Engineering,**  
**Kottayam, Kerala, Year 2023**



| Sr. No | Location/ Name of Building | Electrical Equipment | Rated Power (Watt) | Quantity No. |
|--------|----------------------------|----------------------|--------------------|--------------|
| 1      | Ladies Hostel              | Tube Light (FTL)     | 40                 | 124          |
|        |                            | Ceiling Fan          | 60                 | 90           |
|        |                            | Exhaust Fan          | 150                | 6            |
|        |                            | SPLIT AC             | 1.5 TON            | 4            |
|        |                            | TV                   | 100                | 1            |

| Sr. No     | Location/ Name of Building | Electrical Equipment | Rated Power (Watt) | Quantity No. |
|------------|----------------------------|----------------------|--------------------|--------------|
| 1          | Arts College               | Tube Light (FTL)     | 40                 | 144          |
|            |                            | Tube Light (LED)     | 20                 | 6            |
|            |                            | Ceiling Fan          | 60                 | 93           |
|            |                            | Exhaust Fan          | 150                | 5            |
|            |                            | Split AC             | 1.5                | 1            |
|            |                            | PC                   | 75                 | 75           |
|            |                            | Printer              | 75                 | 4            |
|            |                            | water purifier       | 25                 | 1            |
| PROJERCTOR | 30                         | 4                    |                    |              |

| Sr. No | Location/ Name of Building | Electrical Equipment | Rated Power (Watt) | Quantity No. |
|--------|----------------------------|----------------------|--------------------|--------------|
| 1      | Canteen                    | Tube Light (FTL)     | 40                 | 10           |
|        |                            | Ceiling Fan          | 60                 | 20           |
|        |                            | water purifier       | 25                 | 1            |
|        |                            | REFRIGERATOR         | 300                | 2            |

| Sr. No | Location/ Name of Building | Electrical Equipment | Rated Power (Watt) | Quantity No. |
|--------|----------------------------|----------------------|--------------------|--------------|
| 1      | Food court                 | Tube Light (FTL)     | 40                 | 10           |
|        |                            | Ceiling Fan          | 60                 | 6            |
|        |                            | water purifier       | 25                 | 1            |
|        |                            | REFRIGERATOR         | 300                | 1            |



**Energy Audit Report**  
**Mangalam College of Engineering,**  
**Kottayam, Kerala, Year 2023**



| Sr. No | Location/ Name of Building | Electrical Equipment | Rated Power (Watt) | Quantity No. |
|--------|----------------------------|----------------------|--------------------|--------------|
| 1      | Centre kitchen             | Tube Light (FTL)     | 60                 | 14           |
|        |                            | Ceiling Fan          | 60                 | 8            |
|        |                            | water purifier       | 25                 | 1            |
|        |                            | Refrigerator         | 300                | 1            |

| Sr. No | Location/ Name of Building | Electrical Equipment | Rated Power (Watt) | Quantity No. |
|--------|----------------------------|----------------------|--------------------|--------------|
| 1      | Store                      | Tube Light (FTL)     | 40                 | 6            |
|        |                            | Ceiling Fan          | 60                 | 3            |
|        |                            | PHOTO STAT MACHINE   | 100                | 4            |
|        |                            | PC                   | 75                 | 2            |

| Sr. No | Location/ Name of Building | Electrical Equipment | Rated Power (Watt) | Quantity No. |
|--------|----------------------------|----------------------|--------------------|--------------|
| 1      | State School               | Tube Light (FTL)     | 40                 | 60           |
|        |                            | Tube Light (LED)     | 20                 | 6            |
|        |                            | Ceiling Fan          | 60                 | 48           |
|        |                            | Exhaust Fan          | 150                | 4            |
|        |                            | PC                   | 75                 | 4            |
|        |                            | Printer              | 75                 | 3            |
|        |                            | water purifier       | 25                 | 2            |
|        |                            | PROJERCTOR           | 30                 | 2            |

| Sr. No | Location/ Name of Building | Electrical Equipment | Rated Power ( Watt) | Quantity No. |
|--------|----------------------------|----------------------|---------------------|--------------|
| 1      | Mechanical Workshop        | Tube Light (FTL)     | 40                  | 20           |
|        |                            | Ceiling Fan          | 60                  | 10           |
| 2      | Thermal Engineering Lab    | Tube Light (FTL)     | 40                  | 16           |
|        |                            | Ceiling Fan          | 60                  | 10           |
| 3      | Electrical Workshop        | Tube Light (FTL)     | 40                  | 3            |
|        |                            | Ceiling Fan          | 60                  | 4            |
| 4      | Civil Workshop             | Tube Light (FTL)     | 40                  | 2            |
|        |                            | Ceiling Fan          | 60                  | 4            |



**Energy Audit Report**  
**Mangalam College of Engineering,**  
**Kottayam, Kerala, Year 2023**



| Sr. No | Location/ Name of Building                | Electrical Equipment | Rated Power (Watt) | Quantity No. |
|--------|---|----------------------|--------------------|--------------|
| 1      | Fluid Mechanics & Hydraulics Machines Lab | Tube Light (FTL)     | 40                 | 16           |
|        |   | Ceiling Fan          | 60                 | 10           |
|        |   | Motor                | 2206               | 12           |
|        |   | Motor                | 3677               | 3            |

| Sr. No | Location/ Name of Building   | Electrical Equipment | Rated Power (Watt) | Quantity No. |
|--------|------------------------------|----------------------|--------------------|--------------|
| 1      | Manufacturing Technology Lab | Tube Light (FTL)     | 40                 | 12           |
|        |                              | Ceiling Fan          | 60                 | 16           |
|        |                              | Motor                | 2206               | 19           |

| Sr. No | Location/ Name of Building  | Electrical Equipment     | Rated Power ( Watt) | Quantity No. |
|--------|-----------------------------|--------------------------|---------------------|--------------|
| 1      | Mechanical Measurements Lab | Tube Light (FTL)         | 40                  | 10           |
|        |                             | Ceiling Fan              | 60                  | 10           |
|        |                             | Centrifugal Blower       | 735                 | 1            |
|        |                             | Reciprocating Compressor | 1470                | 2            |

| Sr. No | Location/ Name of Building | Electrical Equipment | Rated Power ( Watt) | Quantity No. |
|--------|----------------------------|----------------------|---------------------|--------------|
| 1      | Power Electronics Lab      | Tube Light (FTL)     | 40                  | 16           |
|        |                            | Ceiling Fan          | 60                  | 4            |
|        |                            | Split AC             | 1500                | 3            |

**Street Lights in College Campus**

| Sr. No | Type of Lights | Rated Power (Watt) | Quantity No. |
|--------|----------------|--------------------|--------------|
| 1      | Metal Halide   | 250 Watt           | 3            |
| 2      | LED            | 100 Watt           | 5            |
| 3      | Solar Light    | 30 Watt            | 2            |





**Energy Audit Report  
Mangalam College of Engineering,  
Kottayam, Kerala, Year 2023**



| Sr. No | Type of Lights | Rated Power (Watt) | Quantity No. |
|--------|----------------|--------------------|--------------|
| 1      | PC             | 75                 | 603          |
| 2.     | Camera         | 35                 | 92           |
| 3      | Printer        | 75                 | 70           |

**Lighting Details Summary**

| Sr. No | Type of Lights        | Rated Power (Watt) | Quantity No. | Total Load (kW) |
|--------|-----------------------|--------------------|--------------|-----------------|
| 1      | Tube light (40w)      | 40                 | 1440         | 57.6            |
| 2      | LED Tube light (20 w) | 20                 | 10           | 0.2             |
| 3      | HPSV                  | 400                | 4            | 1.6             |
| 4      | Metal Halide          | 250                | 3            | 0.75            |
| 5      | Led (100w)            | 100                | 5            | 0.5             |
|        |                       | <b>Total</b>       | <b>1462</b>  | <b>60.65</b>    |

**Ceiling Fan & Ex- Fan Summary**

| Sr. No | Type of Fans | Rated Power (Watt) | Quantity No. | Total Load (kW) |
|--------|--------------|--------------------|--------------|-----------------|
| 1      | Ceiling fan  | 80                 | 1002         | 80.16           |
| 2      | Ex-fan (12") | 70                 | 35           | 2.45            |
| 3      | Ex-fan (15") | 90                 | 20           | 1.8             |
|        |              | <b>Total</b>       | <b>1057</b>  | <b>84.41</b>    |

**AC Details**

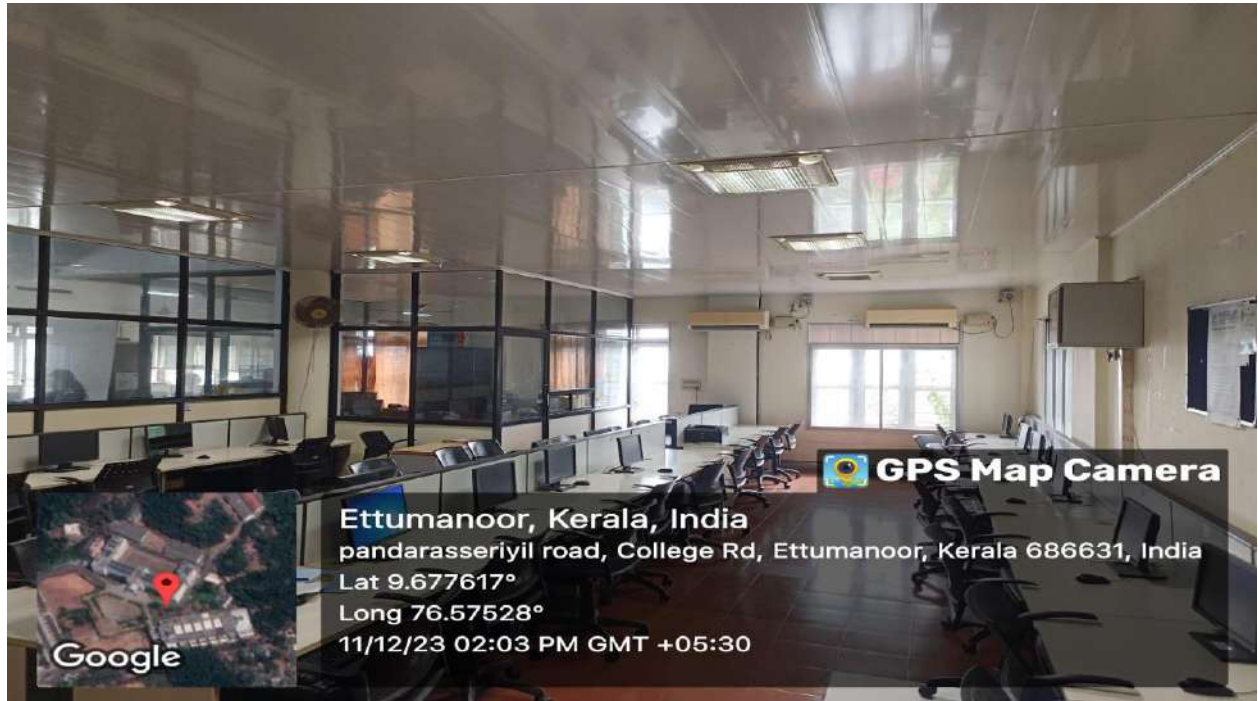
| Sr. No | Type of ACs               | Rated Power (Watt) | Quantity No. | Total Load (kW) |
|--------|---------------------------|--------------------|--------------|-----------------|
| 1      | AC Sprit (1.5 ton)        | 1900               | 27           | 51.3            |
|        | <b>Air Condition Load</b> | <b>1900</b>        | <b>27</b>    | <b>51.3</b>     |



**Energy Audit Report  
Mangalam College of Engineering,  
Kottayam, Kerala, Year 2023**



**Photograph of Electrical Equipment's: -**



## CHAPTER- 5

### ENERGY CONSERVATION MEASURES

**Case Study No. -01**

**Replacement of conventional 40 Watt to energy-efficient LED tube light 20 Watt in phase manner: -**

| Sr. No | Items                                     | Parameters | Units       |
|--------|---|------------|-------------|
| 1      | Power Consumption by T-12 FTL             | 40         | Watt        |
| 2      | No of T-8                                 | 1440       | Nos.        |
| 3      | Working Hrs./Day                          | 8          | Hrs./Day    |
| 4      | Working Days/Year                         | 250        | Days/Year   |
| 5      | Rated Power of Energy Efficient T-5 (LED) | 20         | W           |
| 6      | Expected Energy Saving                    | 57600      | kWh/Year    |
| 7      | Load Factor                               | 0.8        |             |
| 8      | Expected Annual Energy Saving             | 46080      | kWh/Year    |
| 9      | Overall, Per Unit Charges                 | 10.5       | Rs./kWh     |
| 10     | Expected Money Saving                     | 4,83,840   | Rs./Year    |
| 11     | Cost of T-5                               | 220        | Rs./ Pieces |
| 12     | Investment on New LED Light Purchasing    | 316800     | Rs.         |
| 13     | Maintenance Investment@5%                 | 15,840     | Rs.         |
| 14     | Total Investment                          | 332,640    | Rs          |
| 15     | Simple Pay Back Period                    | 8          | Month       |

**Total Calculated Monetary Saving Potential in lighting = Rs 4, 83,840/-**

**Note: - Energy savings depend on the operation hour per day and the load factor of the systems.**

### **Case Study No. 2**

**Replacement of 80 W conventional ceiling fan by 28W BLDC Energy Efficient ceiling fan in Phase manner**

| <b>Sr. No</b> | <b>Item</b>                           | <b>Parameter</b> | <b>Unit</b> |
|---------------|---------------------------------------|------------------|-------------|
| 1             | Rated Power of Ceiling Fan            | 80               | W           |
| 2             | No. of Fan                            | 1002             | Nos         |
| 3             | Working Hrs./Day                      | 8                | Hrs./Day    |
| 4             | Working Days/Year                     | 150              | Days/Year   |
| 5             | Energy Efficient BLDC Fan Rated power | 28               | W           |
| 6             | Energy Saving Potential               | 62524.           | kWh/Year    |
| 7             | Load Factor                           | 0.8              |             |
| 8             | Expected Annual Energy Saving         | 50,019           | kWh/Year    |
| 9             | Per Unit Charges                      | 10.5             | Rs/kWh      |
| 10            | Expected Money Saving                 | 5,25,208         | Rs./Year    |
| 11            | Cost of New Ceiling Fan               | 2,000            | Rs./Pieces  |
| 12            | Investment on New Fan Purchasing      | 20,04,000        | Rs.         |
| 13            | Maintenance Investment@5%             | 1,00,200         | Rs.         |
| 14            | Total Investment                      | 2,104,200        | Rs.         |
| 15            | Simple Pay Back Period                | 4.0              | Year        |

**Total Calculated Monetary Saving Potential in Ceiling Fan = Rs 5, 25,208/-**

**Note: - Energy savings depend on the operation hour per day and the load factor of the systems.**









# GREEN & ENVIRONMENT AUDIT

REPORT | **2023**









Built Environment Sustainability & Transformation

692F,12TH A CROSS BEL LAYOUT, BENGALURU – 560091  
(ISO/IEC 17020:2012, ISO 9001:2015, ISO 14001:2015 Certified Organisation &  
Ministry of MSME registered organisation)



# Certificate of Environmental Audit

THIS CERTIFICATE IS PRESENTED TO

## **MANGALAM COLLEGE OF ENGINEERING**

This is to certify that Mangalam College of Engineering has successfully undergone 'Environmental Audit' on 2nd January, 2024 and assessed the Environmental measures, policies and standards in the campus were found to be excellent.

This certificate is valid till 31st December, 2024  
Ref. No: GA / ENVIRONMENTAL AUDIT / 03 / 02 / 24

**DR NISCHAY N GOWDA**

Founder & Director – Green Aura

CERTIFIED ISO EMS-LA, IGBC - AP,  
US GREEN BUILDING COUNCIL - GREEN ASSOCIATE  
GLOBAL DOCTORATE, SWITZERLAND.









# Green Audit Certificate

This certificate is awarded to **Mangalam College of Engineering, Mangalam Hills, Vettimukal P.O, Ettumanoor, Kottayam, Kerala, 686631** in recognition of their commitment and efforts towards environmental sustainability.

As a result of the Green Audit conducted on **23<sup>rd</sup> Dec 2023**, it has been determined that **Mangalam College of Engineering** has implemented a range of effective environmental sustainability practices in line with National Building Code 2016 –Part-11.

This certificate is valid for following scope of activities:

**Green Audit**  
**Energy Audit**  
**Environment Audit**

Audit Date : 23<sup>rd</sup> Dec 2023  
Certificate No. : 1B05323B20000162  
Issuance Date : 2<sup>nd</sup> Jan 2024

Signature  
Maneet Dewan  
Director

**PQMS Quality Services Private Limited**  
SCO-21, 4<sup>th</sup> Floor, Feroze Gandhi Market, Ludhiana-141001 (Punjab)  
Email: [info@qualityindia.in](mailto:info@qualityindia.in) website: [www.qualityindia.in](http://www.qualityindia.in)



## Acknowledgement

The Audit Assessment team expresses genuine appreciation to the management of Mangalam College of Engineering for granting us the privilege of conducting the Green Audit and Environment Audit. This endeavor is a testament to your commitment to environmental responsibility and sustainability.

We would like to extend our special thanks to the management and staff of Mangalam College of Engineering, The collaboration and active participation of the college's management and staff were indispensable. Their openness to the audit, provision of necessary data, and willingness to implement suggested improvements have made a significant impact on the overall success of the assessment.

The audit, conducted over multiple visits spanning from November to December 2023, aimed to assess and enhance the environmental practices and sustainability measures at Mangalam College of Engineering. Once again, we express our sincere gratitude to Mangalam College of Engineering for their trust, cooperation, and commitment to fostering a greener and more sustainable future. We look forward to continued collaboration and the implementation of the recommendations outlined in the Green Audit report.

The study team consisted of senior technical executives from Green Aura

- **Dr. Nischay N Gowda**, Founder & Director Green Aura, Bengaluru. Lead Assessor PQMS Quality Services Pvt Ltd. (IGBC-AP and LEED-Green Associate)
- **Mr. Manish Walecha**, Certified Energy Auditor (EA-34073/23).
- **Mr. Sachin Kumawat**, Certified Energy Manager (EM-300475/23).
- **Mr. Akash Kumar**, Engineer.



**Submitted to:**  
Principal,  
Mangalam College of Engineering  
Mangalam Hills, Vettimukkal P.O.,  
Ettumanoor, Kottayam, Kerala - 686631



**Audited by:**  
Green Aura,  
692F, 12th A cross Bel layout,  
Bengaluru- 560091.

## Disclaimer

The Audit team has prepared this report for Mangalam College of Engineering using the input data provided by the college representatives. Our findings are complemented by the expert judgment of our team members. While we have exercised reasonable care in its preparation, the details contained in this report have been compiled in good faith based on the information available.

It is important to note that the calculations are based on our best estimates, and we do not make any representation, warranty, or undertaking, either express or implied. The Audit team does not accept responsibility for any direct or consequential losses that may arise from the use of the information, statements, or forecasts in this report.

The information and analysis presented in this report are valid as of the date of our visit and the period of study at the site. Our work represents our best efforts and judgments based on the information available at the time this report was prepared. Green Aura does not guarantee the accuracy of this information or any conclusions drawn from it. The observations made in this report serve as an indication of the facility's performance based on our assessment and should not be construed as a definitive comment on the functioning of the facility. These observations are solely based on the data recorded at the time of our assessment.

Green Aura bears no responsibility for the reader's use of or reliance upon this report, nor for any decisions made based on its contents. Readers are advised that they assume all liabilities incurred by themselves or third parties as a result of their reliance on this report, including the data, information, findings, and opinions contained within it.

## Executive Summary

Colleges wield a significant influence on their surroundings, contributing both positively and negatively to the world at large. The progress of a nation often commences within its educational institutions, where ecological considerations play a pivotal role in overall development. The activities undertaken by a College can result in a diverse range of environmental impacts. A clean and healthy environment not only facilitates effective learning but also fosters a conducive atmosphere for education. Mangalam College of Engineering places great importance on environmental factors and is actively incorporating eco-friendly concepts into its operations.

Mangalam College of Engineering is firmly committed to sustainability and has taken numerous proactive measures to minimize its environmental footprint. However, there are still several areas where significant improvements can be realized. This report aims to showcase the achievements of Mangalam College of Engineering while offering recommendations for enhancing its environmental sustainability. The College conducted a **Green Audit and Environment audit** for the year **2023** and remains dedicated to maintaining a sustainable campus environment.

The primary goal of this report is to identify areas for improvement and propose practical, economically viable solutions to optimize energy and water usage on the campus. Just as individual self-reflection is a natural and integral part of a quality education, institutional self-evaluation is equally essential for a quality educational institution. Consequently, it is imperative for the College to assess its own contributions toward a sustainable future.

Mangalam College of Engineering has undertaken various initiatives to promote an eco-friendly campus environment, including:

Energy Conservation, Water Conservation, Efforts for Carbon Neutrality, Hazardous and E-waste Management, Health and Well-Being, Plantation.

The college actively engage in activities through organizations like the N.S.S. (National Service Scheme) and other initiatives to raise eco-friendly awareness among students. Special programs featuring prominent personalities are organized to educate and train the public, and students are encouraged to participate in eco-friendly endeavors.

In conclusion, Mangalam College of Engineering is committed to its mission of sustainability and continuously strives to create a more environmentally responsible campus for the benefit of its students and the wider community.

## Table of Contents

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# Green Auditing

The term "Green" signifies practices that are environmentally friendly and do not harm the natural environment. This concept can be encapsulated by the acronym "Global Readiness in Ensuring Ecological Neutrality" (GREEN). A "Green Audit" can be defined as the systematic process of identifying, quantifying, recording, reporting, and analyzing elements of ecological diversity, and expressing these findings in financial or social terms.

To effectively implement a Green Audit, it is essential to understand various key aspects, including the objectives, drivers, future potential, benefits, and advantages of such an assessment. The practical application of Green Auditing involves various measures such as energy conservation, the utilization of renewable energy sources, rainwater harvesting, efforts towards achieving carbon neutrality, and extensive plantation initiatives.

The concept of Green Auditing has gained significance in educational institutions and organizations alike, as it serves as a valuable management tool for evaluating and improving environmental standards. By embracing Green Auditing, institutions can contribute to sustainable development and enhance their overall environmental performance. Moreover, the reckless experimentation with nature, often disregarding natural laws and regulations, is a significant driver behind the growing importance of Green Auditing.



**Mangalam College of Engineering- Campus**



## Approach & Methodology

A comprehensive study was conducted to thoroughly examine every aspect of Mangalam College of Engineering. This audit encompassed an array of measurements and analyses, with a specific focus on key areas of energy consumption, water usage, resource utilization, waste management, and sustainable practices. The objective was to assess real losses and potential savings, with a broader aim of enhancing the college environmental performance.

In pursuit of this goal, a straightforward and locally developed monitoring system was devised. This system involves a set of periodic questions that individuals can voluntarily respond to. It is designed to be user-friendly and accessible, emphasizing ease of use for all participants. The ultimate purpose of this auditing report is to inspire the College to set a positive environmental example for the community and to educate its students about sustainability principles.

The primary areas under investigation during the audit were categorized as follows:

1. **Site Selection:** Examining the appropriateness of the College's location.
2. **Built Environment:** Assessing the infrastructure and facilities on campus.
3. **Water Audit:** Analyzing water consumption and management.
4. **Energy Audit:** Evaluating energy consumption and efficiency.
5. **Good Health and Well-Being:** Promoting a healthy living environment.
6. **Waste Management:** Studying waste disposal practices and their impact.
7. **Green Education:** Integrating sustainability into the educational curriculum.
8. **Transportation:** Assessing transportation-related sustainability measures.

Throughout the audit process, there was a continuous dialogue involving College officials, faculty members, and students. This collaborative approach ensured that the suggestions and recommendations put forth were not only meaningful but also practical and feasible for concurrent implementation.



**Mangalam College of Engineering- Campus**

# I. About Mangalam College of Engineering

Mangalam as a sole proprietary concern came into being In April 1969 under the initiative of late Mr. M.C Varghese, a great visionary with social commitment and dedication. The starting was with the publication of a weekly, titled Mangalam. The success of the Mangalam weekly marked the dawn of a new era in the publishing sector of Kerala. Today The Mangalam Group of Companies has carved a niche among India's largest media houses. Mangalam Weekly still holds the record of most number of copies printed and distributed in Asia.

**VISION:** To emerge as a center of excellence in technical education and research, creating employable and committed professionals.

**MISSION:** Inspire the learners to be globally competent engineers through innovative teaching and learning methods and imbibe a sense of social responsibility and creative inquiry in them that leads to higher learning and research.

Mangalam College of Engineering Kerala is a NAAC accredited and ISO 9001-2008 certified educational institution that offers various courses in engineering and management. The college has a supreme infrastructure with state-of-the-art facilities and a green campus. Some of the highlights of the college's infrastructure and green environment are:

Located in Ettumanoor, Kottayam, Kerala, this college sprawls across a 45-acre expanse, offering a peaceful, green campus environment free from noise and environmental pollution. Boasting well-equipped classrooms, laboratories, workshops, and research facilities, the college provides robust support for academic and research pursuits among students and faculty.



A noteworthy feature is the Centre of Excellence in AI and ML with IoT, funded by AICTE, a Technology Business Incubator (TBI) supported by Kerala Startup Mission, SERB funding from MHRD, and a state-of-the-art 3D printing lab. The institution houses a Skill Delivery Platform Kerala (SDPK) lab, courtesy of the Kerala government, offering diverse skill development courses with training and certification.

Beyond academics, the campus is enriched with amenities like a digital theatre, amphitheatre, national basketball court, gym, health club, clinic, food court, digital library, counseling centre, prayer hall, SBI bank and ATM, all set in a Wi-Fi-enabled space.

A vibrant campus life unfolds through co-curricular and extra-curricular activities such as IEEE, CSI, ICI, IETE, IEI, NCC unit, NSS unit, Induction program, Artsfest, Sports day, Merit day, and more. Radio Mangalam 91.2, a community radio station, enhances the college experience by broadcasting programs covering education, culture, environment, health, and social issues. Strengthening the college community is a robust alumni network, actively supporting students and the institution in various capacities.

Recognized as a center of excellence, this institution is committed to providing a conducive and eco-friendly learning environment. It aims to nurture employable and committed professionals who can contribute to society and the nation with their skills and knowledge. An appealing choice for those pursuing a successful career in engineering and research.

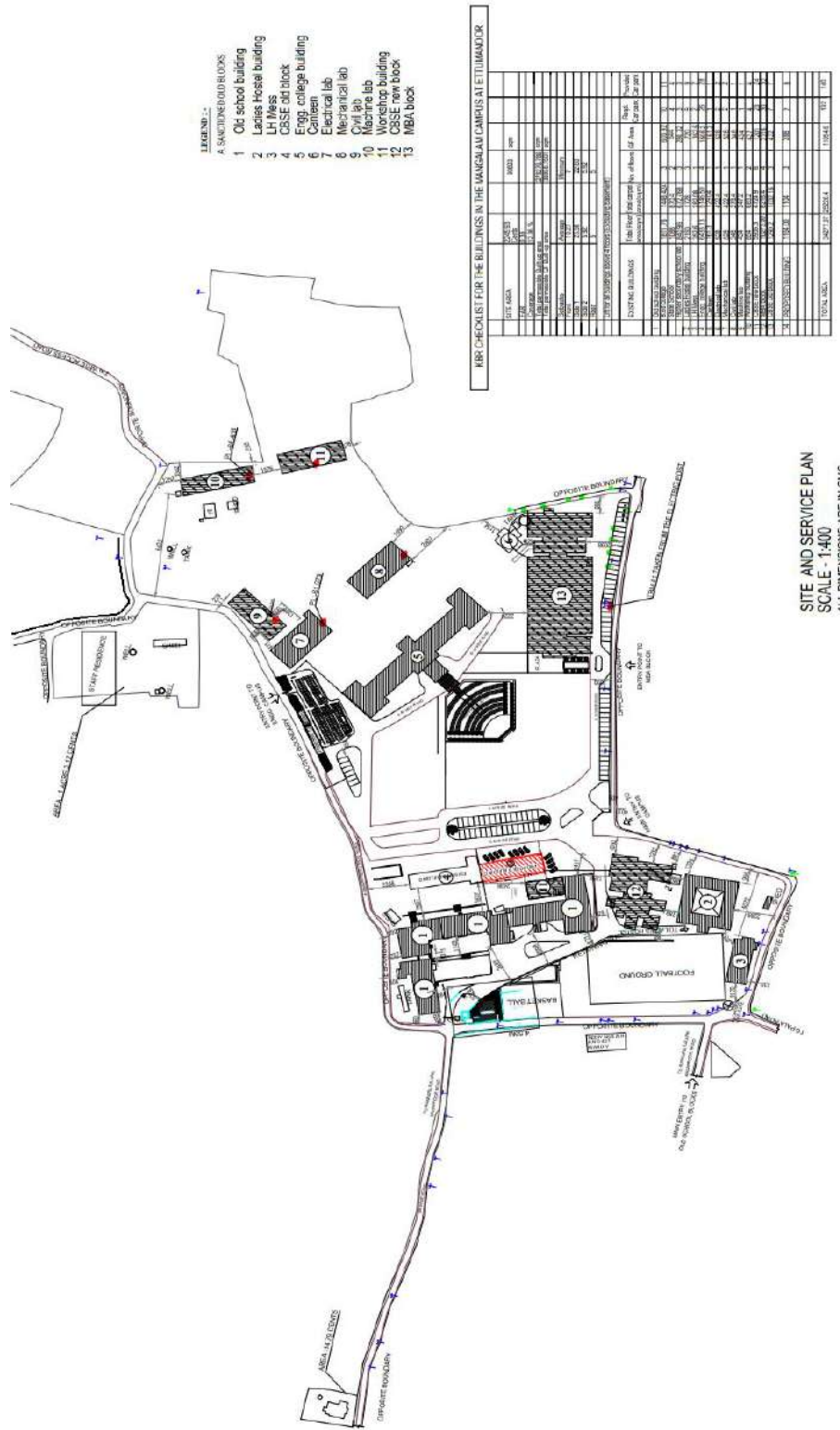


**Mangalam College of Engineering- Campus**



## II. Built Environment

### i. Layout plan

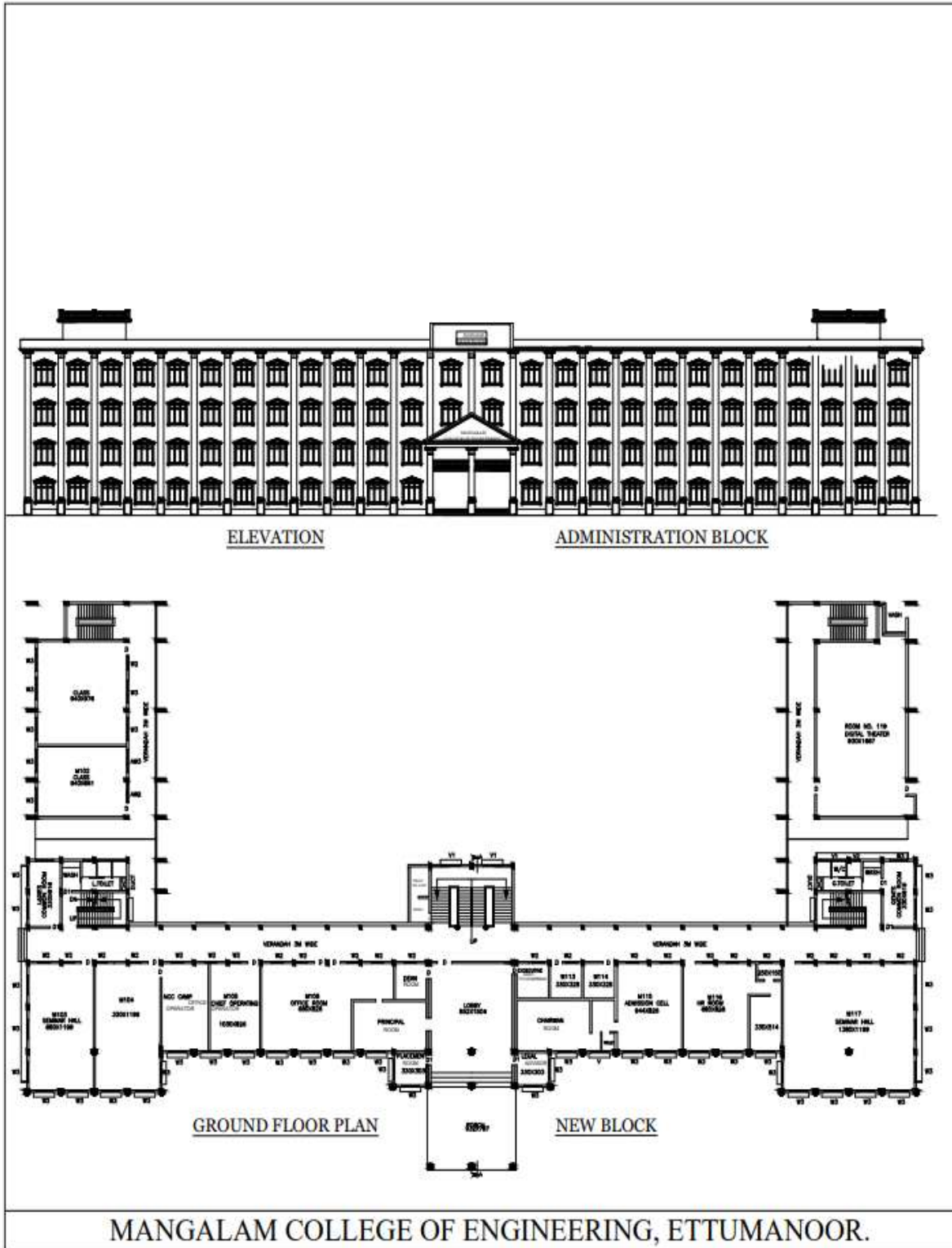


Mangalam College of Engineering Layout plan

## ii. Total built-up area of the College

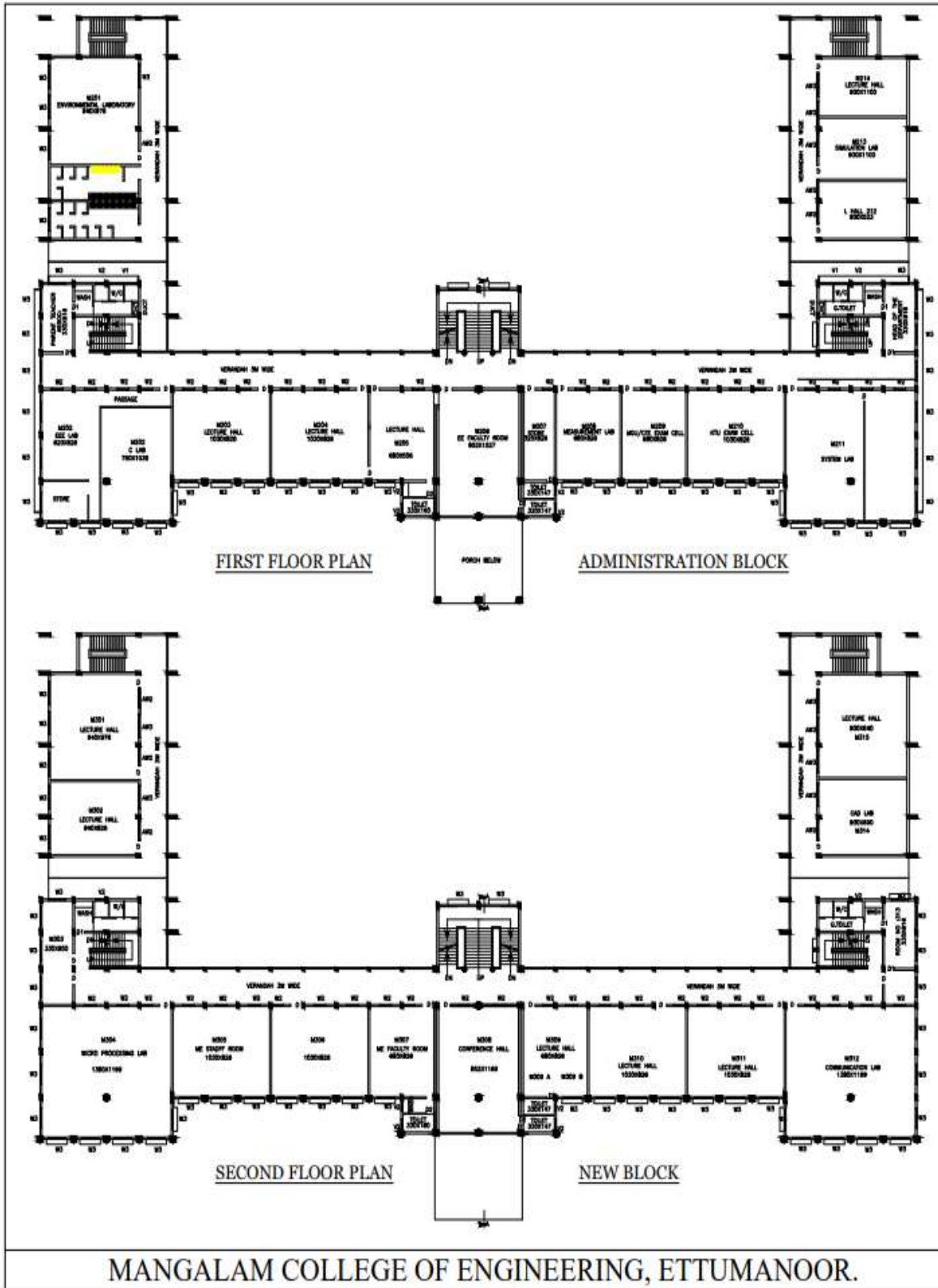
|  |                  |  |            |     |  |  |
|--|------------------|--|------------|-----|--|--|
| SITE AREA  | 2245.93<br>Cents |  | 90893      | sqm |  |  |
| FAR  | 0.36             |  |            |     |  |  |
| Coverage   | 12.06 %          |  |            |     |  |  |
| Total permissible Built-up area                            |                  |  | 278276.786 | sqm |  |  |
| Total permissible GF Built-up area                         |                  |  | 38958.7501 | sqm |  |  |
| Setbacks   | Average          |  | Minimum    |     |  |  |
| Front  | 10.27            |  | 7          |     |  |  |
| Side 1   | 23.56            |  | 22.60      |     |  |  |
| Side 2   | 5.92             |  | 5.92       |     |  |  |
| Rear   | 5                |  | 5          |     |  |  |
| Lift for all buildings above 4 floors (Excluding basement) |                  |  |            |     |  |  |

|    | EXISTING BUILDINGS          | Total Floor area(sqm) | Total carpet area(sqm) | No. of floors | GF Area | Reqd. Car park | Provided Car park |
|----|-----------------------------|-----------------------|------------------------|---------------|---------|----------------|-------------------|
| 1  | Old school building         |                       |                        |               |         |                |                   |
|    | B.ed college                | 1811.78               | 1448.424               | 3             | 603.92  | 10             | 11                |
|    | State School                | 1088                  | 870.4                  | 2             | 544     | 4              | 4                 |
|    | Higher secondary school lab | 840.96                | 672.768                | 3             | 280.32  | 3              | 3                 |
| 2  | Ladies Hostel building      | 2160                  | 1728                   | 3             | 720     | 9              | 9                 |
| 3  | LH Mess                     | 352.6                 | 282.08                 | 1             | 352.6   | 2              | 2                 |
| 4  | Engg. college building      | 6433.13               | 5146.50                | 4             | 1608.2  | 26             | 28                |
| 5  | Canteen                     | 161.3                 | 129.04                 | 1             | 161.3   | 1              | 1                 |
| 6  | Electrical lab              | 528                   | 422.4                  | 1             | 528     | 2              | 2                 |
| 7  | Mechanical lab              | 528                   | 422.4                  | 1             | 528     | 2              | 2                 |
| 8  | Civil lab                   | 348                   | 278.4                  | 1             | 348     | 1              | 1                 |
| 9  | Machine lab                 | 434                   | 347.2                  | 1             | 434     | 1              | 1                 |
| 10 | Workshop building           | 854                   | 683.2                  | 2             | 427     | 4              | 4                 |
| 11 | CBSE new block              | 5906.3                | 4724.9                 | 6             | 1201    | 23             | 24                |
| 12 | MBA block                   | 10273.00              | 8218.4                 | 4             | 2316    | 30             | 32                |
| 13 | CBSE old block              | 1290.2                | 1032.16                | 3             | 422     | 7              | 7                 |
| 14 | PROPOSED BUILDING           | 1164.00               | 1104                   | 3             | 388     | 7              | 8                 |
|    |                             |                       |                        |               |         |                |                   |
|    |                             |                       |                        |               |         |                |                   |
|    |                             |                       |                        |               |         |                |                   |
|    |                             |                       |                        |               |         |                |                   |
|    | TOTAL AREA                  | 34277.07              | 29226.4                |               | 11094.6 | 132            | 140               |



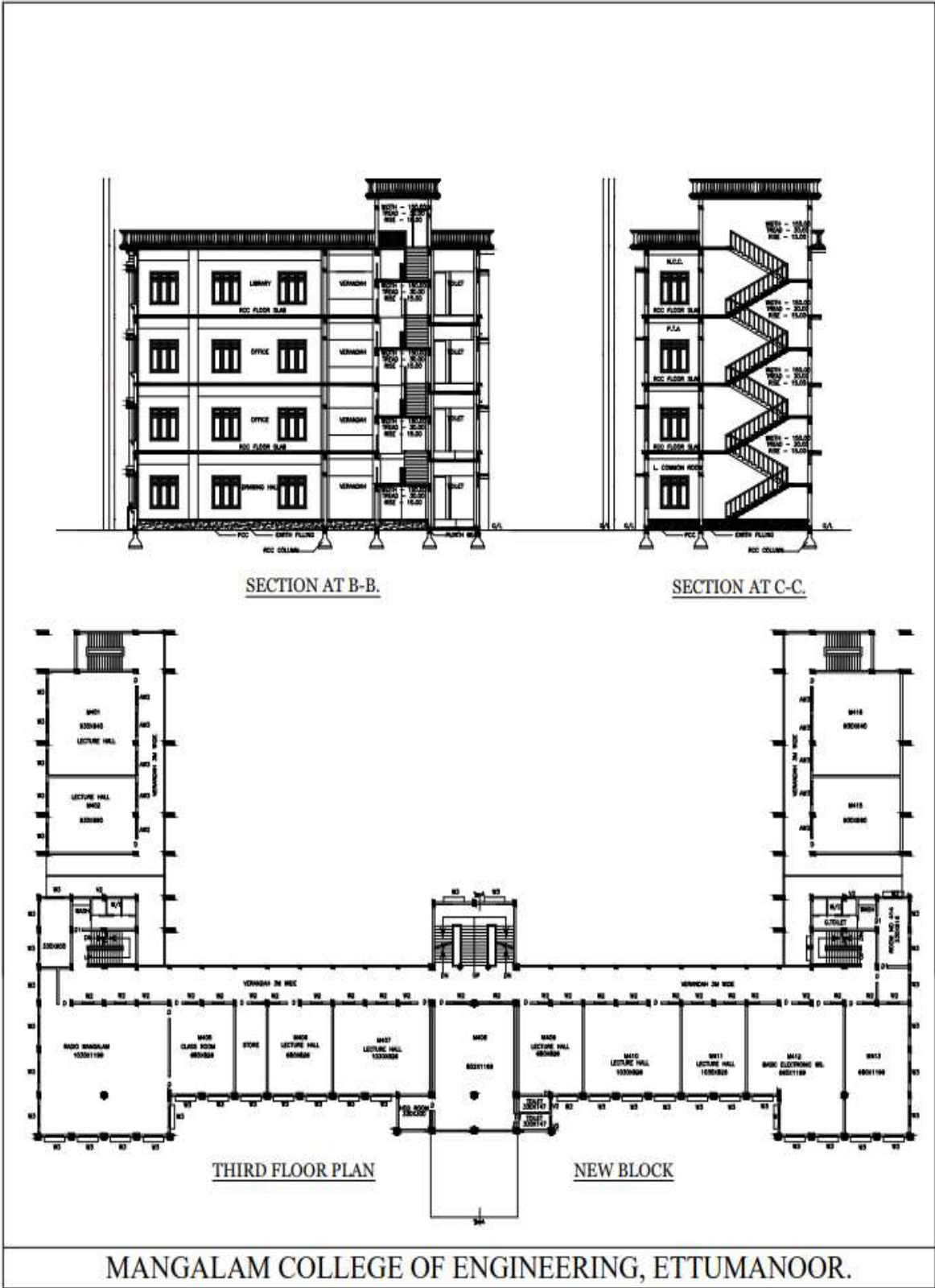
MANGALAM COLLEGE OF ENGINEERING, ETTUMANOOR.

Mangalam College of Engineering first floor plan



Mangalam College of Engineering second floor plan





MANGALAM COLLEGE OF ENGINEERING, ETTUMANOOR.

Mangalam College of Engineering third floor plan

### **Assessment and Comparison:**

The constructed build-up areas closely align with the sanctioned areas in most buildings, indicating effective utilization of the allocated space. The significant diversity in the constructed areas showcases the multifaceted nature of the College, providing dedicated spaces for academic, administrative, and student-centric activities.

### **Vegetated Area and Open Space:**

An exceptional feature of the Mangalam College of Engineering, is the extensive open and vegetated spaces within its 45-acre campus. More than 50% of this vast area is dedicated to lush greenery and vegetation, illustrating the College's commitment to maintaining an eco-friendly and sustainable environment. The substantial vegetated areas and ample open spaces not only contribute to the aesthetic appeal but also serve as vital spaces for recreation, relaxation, and environmental conservation. These green zones provide an ideal setting for students and faculty, offering a serene atmosphere conducive to learning and fostering a deep appreciation for nature. The vast open spaces also allow for outdoor activities, sports, cultural events, and potential future expansions, enhancing the overall campus environment.

This integration of greenery and open areas reflects the College's holistic approach to creating a harmonious ecosystem for academic and personal development.

### **a) Development Footprint and Green Cover**

At Mangalam College of Engineering, the preservation of site features, particularly greenery within its campus, stands as a cornerstone of its development ethos. Embracing a conscientious approach, the campus prioritizes the retention of natural elements—trees, plants, and green spaces during its construction endeavors. This deliberate strategy serves to curtail site damage and reduce the associated negative environmental impacts. The College is dedicated to achieving a delicate equilibrium between its building footprint and the existing green cover. By meticulously integrating construction with the preservation of vegetation, the campus ensures that the architectural and infrastructural developments seamlessly coexist with the natural landscape. This commitment not only amplifies the overall aesthetic appeal of the campus but also fosters thriving habitats for wildlife, encourages biodiversity, and significantly contributes to the creation of a sustainable, environmentally friendly environment.



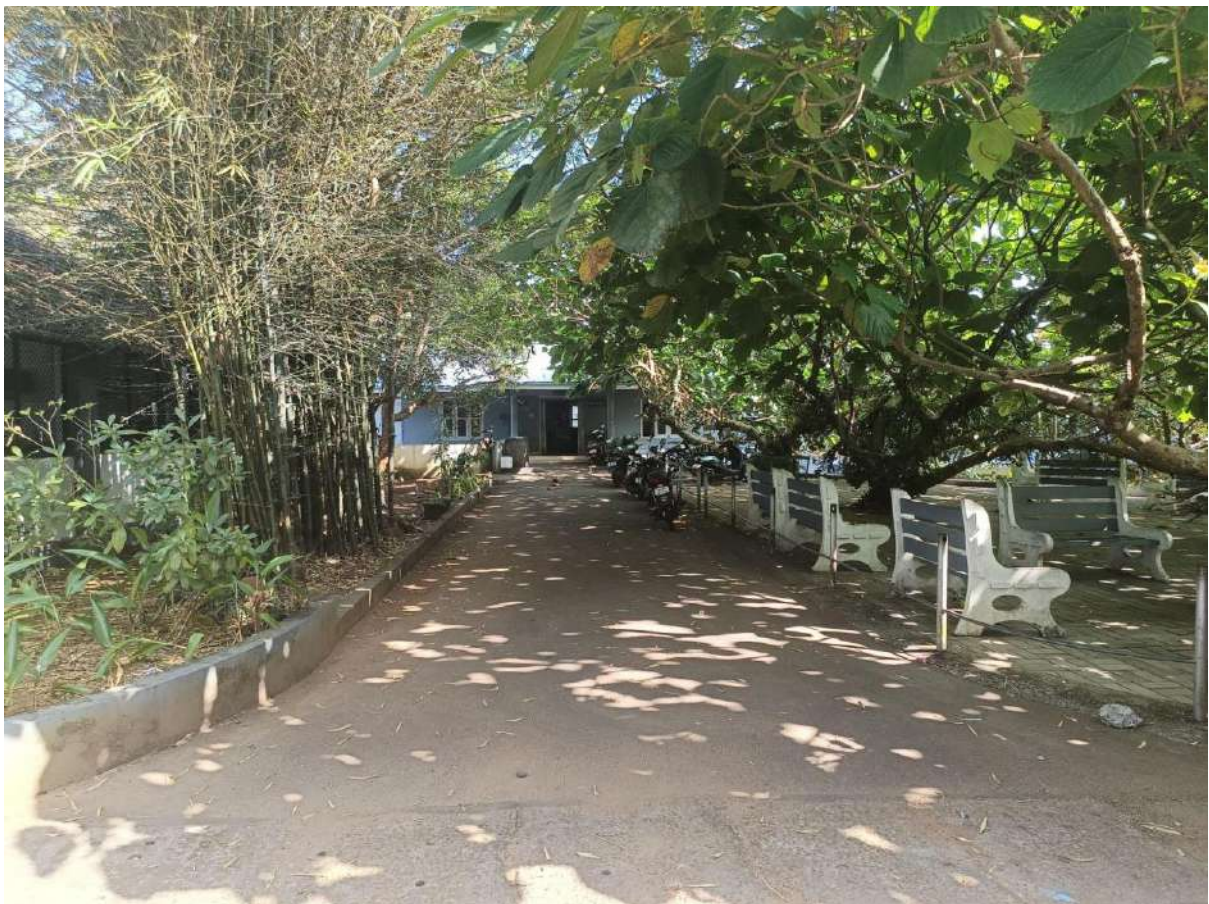
**Mangalam College of Engineering campus development footprint and green cover**





**Mangalam College of Engineering campus development footprint and green cover**





**Mangalam College of Engineering campus development footprint and green cover**



A dedicated effort is made to preserve the campus's natural features, aiming to minimize site damage and reduce negative environmental impacts. An integral part of this conservation initiative is the deliberate preservation of existing trees without disruption. This commitment to safeguarding mature trees not only aligns with the institution's environmental sustainability goals but also serves to maintain the ecological integrity of the site.

## **b) Day lighting**

At Mangalam College of Engineering, the integration of abundant natural daylight through passive architectural methods stands as a hallmark of its design philosophy. Across various spaces, including classrooms, laboratories, computer labs, and the library, the campus showcases a deliberate and thoughtful approach to maximize the use of natural light. Through strategic placement and expansive windows, each area is meticulously designed to invite in copious amounts of daylight, creating bright, inviting, and conducive spaces for learning, research, and study. This conscious use of daylight not only enhances the aesthetic appeal of the campus but also fosters an environment that supports the well-being, focus, and productivity of students and faculty across different educational and research settings.



**Feeling of space and light in the building**



**Use of Natural light for Classrooms**

**Classrooms:** Classrooms are meticulously designed to harness natural daylight using passive architectural techniques. The strategic placement of large windows and the thoughtful architectural layout ensure an abundance of natural light within the learning spaces. Ample daylight not only creates a vibrant and conducive environment for academic pursuits but also contributes to the well-being and comfort of students and faculty.



**Laboratories:** The laboratories at College are intelligently designed with a focus on optimizing natural daylight. Employing passive architectural methods and spacious windows, these spaces are bathed in natural light, fostering an ideal setting for scientific experiments and practical work. The abundance of daylight not only enhances visibility but also creates an inspiring and comfortable environment for research and experimentation.

It is maintained that all regularly occupied spaces are daylit, thereby improving health and well-being of students & teachers.

| Sr.no. | Space        | Prescribed Illumination Level (Lux) | Avg.Readings |
|--------|--------------|-------------------------------------|--------------|
| 1      | Classroom    | 150-300                             | 305          |
| 2      | Lab/workshop | 150-300                             | 350          |
| 3      | Library      | 200-300                             | 333          |
| 4      | Lobby        | 300                                 | 396          |

*Please note that the illumination level is monitored only for daylight. Before starting the monitoring process, the artificial lighting fixtures were switched off. Measured with Digital Lux Meter.*





**Feeling of space and light in all the labs**



**Use of Natural light for library**



### **c) Heat Island Reduction, Non-roof and roof**

Urban heat islands occur when cities replace natural land cover with dense concentrations of pavement, buildings, and other surfaces that absorb and retain heat. This effect increases energy costs (e.g., for air conditioning), air pollution levels, and heat-related illness and mortality.

The College has taken proactive steps to combat the urban heat island effect and minimize its impact on microclimates, as well as the well-being of both humans and wildlife. They have achieved this by strategically planting native, drought-tolerant shade trees and smaller vegetation like shrubs, grasses, and groundcover across the campus. This comprehensive landscaping approach prioritizes tree cover on exposed non-roof impervious areas, effectively reducing heat absorption and promoting a more comfortable environment. Moreover, the provision of shade for over 100% of the parking spaces through covered structures demonstrates a commitment to mitigating heat-related issues and underscores the College's dedication to sustainable and eco-friendly practices.



**Native grass for lawn and drought tolerant shade trees at College to reduce heat island effect**





**Solar panels on roof top**

The installation of solar panels has yielded remarkable results in reducing heat absorption on the building's roof. It has effectively decreased the amount of heat reaching the roof by an impressive margin of over 35%. This significant reduction has resulted in maintaining the covered portions of the roof at temperatures approximately 5 degrees cooler compared to areas of the roof exposed directly to sunlight. This innovative use of solar technology not only generates clean energy but also contributes to improved thermal comfort and energy efficiency within the building.

### **III. Water Audit**

Water audit is an effective management tool for minimizing losses, optimizing various uses and thus enabling considerable conservation of water, the efforts of the campus in water usage and management is seen through following activities it is satisfactory and no unnecessary water wastage is noticed in the campus.

During the survey, no wastages were observed. The open grounds provide means for water percolation as they are not barren due to ample greenery on campus. The campus has a functional rain water harvesting unit and the water collected is used for campus needs.

#### **i. Water Supply and Usage**

In its commitment to environmental sustainability, the College has strategically embraced a conscientious approach to water management, recognizing the paramount significance of responsible water usage in today's world. The primary water supply for meeting the diverse water needs across the campus is sourced from the municipal connection, ensuring a reliable and consistent provision of water resources.

Understanding the critical role water conservation plays in preserving our natural environment, the College has undertaken a commendable initiative to enhance its water sustainability practices. This involves the implementation of recharge structures, meticulously designed and systematically integrated into the campus infrastructure. These recharge structures serve as instrumental components in fostering groundwater replenishment by facilitating the percolation of rainwater and surface runoff into the ground.

The integration of these recharge structures represents a proactive measure to contribute to the preservation and sustainability of groundwater resources. Groundwater, a vital component of the hydrological cycle, plays a pivotal role in sustaining ecosystems and meeting human water needs. By allowing rainwater and surface runoff to permeate the soil and recharge aquifers, the College is actively participating in the restoration and maintenance of the local groundwater table.

It's noteworthy that the College adheres to governmental guidelines, specifically those set forth by the Kerala government, by refraining from the excavation of bore wells within the campus premises. This decision aligns with the broader vision of sustainable water management and reflects a responsible and compliant approach to resource utilization.

Through these combined efforts, the College not only ensures a reliable water supply for its various campus activities but also demonstrates a commitment to environmental stewardship. By embracing water conservation practices and adhering to regulatory guidelines, the institution sets a positive example for the community and contributes to the broader goals of preserving natural resources for future generations.

## ii. Water quality

The quality of the bore well water has been assessed and meets the standards for potable (drinkable) water. To ensure the continued safety and quality of the drinking water provided to staff and students, the campus has implemented a comprehensive water treatment system. This system includes UV (Ultraviolet) and RO (Reverse Osmosis) filtration systems installed on each floor of every block. These filtration systems effectively purify the water, making it safe for consumption, and contribute to the overall well-being of the College community by providing access to clean and potable drinking water.



**RO water purifier**





## KISCO - SOIL, WATER TESTING LAB

PALA PH : 9562933900

(Approved by Kerala State Pollution Control Board)

|  |  |
|--|--|
| AJITHAKUMARAN NAIR K.M.<br>SURYA EVENTS<br>NEDUMPURATHU<br>KIDANGOOR P.O. 9142144379 | SAMPLE RECEIVED : 08/03/2023<br>RESULT ISSUED : 14/03/2023 |
|--|--|

### WATER ANALYSIS REPORT

#### RESULT

- Total number of coliform bacteria present in the given water sample is ZERO per 100 ml.  
(Coliform bacteria should be less than 39 per 100 ml)
- E.coli bacteria - ABSENT  
(Should be absent in the drinking water)

#### CONCLUSION

- Water sample is potable (suitable for drinking) by microbial water analysis.



AUTHORISED SIGNATORY

**RO water Test report**



### **iii. Rain water harvesting**

A comprehensive approach to rainwater harvesting has been embraced to promote sustainable water management practices on campus. Utilizing the non-roof method, the campus has implemented an innovative strategy aimed at optimizing rainwater utilization and recharging the groundwater table effectively. As part of this approach, specific structures, such as recharge pits, have been strategically established across the campus to capture and infiltrate rainwater into the ground. This method not only conserves water but also significantly contributes to enhancing the groundwater table.

Furthermore, the campus has incorporated an advanced system of drain channels distributed throughout the campus, intelligently designed to collect rainwater and channel it to a centralized point or low-lying areas. This meticulous planning ensures that rainwater is efficiently gathered and redirected to specific zones for effective absorption or collection. By adopting this holistic approach, the campus minimizes surface runoff and effectively manages rainwater, contributing to both groundwater replenishment and the conservation of water resources.



**Open Rain water channels**



This multi-faceted strategy underscores the institution's commitment to sustainable water management. By combining the non-roof method with an intricate network of drain channels, the College demonstrates a dedication to eco-friendly practices and responsible water utilization, ensuring an environmentally sustainable campus for the benefit of present and future generations

The campus has implemented rainwater recharge pits, specifically designed to improve the groundwater table and augment the vegetated area on campus. These pits, constructed with a depth of 15 feet, are strategically located within the institution's premises, primarily near the bore well.

The primary objective of these recharge pits is to facilitate the restoration of groundwater levels by enabling rainwater to permeate through the soil and recharge underground aquifers. Placing these pits in close proximity to the bore well is a carefully considered decision, accounting for crucial factors such as the catchment area, soil percolation rates, and groundwater depth. This strategic placement near the bore well maximizes water infiltration in a specific targeted area, effectively contributing to the institution's sustainable water resource management and promoting groundwater replenishment. The recharge structures are dedicated specifically to the bore well, ensuring a localized and efficient recharge process.



**Open well**





**Rain water Collecting Tank (1 lakh )**



**Open well**



## IV. Good Health and Well-being

### i. Campus design caters to differently able people

The campus design places a strong emphasis on accessibility and inclusivity, catering to differently-abled individuals and senior citizens. Several measures have been implemented to ensure their comfort and ease of movement, including:

**Non-Slippery Ramps:** Ramps with non-slip surfaces have been installed to provide smooth access for individuals with mobility challenges, ensuring safe and secure movement.



**Image - Non slippery ramps**



**Wheel chair facility**



**Wheelchairs:** Wheelchairs are provided to assist those who require mobility aids, facilitating their movement within the campus.

**Uniformity in Floor Level:** Exterior common areas have been designed with consistent floor levels to ensure unobstructed movement and accessibility for all.

**Easy Access to Main Entrance:** The main entrances of buildings are easily accessible, removing barriers and enabling smooth entry for everyone.

**Preferred Parking for Differently-Abled:** Designated parking spaces have been allocated for differently-abled individuals, allowing them convenient access to the campus facilities.

**Appropriately Designed Preferred Car Park Spaces:** Specifically designed preferred car park spaces are situated for easy access to the building's main entrance enhancing convenience for differently-abled and senior citizens.

**Dispensary:** A dispensary is a vital facility provided within the College campus to cater to the healthcare needs of students. It serves as a dedicated space where students can receive medical care, treatment, and support. The purpose and features of a College dispensary is as follows:

- a. **Basic Medical Services:** The College dispensary offers essential medical services to address common health issues that students may encounter. This includes treatment for minor injuries, illnesses, and other health concerns.
- b. **Qualified Medical Staff:** A qualified and experienced medical team, often consisting of doctors, nurses, and support staff, is available in the dispensary. They are responsible for diagnosing and treating students and providing healthcare advice.
- c. **First Aid:** The dispensary is equipped with first-aid supplies and equipment to provide immediate care in case of accidents or emergencies. This quick response can be critical in preventing the worsening of injuries.
- d. **Medication Distribution:** The dispensary typically stocks a range of common medications, allowing students to obtain prescribed or over-the-counter drugs as needed. This is especially beneficial for students with chronic medical conditions.
- e. **Health Counseling:** In addition to treatment, the dispensary often offers health counseling and guidance on maintaining a healthy lifestyle. This can include advice on nutrition, stress management, and preventive measures.
- f. **Vaccination and Health Programs:** Some College dispensaries may also organize health programs, vaccination campaigns, and wellness workshops to promote the overall well-being of the student population.

- g. **Confidentiality:** The dispensary maintains strict patient confidentiality, ensuring that students can discuss their health concerns without fear of information being disclosed without their consent.
- h. **Emergency Response:** In the case of a medical emergency, the dispensary can serve as a primary point of contact and coordination for arranging hospital transfers or ambulance services.
- i. **Convenient Access:** Having a dispensary on campus ensures that students have easy and timely access to healthcare services. This can be particularly valuable when students are too unwell to travel off-campus.



**Washroom facility for differently abled**

These measures collectively create an inclusive environment, promoting equal access and participation for all members of the campus community, regardless of physical abilities or age.

## ii. Tobacco Smoke Control

The campus has taken care to eliminate exposure of students & teachers to tobacco smoke thereby reducing health impacts caused due to passive smoking.

## iii. Ozone Depletion

The refrigerant selected for the Air Conditioning System eliminates the emission of compounds that contribute to ozone depletion and global warming. The Air conditioning equipment has been selected with HFC based refrigerant R 410A.

## iv. Fire suppression system

To ensure the safety and well-being of the College community, College has implemented a robust fire safety system with hand held fire extinguishers and are Halon free. campus has not used any Halon based fire suppression system. Carbon dioxide B C Fire Extinguisher, also including dedicated fire safety water lines. These water lines serve as a crucial component of our emergency response plan, providing the means to combat fires effectively and minimize potential damage.



Fire suppression extinguishers



## v. Basic Amenities

Institution has Provide access to basic amenities, so as to reduce negative impacts caused from automobile use and also make it easy for students, basic amenities such as bank, cafeteria, canteen, bus stop in front of the College and several other basic amenities, within the campus itself.



Canteen facility



To enhance physical, emotional and spiritual well-being of campus occupants, the campus has breakout spaces by providing facilities such as, but not limited to gymnasium, yoga, meditation, indoor games, outdoor games, playground, etc.,



**Gym Faciltiy**





**Outdoor games facility**

## V. Waste Management Audit

Mangalam College of Engineering is committed to promoting environmentally responsible practices, and one key area where this commitment is evident is in its waste management strategies. By implementing a range of initiatives, the College aims to reduce its environmental impact, minimize landfill contributions, and foster a culture of sustainability among its students and staff.

### **Source Segregation:**

The College has established a robust source segregation system, encouraging the separation of waste at its origin. Dust bins for biodegradable and plastic waste are strategically placed across the campus, facilitating the easy disposal of waste materials by students and staff.

### **Regular Cleaning and Municipal Service Collaboration:**

Daily cleaning activities ensure the maintenance of a clean and hygienic environment. A significant portion of non-biodegradable waste is efficiently lifted by the City Municipal service, reinforcing the College's commitment to responsible waste disposal.

### **Specialized Handling of Hazardous Waste:**

College is responsible for the collection and proper disposal of various types of hazardous waste generated within the College, ensuring adherence to safety and environmental standards.

### **E-waste Management:**

The College recognizes the importance of responsible e-waste management. Defective items from the computer lab and other electronic waste are stored appropriately.

An approved e-waste management and disposal facility have been contacted to ensure the scientific and environmentally sound disposal of electronic waste, with a focus on potential reuse.

### **Dedicated Collection Centers:**

Specific collection centers on campus are designated for all kinds of waste generated, ensuring safe and compliant handling of these materials.



### List Dust Bin in Campus

| Sr. No | Location/ Name of Building | Type of Colour      | Quantity (no) |
|--------|----------------------------|---------------------|---------------|
| 1      | MAIN BLOCK                 | GREEN , BLUE, RED   | 16            |
| 2      | NEW BLOCK                  | GREEN               | 12            |
| 3      | OUTSIDE MAIN BLOCK         | GREEN , BLUE, RED   | 09            |
| 4      | STORE                      | BROWN, GREEN , BLUE | 04            |
| 5      | STRAWBERRY FIELD           | GREEN , BLUE        | 02            |
| 6      | CANTEEN                    | GREEN               | 02            |
| 7      | CBSE BLOCK                 | BLACK, RED, YELLOW  | 05            |
| 8      | B.ED BUILDING              | GREEN               | 01            |
| 9      | STATE SCHOOL               | GREEN               | 01            |
| 10     | MECHANICAL LAB             | YELLOW              | 01            |
| 11     | INFRONT OF SNACK CENTRE    | GREEN               | 01            |

### Promotion of 3R Principles:

#### Reduce:

Mangalam College of Engineering has taken significant steps to reduce paper usage. Paperless processes have been implemented for admissions, examination forms, and financial transactions. Students are encouraged to use both sides of paper for writing tests, and the adoption of paper binding for academic practical records has replaced the use of plastic. The dissemination of notices and circulars to faculty is predominantly done through email, minimizing the need for printed materials.

#### Reuse:

The College stores e-waste and defective items from the computer lab with the intention of facilitating their reuse wherever possible. By embracing a culture of reusing materials, Mangalam College of Engineering actively contributes to the reduction of waste generation.

**Recycle:** The waste management is in order with the installation of dust bins. The waste is segregated at source by providing separate dust bins for Biodegradable and Plastic waste. Students and staff members are given sufficient information regarding the effective management of the waste generated in the campus.

#### Conclusion:

Mangalam College of Engineering has successfully implemented a comprehensive waste management strategy that aligns with the principles of sustainability. Through source segregation, collaboration with municipal services, and dedicated handling of various waste streams, the College is setting a positive example for responsible waste management within the academic community. The commitment to the 3R principles—Reduce, Reuse, and Recycle—underscores the institution's dedication to minimizing its environmental footprint and fostering a culture of sustainability among students, staff, and the broader community.



## VI. Biodiversity Audit

A comprehensive scientific survey of the campus' flora and fauna was conducted throughout the rainy, winter, and summer seasons in 2023. This biodiversity audit yielded noteworthy findings, including the identification of numerous tree species and a diverse array of mammals, birds (Aves), arthropods, and annelids. These discoveries underscore the remarkable composition of flora and fauna thriving on the campus. Notably, the campus hosts a seasonal influx of various bird species, further enhancing its ecological significance. Moreover, the institution has embarked on a commendable initiative to label trees and plants with their botanical names and assign unique numerical identifiers. This concerted effort aligns with the broader goal of preserving and celebrating the campus's rich biodiversity, fostering a deeper appreciation for the natural world.

**Campus Plantation Overview:** In the campus, there is a dedicated effort towards creating a vibrant and green environment with a focus on a variety of plants that contribute to the beauty and ecological balance of the surroundings.

**Horticulture Department Presence:** In the campus, there is a dedicated Horticulture Department overseeing the management of the garden areas.

Staff Composition in the Horticulture Department:

- 01 Assistant Facility Manager
- 01 Supervisor
- 03 Gardeners

This integrated approach to horticulture not only beautifies the campus but also instills a culture of environmental stewardship and community engagement among the campus occupants.

| Sr. No | Location/ Name of Building  | Plant Name           | Nos |
|--------|---|----------------------|-----|
| 1      | NEAR ELECTRICAL ROOM  | NEPHELIUM LAPPACEUM  | 02  |
| 2      | NEAR MT LAB AND MECHANICAL WORKSHOPS                                    | RUBBER TREE          | 164 |
| 3      | NEAR MT LAB AND WORKSHOPS   | COCONUT TREE         | 62  |
| 4      | NEAR WORSHOPS   | JACK TREE            | 14  |
| 5      | NEAR CANTEEN,MAIN BLOCK AND WORHOPS                                     | MANGO TREE           | 06  |
| 6      | NEAR CENTRE KITCHEN, CBSE BLOCK, MAIN BLOCK PARKING AREA, CANTEEN, LABS | BAMBOO TREE          | 20  |
| 7      | NEAR MAIN ENTRANCE, POLYTECHNIC BLOCK, CANTEEN AND MAIN BLOCK           | GULMOHAR TREE        | 32  |
| 8      | NEAR AMPHITHEATRE   | DATE PALM            | 78  |
| 9      | NEAR COLLEGE GROUND   | ACACIA               | 09  |
| 10     | INFRONT OF POLYTECHNIC BLOCK  | ELENGI               | 28  |
| 11     | NEAR NEW BLOCK  | MAHAGONY             | 22  |
| 12     | NEAR MAIN ENTRANCE, OXFORD CIRCLE, POLYTECHIC                           | BADAM TREE           | 14  |
| 13     | NEAR CNTEEN AND MAIN BLOCK PARKING AREA                                 | FIG TREE             | 22  |
| 14     | NEAR EINSTEEN WALK  | ADENANTHERA PAVONINA | 01  |
| 15     | NEAR MBA BLOCK AND POLYTECHNIC BUILDING                                 | GOOSEBERRY TREE      | 04  |
| 16     | NEAR AMPHITHEATRE AND MAIN ENTRANCE                                     | BANYAN TREE          | 03  |
| 17     | NEAR MAIN BLOCK   | GOLDEN SHOWER TREE   | 02  |
| 18     | NEAR WORKSHOPS  | ANJILI TREE          | 03  |
| 19     | NEAR POLYTECHNIC BUILDING   | INDIAN BAEI          | 01  |
| 20     | NEAR WORKSHOPS  | GUAVA TREE           | 03  |
| 21     | INFRONT OF AMPHITHEATRE   | PALM TREE            | 24  |
| 22     | NEAR KITCHEN AND POLYTECHNIC BIKE PARKING                               | MOUNTAIN APPLE       | 04  |
| 23     | NEAR CIVIL WORKSHOP, ENTRANCE AND GROUNG                                | TEAK                 | 09  |
| 24     | NEAR ELECTRICAL ROOM  | ALSTONIA SCHOLARIS   | 01  |
| 25     | INFRONT OF B.ED BLOCK   | NEEM TREE            | 02  |
| 26     | INFRONT OF B.ED BLOCK AND NEAR POLYTECHNIC BUILDING                     | BOSWELLIA SERRATA    | 03  |
| 27     | NEAR POLYTECHNIC BIKE PARKING   | CARYOTA URENS        | 04  |
| 28     | NEAR POLYTECHNIC BUILDING   | THANNI               | 10  |
| 29     | NEAR STATE SCHOOL   | CUSTARD APPLE        | 01  |
| 30     | INFRONT OF STATE SCHOOL   | MONOON LONGIFOLIUM   | 18  |
| 31     | INFRONT OF B.ED BLOCK   | JAMUN TREE           | 01  |
| 32     | NEAR COLLEGE GROUND   | LAKSHMI TARU         | 01  |
| 33     | NEAR CBSE SCHOOL EAST SIDE  | CALOTROPIS GIGANTEA  | 02  |
| 34     | NEAR LADIES HOSTEL  | CITRUS LIMON         | 01  |

A diverse range of mammal, bird, arthropod, and annelid species were observed on campus, showcasing an unexpectedly rich composition of flora and fauna. This biodiversity is particularly remarkable given the urban location of the campus in the heart of the city, underscoring the resilience and adaptability of the local wildlife to coexist in this unique environment.

Animals and Birds most observed are as follows:

|          | <b>Sr. No.</b> | <b>Common Name</b>        | <b>Species</b>       |
|----------|----------------|---------------------------|----------------------|
| Birds    | 1              | House Sparrow             | Passer domesticus    |
|          | 2              | Great Egret               | Ardea alba           |
|          | 3              | Rosy Starling             | Paster roseus        |
|          | 4              | Large Grey Babbler        | Turtoides malcolmi   |
|          | 5              | Alpine swift              | Apus melba           |
|          | 6              | Common Cuckoo             | Cuculus canorus      |
|          | 7              | Common Myna               | Acridotheres tristis |
|          | 8              | Pigeon                    | Columbidae           |
| Reptiles | 1              | Indian cobra              | Naja naja            |
|          | 2              | Graceful racer            | Platyceps gracilis   |
|          | 3              | Indian Palm Squirrel      | Funambulus palmarum  |
| Insects  | 1              | Sphinx moths              | Sphingidae           |
|          | 2              | Common Gull               | Cepora nerissa       |
|          | 3              | Common grass yellow       | Eurema hecabe        |
|          | 4              | Lemon migrant             | Catopsilia Pomona    |
|          | 5              | White orange tip          | Ixias Marianne       |
|          | 6              | Common Jay                | Grapium doson        |
|          | 7              | Peacock pancy             | Junonia almanac      |
|          | 8              | Common crow butterfly     | Euploea core         |
|          | 9              | Lesser grass blue         | Zizina otis          |
|          | 10             | Forget Me Not             | Catochrysops Strabo  |
|          | 11             | Common Mormon Swallowtail | Papilio polytes      |
|          | 12             | Lime Swallowtail          | Papilio demoleus     |
|          | 13             | Lime blue                 | Chilades lajus       |
|          | 14             | Grasshopper               | Poekilocerus pictus  |
|          | 15             | Blue Tiger                | Tirumala limniace    |
|          | 16             | Common evening brown      | Melanitis leda       |

Institution is Minimizing disturbances and restoring vegetation in the campus, so as to promote habitat and biodiversity.

## VII. Green Policy and Education

College is actively promoting green education by engaging students and local communities to elevate awareness levels and inspire the adoption of eco-friendly practices through the National Service Scheme (NSS). NSS plays a pivotal role in educating students about the environment, environmental laws, and their responsibilities in safeguarding the environment. The institution conducts a myriad of programs and awareness initiatives dedicated to environmental protection. These activities are organized periodically and encompass various outreach and educational programs throughout the year, involving both campus residents and local communities. This collective effort aims to enhance public awareness of environmental sustainability and the green initiatives implemented on the campus.

The institution also celebrates significant environmental occasions such as Environmental Day, Earth Day, and Water Day every year. These celebrations often involve tree planting activities, serving as a means to raise awareness and expand green coverage in and around the campus. This commitment to environmental awareness and action demonstrates the institution's dedication to sustainable practices and the well-being of the environment.

### i. Transforming Kerala's Waste Landscapes: The Sneharamam Initiative

**Introduction:** In a groundbreaking move towards environmental sustainability, the Kerala government has unveiled plans to convert approximately 3,000 garbage dump sites across the state into vibrant, clean-and-green Sneharamam parks by the end of the year. This ambitious project is part of the Malinya Muktham Nava Keralam campaign, aiming to create a cleaner and healthier environment for the people of Kerala.

**Commencement on Gandhi Jayanti:** The transformative journey is set to kick off on October 2nd, Gandhi Jayanti, symbolizing a commitment to Gandhian principles of cleanliness, self-sufficiency, and community well-being. Local self-government institutions (LSGIs) and the Kerala Solid Waste Management Project (KSWMP) will collaborate to identify suitable dump sites that can be repurposed into inviting green spaces.

**Mangalam College of Engineering's Contribution:** As a proactive step towards realizing this vision, the NSS unit 561 of Mangalam College of Engineering took a hands-on approach by organizing a cleaning program at Ettumanoor Municipality's Chirakkulam on October 2nd, 2023. This initiative not only highlights the enthusiasm of the youth but also signifies the active involvement of educational institutions in the state's mission to combat waste and rejuvenate its landscapes.

**The Sneharamam Concept:** The term 'Sneharamam' itself reflects the essence of the initiative, translating to 'Garden of Love.' The aim is not just to cleanse the land but to infuse it with love, care, and sustainable practices. These transformed spaces are envisioned to serve as community hubs, fostering a sense of belonging and responsibility among the residents.



## Goals and Objectives:

1. Environmental Restoration: The primary objective is to restore the ecological balance of these dump sites, converting them into green havens that contribute positively to the environment.
2. Community Engagement: Sneharamam parks are designed to be inclusive spaces that encourage community participation, collaboration, and a sense of collective responsibility towards the environment.
3. Educational Platforms: These parks will also serve as educational platforms, promoting awareness about waste management, recycling, and sustainable living practices.

## Benefits of the Sneharamam Initiative:

1. Healthier Environment: The transformation of dump sites into green parks will significantly improve air quality and contribute to overall environmental health.
2. Community Well-being: By actively involving local communities in the process, Sneharamam parks will foster a sense of pride and ownership, promoting mental and emotional well-being.
3. Tourism and Aesthetics: Beautified landscapes are likely to attract tourists, further boosting local economies and enhancing the overall aesthetics of the region.

**Conclusion:** The Sneharamam initiative is a testament to Kerala's commitment to sustainable development and environmental conservation. Through community collaboration, active participation, and a shared vision, the state aims to turn once-degraded landscapes into vibrant, clean, and green spaces that embody the principles of love, care, and environmental stewardship. This project marks a significant step towards a greener, cleaner, and more sustainable future for the people of Kerala.



## ii. Transforming Railway Stations: Mangalam College of Engineering NSS Unit 561 Contributes to Swachh Rail Swachh Bharat

**Introduction:** In alignment with the nationwide Swachh Rail Swachh Bharat program, students from the National Service Scheme (NSS) Unit 561 at Mangalam College of Engineering demonstrated their commitment to cleanliness and community service by undertaking a cleaning initiative at the Kumaaranallur Railway Station.

**Swachh Rail Swachh Bharat Program:** The Swachh Rail Swachh Bharat initiative is a crucial component of the national cleanliness drive, emphasizing the need for cleanliness and hygiene in railway stations across the country. This program aims to enhance passenger experience, promote environmental sustainability, and instill a sense of pride in railway facilities.

**Mangalam College of Engineering's NSS Unit 561 In Action:** In a proactive move, the NSS students from Mangalam College of Engineering organized a cleaning drive at the Kumaaranallur Railway Station. The initiative reflects the college's dedication to community service and aligns with the larger vision of creating cleaner and more hygienic public spaces.

**Cleaning the Premises of Kumaaranallur Railway Station:** On a specific day, the NSS Unit 561 mobilized its members for a comprehensive cleaning program at Kumaaranallur Railway Station. The cleaning drive encompassed various areas of the station premises, including platforms, waiting areas, and other public spaces.

### Objectives of the Cleaning Initiative:

1. **Enhanced Passenger Experience:** The primary goal of the cleaning initiative was to improve the overall cleanliness and hygiene standards at Kumaaranallur Railway Station, ensuring a more pleasant experience for passengers.
2. **Community Participation:** The NSS students actively involved the local community in the cleaning process, fostering a sense of shared responsibility and encouraging a collaborative approach towards maintaining public spaces.
3. **Promoting Swachh Bharat Abhiyan:** The initiative is in line with the larger Swachh Bharat Abhiyan, contributing to the national mission of creating a cleaner and healthier India.

**Impact and Future Steps:** The cleaning initiative at Kumaaranallur Railway Station not only brought immediate visible improvements but also served as a catalyst for positive change in the community. The NSS Unit 561 plans to continue its efforts, engaging in regular cleaning drives and awareness campaigns to maintain the cleanliness standards at the railway station.

**Conclusion:** Mangalam College of Engineering's NSS Unit 561's contribution to the Swachh Rail Swachh Bharat program exemplifies the power of community-driven initiatives in fostering positive change. Through their dedication and commitment, these students have not

only cleaned the premises of Kumaaranallur Railway Station but have also inspired a sense of responsibility and cleanliness in the broader community. Such initiatives are pivotal in realizing the vision of a Swachh Bharat – a cleaner and healthier India for all.



### iii. Nurturing Green Futures: Mangalam College of Engineering's Environment Day Sapling Distribution

**Introduction:** In a commitment to environmental conservation and sustainable practices, Mangalam College of Engineering observed World Environment Day on June 5, 2023. Under the dedicated leadership of the program officer, a sapling distribution event was organized, symbolizing the institution's dedication to fostering a greener and healthier future.

**World Environment Day Celebration:** World Environment Day serves as a global platform for raising awareness and encouraging positive action towards environmental protection. Mangalam College of Engineering took this opportunity to contribute actively to the cause, emphasizing the importance of individual and collective efforts in safeguarding the planet.

**Sapling Distribution Initiative:** The highlight of the Environment Day celebrations at Mangalam College of Engineering was the distribution of saplings. Under the guidance of the program officer, this initiative aimed to engage students and staff in a hands-on activity that directly contributes to the preservation of the environment.



### Key Features of the Sapling Distribution Program:

1. **Leadership and Organization:** The program officer played a pivotal role in organizing and leading the sapling distribution event, ensuring its smooth execution and impactful outcomes.
2. **Collaborative Participation:** Students, faculty, and staff actively participated in the initiative, fostering a sense of shared responsibility and environmental consciousness within the college community.
3. **Diverse Sapling Varieties:** A variety of saplings, representing native and beneficial plant species, were distributed. This not only adds aesthetic value to the campus but also supports local biodiversity.

### Objectives of the Sapling Distribution Event:

1. **Promoting Green Practices:** The distribution of saplings aimed to encourage the adoption of green practices among students and staff, promoting a sustainable lifestyle.
2. **Educational Outreach:** The event served as an educational platform, raising awareness about the significance of trees in environmental conservation and the role each individual plays in fostering a healthier planet.
3. **Symbolizing Commitment:** By distributing saplings on World Environment Day, Mangalam College of Engineering demonstrated its commitment to environmental stewardship and sustainability.

**Impact and Future Initiatives:** The sapling distribution event left a lasting impact on the college community, fostering a sense of environmental responsibility. The college plans to monitor the growth of the distributed saplings, organize tree-planting drives, and continue educational campaigns to sustain the momentum generated on World Environment Day.

**Conclusion:** Mangalam College of Engineering's Environment Day sapling distribution initiative exemplifies the institution's dedication to creating a sustainable and eco-friendly campus. By actively involving the college community, this event not only contributed to the beautification of the campus but also planted the seeds for a greener and healthier future, aligning with the global effort to address environmental challenges.





#### iv. **Cultivating Beauty: NSS Volunteers Lead Campus Cleaning and Sapling Plantation at Mangalam College of Engineering**

**Introduction:** In a harmonious blend of environmental stewardship and campus pride, NSS volunteers at Mangalam College of Engineering took the initiative to enhance the aesthetic appeal and sustainability of the campus. On October 23, 2023, a comprehensive campus cleaning and sapling plantation event were organized, showcasing the collective commitment of the NSS volunteers towards a cleaner and greener educational environment.

**Campus Cleaning and Beautification:** The campus cleaning and beautification drive were marked by the active participation of NSS volunteers, who dedicated their time and effort to rejuvenate various areas of Mangalam College of Engineering. From classrooms to common areas, the volunteers meticulously cleaned and spruced up the campus, contributing to an inviting and positive learning atmosphere.

**Sapling Plantation Initiative:** As part of the broader beautification program, NSS volunteers engaged in sapling plantation across designated areas of the college campus. This initiative aimed not only to enhance the greenery but also to promote biodiversity and create sustainable green spaces within the educational institution.

#### **Key Highlights of the Event:**

1. **Volunteer-led Initiative:** The NSS volunteers took charge of planning and executing the campus cleaning and beautification event, demonstrating their leadership and commitment to community service.
2. **Comprehensive Cleaning:** The cleaning drive covered various aspects, including waste disposal, landscaping, and maintenance, ensuring an overall improvement in the cleanliness and aesthetics of the campus.
3. **Sustainable Practices:** The inclusion of sapling plantation underscored the commitment to sustainability, fostering an environment-conscious ethos among the college community.

#### **Objectives of the Campus Beautification Event:**

1. **Enhance Campus Aesthetics:** The primary goal was to create an aesthetically pleasing and clean environment that enhances the overall campus experience for students, faculty, and staff.
2. **Promote Environmental Awareness:** Through sapling plantation, the event aimed to raise awareness about the importance of green spaces, biodiversity, and the role of individuals in environmental conservation.
3. **Foster a Sense of Ownership:** By actively participating in the campus beautification efforts, NSS volunteers sought to instill a sense of ownership and pride among the college community, encouraging everyone to contribute to the upkeep of the campus.

**Impact and Future Initiatives:** The campus beautification event left a tangible impact on Mangalam College of Engineering, creating a more inviting and eco-friendly space. The NSS volunteers aspire to continue their efforts, organizing periodic cleaning drives, tree-planting initiatives, and awareness campaigns to sustain the positive transformation achieved on October 23, 2023.

**Conclusion:** Mangalam College of Engineering's campus beautification, led by NSS volunteers, exemplifies the spirit of community service and environmental consciousness within the college community. This initiative not only contributes to a visually appealing campus but also reinforces the importance of collective action in creating a conducive and sustainable learning environment.



#### v. **Empowering NSS Volunteers: NRPF Orientation Program at Mangalam College of Engineering**

**Introduction:** On October 14, 2023, an insightful orientation program on Natural Resource Protection Force (NRPF) was conducted at Mangalam College of Engineering. Devika M, the Regional Coordinator for Kottayam, Idukki, and Alappuzha, led the orientation, providing valuable insights and empowering NSS volunteers from S3 and S5 to actively contribute to natural resource conservation.

**Overview of NRPF Orientation:** The NRPF orientation aimed to familiarize NSS volunteers with the principles, goals, and strategies of the Natural Resource Protection Force. Devika M, an experienced regional coordinator, shared her expertise and knowledge, emphasizing the importance of preserving and safeguarding our natural resources for sustainable development.

### **Key Components of the Orientation Program:**

1. **Introduction to NRPF:** The session began with a comprehensive introduction to NRPF, highlighting its mission, objectives, and the critical role it plays in environmental conservation.
2. **Regional Perspective:** Devika M provided specific insights into the environmental challenges faced by the Kottayam, Idukki, and Alappuzha regions, offering context and relevance to the NSS volunteers.
3. **S3 and S5 Engagement:** Tailored to the academic levels of the NSS volunteers, the orientation program addressed the distinct roles and responsibilities of S3 and S5 students within NRPF initiatives.

### **Objectives of the NRPF Orientation:**

1. **Awareness and Understanding:** The primary goal was to raise awareness and enhance the understanding of NSS volunteers regarding the importance of natural resource protection and the role they can play.
2. **Skill Building:** The orientation program aimed to equip volunteers with practical skills, knowledge, and strategies to actively participate in NRPF initiatives and make a positive impact.
3. **Regional Relevance:** By focusing on the specific environmental challenges of the Kottayam, Idukki, and Alappuzha regions, the orientation sought to create a stronger sense of local ownership and commitment among the volunteers.

**Impact and Future Involvement:** The NRPF orientation left a lasting impact on the participating NSS volunteers, inspiring a sense of responsibility towards environmental conservation. The students expressed enthusiasm to engage in upcoming NRPF activities, fostering a culture of active involvement in natural resource protection within the college community.

**Conclusion:** Mangalam College of Engineering's NRPF orientation, led by Devika M, exemplifies the institution's commitment to holistic education and community engagement. By empowering NSS volunteers with knowledge and skills related to natural resource protection, the college contributes to nurturing environmentally conscious leaders who are poised to make a positive impact on the region and beyond.



#### vi. **Greening Our Homes: NSS Volunteers Foster Tree Plantation During NSS Week**

**Introduction:** In a commendable initiative to extend the spirit of environmental consciousness beyond the college campus, NSS volunteers at Mangalam College of Engineering embraced the concept of "Tree Plantation at Home" as part of the NSS Week celebrations. This endeavor, undertaken by every NSS volunteer, reflects a collective commitment to nurturing a greener and healthier environment starting from their own residences.

**NSS Week Celebration:** NSS Week serves as an opportune time for volunteers to engage in meaningful community service activities and initiatives. Recognizing the importance of individual contributions to environmental sustainability, Mangalam College of Engineering integrated a unique "Tree Plantation at Home" program into the NSS Week agenda.

#### **Key Highlights of the Tree Plantation at Home Initiative:**

1. **Individual Commitment:** Each NSS volunteer took personal responsibility for planting a tree at their home premises, fostering a sense of individual ownership and environmental stewardship.



2. **Variety of Trees:** Volunteers were encouraged to plant a variety of trees suitable for their home environments, ensuring diversity and adaptability to different climates and soil conditions.
3. **Educational Component:** Alongside the tree plantation, NSS volunteers were provided with information on the chosen tree species, care guidelines, and the environmental benefits associated with the selected trees.

### **Objectives of the Tree Plantation at Home Initiative:**

1. **Promoting Green Practices:** The primary objective was to encourage NSS volunteers to adopt green practices in their daily lives by actively participating in tree plantation at their homes.
2. **Raising Environmental Awareness:** By providing information about the selected trees, the initiative aimed to raise awareness about the importance of trees in mitigating climate change, improving air quality, and supporting biodiversity.
3. **Individual Impact:** The initiative sought to demonstrate that individual actions, even on a small scale, contribute significantly to the larger goal of environmental conservation.

**Impact and Future Sustainability:** The Tree Plantation at Home initiative during NSS Week not only resulted in an immediate visual enhancement of greenery in residential areas but also fostered a lasting sense of environmental responsibility among NSS volunteers. The hope is that this initiative will inspire a long-term commitment to sustainable practices and a heightened awareness of the role individuals play in fostering a greener planet.

**Conclusion:** Mangalam College of Engineering's Tree Plantation at Home initiative encapsulates the essence of NSS Week by empowering volunteers to become environmental ambassadors in their own communities. This simple yet impactful gesture symbolizes the potential for positive change when individuals unite for a common cause, fostering a culture of environmental sustainability and responsibility within and beyond the college community.



## **vii. Transforming Landscapes: NSS Volunteers Lead Campus Cleaning and Sapling Plantation at Mangalam College of Engineering**

**Introduction:** On October 23, 2023, Mangalam College of Engineering witnessed a remarkable transformation as NSS volunteers took the initiative to enhance the campus's beauty and sustainability. The combined efforts of dedicated volunteers resulted in a comprehensive campus cleaning and sapling plantation event, creating a more vibrant and eco-friendly learning environment.

### **Key Highlights of the Campus Beautification Event:**

1. **Volunteer-Led Initiative:** The NSS volunteers spearheaded the planning and execution of the campus cleaning and beautification event, showcasing their commitment to community service and environmental stewardship.
2. **Comprehensive Cleaning:** The cleaning drive encompassed various areas of the campus, ensuring that classrooms, common areas, and outdoor spaces were thoroughly cleaned and revitalized.
3. **Sapling Plantation:** In addition to cleaning, the volunteers actively participated in the plantation of saplings across designated areas of the campus, contributing to the expansion of green spaces.

### **Objectives of the Campus Beautification Event:**

1. **Enhance Aesthetic Appeal:** The primary goal was to create a more aesthetically pleasing campus environment that promotes a positive and inspiring atmosphere for students, faculty, and staff.
2. **Promote Environmental Consciousness:** The event aimed to raise awareness about the importance of environmental conservation and sustainability, instilling a sense of responsibility within the college community.
3. **Encourage Community Participation:** By involving NSS volunteers, the event sought to foster a sense of community engagement and collective responsibility for the upkeep of the college premises.

**Impact and Sustainable Practices:** The campus beautification event left a visible impact on Mangalam College of Engineering, creating a cleaner and greener ambiance. The planted saplings not only contribute to the beautification but also serve as a long-term commitment to fostering biodiversity and environmental health on the campus.

**Future Initiatives:** Building on the success of the campus beautification event, the NSS volunteers express their commitment to organizing regular cleaning drives, tree-planting initiatives, and awareness campaigns. These initiatives aim to sustain the positive changes initiated on October 23, 2023, and further embed a culture of environmental responsibility within the college community.



**Conclusion:** Mangalam College of Engineering's campus beautification event, driven by the enthusiasm of NSS volunteers, exemplifies the power of collective action in creating positive change. This initiative not only enhances the physical appearance of the campus but also nurtures a sense of pride and responsibility among the college community, laying the foundation for a sustainable and eco-conscious educational institution.



## VIII. Transportation

Vehicles stand as a notable contributor to energy consumption and environmental pollution. Recognizing this impact, our College fervently advocates for a shift towards eco-friendly transportation options among students and faculty. By encouraging the adoption of sustainable modes of transportation, such as cycling, walking, carpooling, or utilizing electric vehicles, College aim to mitigate the environmental footprint associated with conventional automobile use.

### i. Pedestrian Network

In line with the dedication to enhancing the safety and overall experience for pedestrians on campus, the College has implemented a meticulously designed interconnected network of walkways. This thoughtfully planned system seamlessly connects key buildings and essential amenities, prioritizing the safety and convenience of the campus community. With a focus on providing proper shading and ample illumination, these walkways not only ensure a secure environment but also contribute to a more pleasant and comfortable experience for those traversing the campus.

### ii. Sustainable Transportation

Demonstrating a steadfast commitment to sustainability, our College has made significant strides in providing accessible and eco-friendly transportation options for its community. The implementation of shuttle services and facilitation of public transportation usage exemplify our dedication to reducing the environmental impact of commuting. Moreover, a substantial number of our faculty actively participates in carpooling initiatives, further bolstering our sustainable transportation efforts. By fostering these practices, we not only prioritize the well-being of our environment but also encourage a sense of shared responsibility among our College community, solidifying our commitment to a greener and more sustainable future.



Charging points for E vehicles



## IX. Observation and Recommendation

### Observations of the Green Audit

Our recent Green Audit has yielded several noteworthy observations that reflect commitment to sustainability and environmental responsibility. These observations encompass various aspects of our operations and practices across:

1. **Well-Maintained Signages:** We are pleased to report that signages, essential for guiding and informing our campus community, have been meticulously maintained at all relevant locations across our campuses.
2. **Paper Consumption Monitoring:** Vigilant paper consumption monitoring is in place across all our buildings, reflecting our dedication to reducing paper waste and promoting eco-friendly practices.
3. **Effective Waste Management:** Waste bins and containers are strategically positioned, with separate receptacles for different types of waste. Continuous waste quantity monitoring ensures efficient waste management.
4. **Responsible E-Waste Disposal:** E-waste is responsibly handled by returning it to suppliers for proper disposal, minimizing its environmental impact.
5. **Lead-Acid Battery Management:** Used lead-acid batteries are returned to manufacturers or their agents during replacements, ensuring safe and eco-conscious disposal.
6. **Afforestation Efforts:** Our commitment to environmental conservation is exemplified by the planting of over 100 saplings in and around our campus as part of NSS and other initiatives.
7. **Environmentally Friendly Cleaning Practices:** We prioritize the use of environmentally friendly cleaning agents for maintaining the cleanliness of our floors and toilets across all campuses.
8. **Fire Safety Measures:** Fire extinguishers are regularly refilled, and mock drills are conducted to prepare our campus community for potential fire emergencies.
9. **First Aid Availability:** To ensure that first aid kits are readily available on each floor of campus at convenient locations. Regular monitoring ensures that all items are consistently accessible.

These observations reaffirm College dedication to environmental sustainability and our resolve to create a greener, safer, and more eco-conscious environment campuses.

## Recommendations for Sustainable Practices

Following the recent Green Audit, we have identified several key recommendations aimed at further enhancing our sustainability efforts and environmental responsibility:

- 1. Sustainability Training:** Implement comprehensive sustainability training programs to educate our College community on sustainable practices and environmental stewardship.
- 2. Environmentally Responsible Purchasing Policy:** Adopt and implement an Environmentally Responsible Purchasing Policy to guide our procurement decisions and reduce our environmental footprint.
- 3. Stakeholder Engagement:** Encourage government, foundations, and industry involvement in interdisciplinary research, education, policy formation, and information exchange related to environmentally sustainable development.
- 4. Canteen Renovation:** Explore the renovation of our canteen's cooking system by installing solar water heaters with heat pumps to reduce gas consumption and promote renewable energy use.
- 5. Employee Tree Ownership:** Consider assigning tree ownership to our employees, fostering a sense of ownership and responsibility for the campus's green spaces.
- 6. Butterfly Garden:** Develop a butterfly garden on campus to celebrate and appreciate the diversity of flora and fauna, promoting biodiversity conservation.
- 7. Water meter:** Installation of water meters: install water meters at all water tank outlets to accurately monitor and control water usage.
- 8. Low VOC paints:** During renovation, maintenance or new building construction use low voc paint for painting purposes.
- 9. Repairing leaks:** Address leaks promptly by fixing taps and pipes to minimize water wastage.
- 10. Automatic faucets:** Install auto-flush systems for basins to reduce water usage and promote efficient handwashing practices

Annex 1  
ISO17020:2012



Annex 2  
ISO9001:2015



**Certificate of Registration**

This is to certify that

**GREEN AURA**  
#692 F, 12TH A CROSS BEL LAYOUT, BHARATHNAGAR, MAGADI ROAD,  
BENGALURU KARNATAKA, 560091, INDIA

has been independently assessed by QRO  
and is compliant with the requirement of:

**ISO 9001:2015**  
**Quality Management System**

For the following scope of activities:

**GREEN BUILDING SERVICES, CONSTRUCTION, INTERIOR DESIGN,  
GREEN AUDITING, SUSTAINABLE SERVICES**

Date of Certification: 14th January 2023  
1<sup>st</sup> Surveillance Audit Due: 13th January 2024

2<sup>nd</sup> Surveillance Audit Due: 13th January 2025  
Certificate Expiry: 13th January 2026

**Certificate Number: 305023011402Q**



Head of Certification

Validity of this certificate is subject to annual surveillance audits to be done successfully on or before 365 days from date of the audit.  
(In case surveillance audit is not allowed to be conducted, this certificate shall be suspended / withdrawn.)  
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Annex 3  
ISO14001:2015

*Certificate of Registration*

This is to Certify that  
Environmental Management System of




**GREEN AURA**

#692 F, 12TH A CROSS BEL LAYOUT, BHARATHNAGAR, MAGADI ROAD, BENGALURU  
KARNATAKA-560091, INDIA

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

GREEN BUILDING SERVICES OF CONSTRUCTION, INTERIOR DESIGN, GREEN AUDITING,  
SUSTAINABLE SERVICES.

|                           |              |                |              |
|---------------------------|--------------|----------------|--------------|
| Certificate No            | : 23EENO06   | Issuance Date  | : 02/08/2023 |
| Initial Registration Date | : 02/08/2023 |                |              |
| Date of Expiry            | : 01/08/2026 |                |              |
| 1st Surve. Due            | : 02/07/2024 | 2nd Surve. Due | : 02/07/2025 |

*Demul*  
Director

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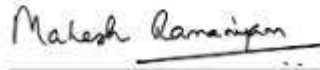
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## Nischay N

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**LEED® Green Associate™**

by demonstrating the knowledge and understanding of  
green building practices and principles needed to  
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MAHESH ANWAR  
PRESIDENT & CEO, U.S. GREEN BUILDING COUNCIL  
PRESIDENT & CEO, GREEN BUSINESS CERTIFICATION INC.











