

Unit 33: Advanced Electrical Design & Installation

Unit code L/615/1419

Unit Level 5

Credit value 15

Introduction

Across the world, people rely on the ability to use electrical devices to facilitate work, education, and entertainment. The provision of sufficient electrical power relies on the design of systems which are suitable to the application, but are also safe and sustainable. The overall aim of this unit is to support students to develop an understanding of the principles that underpin the design and installation of electrical systems for complex buildings.

Topics covered in this unit include: electrical distribution systems, cabling, lighting systems, electromagnetic compatibility, applying protective measures, equipment installation, building services automation, building system engineering, statutory regulations, health & safety.

On successful completion of this unit students will be in a position to be able to assist senior colleagues with electrical systems design and installation. In addition, students will have the advanced knowledge and skills to progress on to a higher level of study.

Learning Outcomes

By the end of this unit students will be able to:

1. Evaluate the principles that underpin the design and installation of power and distribution systems, electromagnetic compatibility equipment and electrical equipment.
2. Discuss the range of protective measures necessary for the safe installation and operation of electrical systems.
3. Design an electrical distribution plan for a complex non-domestic building.
4. Present a report on the national/regional/local standards for technical, and health & safety regulations that apply to specific building types.

Essential Content

LO1 **Evaluate the principles that underpin the design and installation of power and distribution systems, electromagnetic compatibility equipment and electrical equipment**

Electrical distribution.

Lighting systems.

Power cables and their application.

System protection.

Low-voltage switchboards and distribution systems.

Grounding systems.

Power-factor correction and harmonic filtering.

Protection equipment for load circuits.

Mechanical, electromechanical, and electronic modular devices, timers.

Operator communication, switching, control, and signalling systems, information and monitoring systems.

Building control systems.

Terminology.

Electromagnetic compatibility (EMC) equipment design.

Compliance with EMC installation rules.

LO2 **Discuss the range of protective measures necessary for the safe installation and operation of electrical systems**

Protection against direct and indirect contact.

Protection against electric shock under normal conditions.

Protection against electric shock under fault conditions.

Protection against overvoltage of atmospheric origin or switching overvoltage in low-voltage systems.

LO3 **Design an electrical distribution plan for a complex non-domestic building**

Functional buildings.

Office buildings.

Hotels.

Hospitals and medical practices.

Industrial buildings and exhibition halls.

Garages.

General information on special areas, locations, and installations.

L04 Present a report on the national/regional/local standards for technical, and health & safety regulations that apply to specific building types

Building regulations.

Health and safety regulations.

Wiring regulations.

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Evaluate the principles that underpin the design and installation of power and distribution systems, electromagnetic compatibility equipment and electrical equipment		LO1 LO2 D1 Assess the appropriate protective measures related to the design of systems for power supply, distribution, electromagnetic compatibility and equipment.
P1 Explore the principles of design and installation for power supply and distribution, electromagnetic compatibility and electrical equipment.	M1 Compare the installation strategies of different electrical systems in relation to health & safety requirements.	
LO2 Discuss the range of protective measures necessary for the safe installation and operation of electrical systems		
P2 Discuss the range of protective measures in normal and fault conditions.	M2 Illustrate the protective measures necessary for normal and fault conditions in specific systems.	
LO3 Design an electrical distribution plan for a complex non-domestic building		LO3 LO4 D2 Justify the design of an electrical power distribution system and the specification of equipment in relation to statutory regulations and health & safety.
P3 Design an electrical distribution plan for a complex non-domestic building. P4 Calculate electrical loads and suitable cabling sizes for an electrical distribution plan.	M3 Specify correctly sized distribution equipment for an electrical distribution plan.	
LO4 Present a report on the national/regional/local standards for technical, and health & safety regulations that apply to specific building types.		
P5 Present a report on the range of relevant national/international standards associated with electrical systems and installation. P6 Discuss the national/regional/local regulations related to electrical power and distribution.	M4 Evaluate the relationship between local, regional and national standards related to electrical system design and installation.	

Recommended resources

GREENO, R. (1996) *Building Services and Design*. Longman.

HASSAN, G. (1996) *Building Services*. Macmillan.

SEIP, G.G (2000) *Electrical Installations Handbook*. 3rd Ed. Wiley-Blackwell.

Links

This unit links to the following related units:

Unit 8: Mathematics for Construction

Unit 9: Principles of Heating Services Design & Installation

Unit 10: Principles of Ventilation and Air Conditioning Design & Installation

Unit 19: Principles of Electrical Design & Installation

Unit 31: Advanced Heating, Ventilation and Air Conditioning Design & Installation

Unit 40: Alternative Energy Systems Design & Installation