

Liverpool John Moores University

Title: POWER SUPPLIES TO BUILDINGS
Status: Definitive
Code: **5009BEFD** (108471)
Version Start Date: 01-08-2011

Owning School/Faculty: Built Environment
Teaching School/Faculty: Liverpool Community College

Team	Leader
Derek King	Y

Academic Level: FHEQ5
Credit Value: 12.00
Total Delivered Hours: 64.00
Total Learning Hours: 120
Private Study: 56

Delivery Options

Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	42.000
Tutorial	12.000
Workshop	7.000

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	Controlled assignment under exam conditions	50.0	3.00
Report	AS2	Project based assignment	50.0	

Aims

To develop students understanding of the power requirements of industrial & commercial building and the methods by which the power can be supplied and distributed.

To provide an opportunity for the students to experience the process of carrying out a power supply design project.

To enable them to interpret the requirements of a building, develop practical

schemes and evaluate the effectiveness of alternative schemes.

Learning Outcomes

After completing the module the student should be able to:

- 1 Investigate and categorise the power needs of large buildings and complexes.
- 2 Investigate the use of transformers in power transmission, distribution, measurements and protection.
- 3 Calculate fault currents in power supply networks and thereby analyse the rating of HV switchgear and protection equipment.
- 4 Design power supply and distribution networks to buildings and complexes with large power loads.
- 5 Evaluate the effects of abnormal loads on power supply systems.

Learning Outcomes of Assessments

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

EXAM	2	3	4	5	
REPORT	1	2	3	4	5

Outline Syllabus

Power assessment: power demand and load factors, assessment of demand for large 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 up to 11kV, large power cables, protection systems, fire and explosion risk, health & safety, authorised operators.

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, supply design constraints, effect of abnormal loads on HV tariffs and energy contracts.

Learning Activities

Lectures, tutorials, case studies, site visits.

References

Course Material	Book
Author	Bayliss, C.
Publishing Year	1999
Title	Transmission and Distribution in Electrical Engineering
Subtitle	
Edition	
Publisher	Butterworth-Heinemann
ISBN	0750640596

Course Material	Book
Author	Hiley, J. Hughes, E. et al
Publishing Year	2004
Title	Hughes Electrical and Electronic Technology
Subtitle	
Edition	9th Edition
Publisher	Prentice Hall
ISBN	0131143972

Course Material	Book
Author	CIBSE
Publishing Year	2005
Title	Guide K: Electricity in Buildings
Subtitle	
Edition	
Publisher	CIBSE
ISBN	190328726X

Course Material	Book
Author	Franklin, A.C. & Franklin, D.P.
Publishing Year	1998
Title	The J & P Transformer Book
Subtitle	
Edition	12th Edition
Publisher	Newnes
ISBN	0750611588

Course Material	Book
Author	Warne, D.F.
Publishing Year	2005

Title	Newnes Electrical Power Engineers Handbook
Subtitle	
Edition	2nd Edition
Publisher	Butterworth-Heinemann
ISBN	0750662689

Course Material	Book
Author	Electricity Rating Association
Publishing Year	1995
Title	Power Systems Protection
Subtitle	
Edition	
Publisher	Institution of Engineering and Technology
ISBN	0852968477

Notes

This module is a key component for those students wishing to complete the programme following a 'electrical' building services pathway. It develops 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 power supplies for students from an electrical installations background by analysing some of the core concepts and exploring how these effect the design of power supplies to these types of buildings.