ELE4116: Electrical Installation Design

Electrical Lighting and Power System Design Concept Note

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1 Introduction

This project involves designing a comprehensive electrical lighting and power system for a residential building, consisting of various functional spaces such as bedrooms, living rooms, kitchens, and bathrooms. Using AutoCAD, the aim is to ensure efficient, safe, and optimized electricity distribution for lighting, power sockets, and the lightning protection system (LPS). The system will adhere to industry standards and regulatory codes.

2 Project Objectives

The primary objectives of this project are:

- To design an energy-efficient lighting system tailored to meet the functional needs of each room.
- To develop an optimized layout for power sockets, ensuring convenient access in all rooms.
- To comply with safety standards, allowing for balanced load distribution across circuits.
- To provide a clear, detailed schematic that can be readily implemented on-site.

3 Scope of Work

The scope includes accurately recreating the architectural floor plan in AutoCAD based on the provided layout. The focus will be on:

- **Lighting System**: Placement of energy-efficient LED fixtures suited to room-specific requirements, with a detailed schematic showing connections to switches and the distribution board.
- **Power Sockets**: Positioning of power outlets for convenient access in each room, balanced with circuits to optimize load distribution.
- **Load Estimation**: Total electrical load requirements will be calculated to ensure safety and efficiency in balancing loads across circuits.

4 Methodology

The project applies to a dual-unit residential building with symmetrical layouts. Each unit contains two bedrooms, a kitchen, a living/dining room, and associated spaces (e.g., bathrooms, storage). The architectural plan measures 21.4m x 12.8m in total.

4.1 Power Outlet Design for Each Unit

Based on room function and anticipated usage, the following power outlet allocations are proposed:

- Living Room: 4 sockets
- Dining Room: 1 socket
- Master Bedroom: 2 sockets
- Master Bathroom: 1 socket
- Children's Bedroom: 2 sockets
- Kitchen: 3 sockets
- Dirty Kitchen: 1 socket

4.2 Appliance Load Ratings

The table below outlines standard appliances and their ratings, used for load calculations in each unit:

Appliance	**Quantity**	**Power Rating (kW)**
Washing Machine	1	1.5
Refrigerator	1	0.3
Water Heater	2	5.0
Cooker	1	2.0
Microwave	1	0.8
Dryer	1	6.0
Dishwasher	1	1.8

Table 1: Standard Appliance Load Ratings

5 Lighting Calculation

The following table details lighting requirements per room, based on dimensions and function:

Room	**Length(m)**	**Width (m)**	**Area(m^2)**	**Lamps**	**Power(W)**	**Total(W)**
Children's Bedroom	4.5	3.2	14.4	1	5	5
Living Room	4.2	2.5	10.5	3	10	30
Dining Room	4.2	4.15	17.43	2	5	10
Master Bedroom	4.5	3.3	14.85	3	5	15
Store	2.0	1.5	3.0	1	5	5
Master Bathroom	3.15	1.5	4.72	1	5	5
Kitchen	3.4	2.55	8.67	1	5	5

Table 2: Lighting Requirements by Room

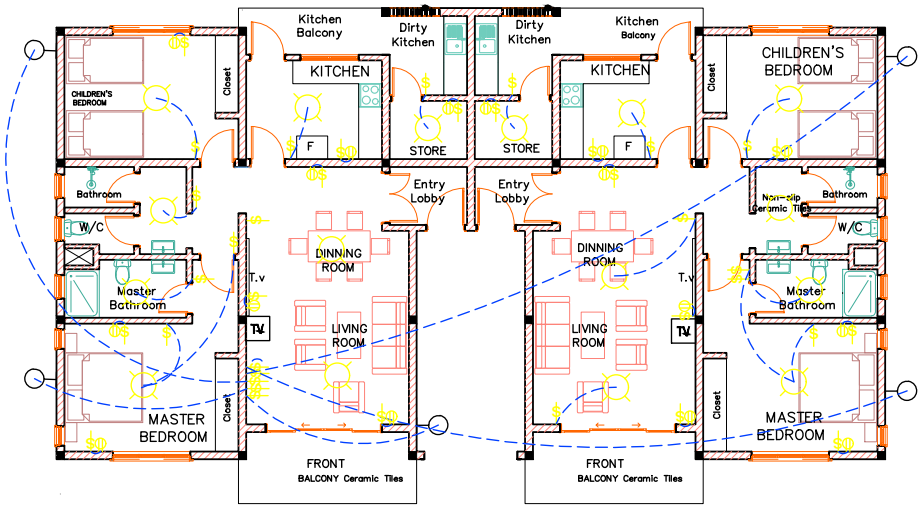
6 Materials and Equipment

The following materials and equipment are required:

- **AutoCAD Software**: For creating layout and schematic drawings.
- **LED Lighting Fixtures**: Energy-efficient, with a typical rating of 9-12 watts per fixture.
- **Wiring**: Standard residential wiring (e.g., $2.5mm^2$ for sockets, $1.5mm^2$ for lighting circuits).
- **Sockets and Switches**: High-quality, durable outlets for safety.
- **Distribution Board and Circuit Breakers**: Suitable to handle load requirements (6A for lighting circuits, 16A for socket outlets).
- **Protection Equipment**: Including RCDs and surge protectors for safety.

7 Conclusion

This project aims to deliver a comprehensive and optimized electrical lighting and power system design for a residential building. The use of AutoCAD ensures precise design, and the adoption of energy-efficient LED lighting and strategically placed power sockets enhances functionality. Safety, load balancing, and compliance with electrical codes are emphasized throughout the project.


Kitchen Balcony
Dirty Kitchen
Dirty Kitchen
Kitchen Balcony
CHILDREN'S BEDROOM
KITCHEN
KITCHEN
Closet
Closet
CHILDREN'S BEDROOM
F
F
STORE
STORE
Entry Lobby
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Bathroom
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Non-slip Ceramic Tiles
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DINNING ROOM
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Master Bathroom
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Closet
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FRONT
BALCONY Ceramic Tiles
FRONT
BALCONY Ceramic Tiles