Liverpool John Moores University

Title:	ELECTRICAL INSTALLATIONS FOR BUILDINGS
Status:	Definitive
Code:	**5608BEFDL** (123962)
Version Start Date:	01-08-2016
Owning School/Faculty:	Built Environment
Teaching School/Faculty:	City of Liverpool College

Team	Leader
Alfred Leung	Y

Academic Level:	FHEQ5	**Credit Value:**	20	**Total Delivered Hours:**	72
Total Learning Hours:	200	**Private Study:**	128		

Delivery Options
Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	60
Tutorial	9

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	Formal examination	40	3
Artefacts	AS2	Design Project	60	

Aims

The aim of this module is to develop students understanding of the power requirements of industrial & commercial building and the methods by which the power can be supplied and distributed within the building. It will enable them to interpret the requirements of a building, develop practical schemes and evaluate the effectiveness of alternative schemes. The module also aims to further develop the principles and practices of low voltage electrical distribution in buildings to include some of the more specialised aspects found in complex buildings.

Learning Outcomes

After completing the module the student should be able to:

1 Investigate and categorise the power needs of large buildings & complexes and the effects of abnormal loads to design appropriate power supply and distribution networks.
2 Investigate and analyse the use and operation of transformers and motors in building services applications.
3 Calculate fault currents in power supply networks and thereby analyse the rating of HV switchgear, cables and protection equipment.
4 Evaluate alternative electrical installation proposals and strategies to establish feasible design solutions.
5 Analyse modes of vertical and horizontal transportation for buildings and develop appropriate electrical installation provision.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

FORMAL EXAMINATION	2	3	
DESIGN PROJECT	1	4	5

Outline Syllabus

Power assessment: power demand and load factors, assessment of demand forlarge industrial & commercial buildings.

Supply Options: tariff arrangements and alternative supply options, comparison of alternative tariffs, choice of supply voltage, requirements of suppliers network.

Transformers: electromagnetic induction, transformer principles, phasor diagrams, equivalent circuits, referred values, transformer tests, efficiency and regulation, parallel operation and group references, protection transformers.

Fault currents: types of faults, percentage and p.u. values, fault levels, short circuit currents, network configurations, network analysis for fault levels.

Large Power equipment: space and installation requirements of large power transformers, electrical machines, large power consuming plant & switchgear at 11kV & above, large power cables, protection systems, fire and explosion risk, health & safety, authorised operators. Noise & Vibration from electrical equipment, effect on buildings.

Design of Power Installations: design of large power supply and distribution at up to 11kV for complex buildings, layout, specification and control of the main power distribution within buildings. Power distribution: networks, radial, rings,

interconnected mesh, HV Switchgear types. (RMU, Oil, Vacuum, and SF6), protection systems, relay settings and grading, HV fuses, HV Switchgear ratings, protection systems and relays, power system earthing.

Abnormal loads: load assessment, maximum demand, load management, large motor loads, welding, voltage interference, harmonics.

Design criteria: design, designing for health and safety, risk assessment, Electricity Safety, Quality & Continuity Regulations. and other current standards and regulations. Alternative approaches. Design for resilience and reliability assessment.

Feasible solutions: Establishment of alternative options, techniques for critical analysis of alternative solutions to identify most feasible.

Lift Operation & requirements: Passenger, goods and service lifts, firefighting, evacuation and lifts for the disabled.

Lift control: attendant, single automatic push button control, collective, duplex, dispatch. Speed control safety devices, services in lift wells.

Roping and winding systems: above well, below well, compensating. Geared and gearless winding.

Hydraulic lifts: control, oil cooling

Design of lift & Escalators: location of lifts, grouping. Assessment of demand: waiting time, handling capacity, arrival rate, estimation of population, daily occupancy, building type and height

Passenger demand: handling capacity, traffic profiles, up-peak, round trip time, calculation of handling capacity

Escalators and walkways: safety devices, discharge capacity, fire control, guards at intersections, angle of inclination

DC and AC motors: dc series/shunt motors, speed/torque characteristics, induction/synchronous motor characteristics, starting methods, inverters, soft-start, DOL, star-delta etc, speed control, motor selection and ratings. Operating principles of inverters, use of inverters to control speed of motors.

Principles of rectification: diode, half-wave, full-wave, rectifier circuits single and three phase, smoothing circuits, thyristor and applications, phase control and integral cycle control.

Learning Activities

Lectures, tutorials, case studies, workshops, site visits.

Notes

This module is a key component for those students wishing to complete the programme following an 'electrical' building services pathway. It aims to develop an understanding of the technology associated with the provision of electrical power supply to and within large commercial/industrial buildings and complexes. The focus of the module is to increase the range and depth of understanding of electrical installations and power supplies for students from an electrical installations.