Liverpool John Moores University

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Title:	ELECTRICAL, ELECTRONIC AND CONTROL PRINCIPLES
Status:	Definitive
Code:	**5010BEFD** (108472)
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	35.000
Practical	14.000
Tutorial	12.000

Grading Basis: 40 %

Assessment Details

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

Aims

To develop the student's knowledge and understanding of a range of electrical principles to enable circuit calculations and analysis of complex networks.
To provide the underpinning electrical principles to support many of the techniques and technologies implicit in electrical installations design and contained within the other modules of the programme.

To develop the student's understanding of the range of electronic engineering principles involved in the controls associated with building services plant and systems.

Learning Outcomes

After completing the module the student should be able to:

1	Evaluate and analyse ac networks in a series of combinations and relate the analysis to the application of complex quantities.
2	Investigate the application of circuit theorems and complex quantities techniques to all practical dc and ac networks met in electrical building services engineering.
3	Analyse the response of circuits to transients.
4	Investigate the theory and application of electronic measuring instruments and relate their use to analogue instruments.
5	Investigate control principles and their operation and relate these to system which operate electronically.
6	Investigate the effect of varying the frequency in ac circuits as related to the control of power in circuits and communication systems.
7	Investigate the principles of analogue and digital information transmission systems as related to control loops and functions.

Learning Outcomes of Assessments

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

EXAM	1	3	5	7			
ASSIGNMENT	1	2	3	4	5	6	7

Outline Syllabus

Transformation theorems: single phase RLC circuits, series and parallel. Three phase
Star/Delta networks, balanced and unbalanced loads. Star/Delta Transformation Theorems
Power factor: power measurement and power factor control.
Complex quantities: j operator, quadrature and polar forms. Admittance, conductance and susceptance, complex power analysis.
DC Circuit theorems: Thevenin's theorem, Norton's theorem, Superposition theorem. Maximum power transfer theorem.
AC Circuit theorems and applications: Thevenin's theorem, Norton's theorem, application to transmission lines, T and P networks, power system configurations and reductions, complex quantities analysis. RLC networks, frequency variations, series and parallel networks, Q factor, filter circuits, bandwidth, coupled circuits, power networks, communication circuits
Transient analysis: capacitance and inductance. R/C and R/L circuits growth and decay of voltage and current. Exponential functions. Sinusoidal and step inputs. Differentiator and integrator networks.

Electronic measuring instruments: analogue moving coil and moving iron instruments. Digital and electronic meters
Electronic systems: introduction to systems, electronic systems, basic amplifiers, basic attenuators, block diagrams.
Transmission systems: dc and ac transmission signals, frequency and wavelength, relationships, analogue/digital signals, modulation, series/parallel data transmission, protocols, data networks.
Control principles: open loop/closed loop systems, non-engineering closed loop system, regulation of system, transfer functions, simple speed control system, system response (transient), damping, control law, PID, selection, operational amplifiers, digital process control, computer control.

Learning Activities

Lectures, tutorials, labwork.

References

Course Material	Book
Author	Bird, J.
Publishing Year	2004
Title	Electrical Circuit Theory and Technology
Subtitle	
Edition	
Publisher	Newnes
ISBN	0750657847

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

Course Material	Book
Author	Bolton, W.
Publishing Year	2004
Title	Instrumentation and Control Systems
Subtitle	
Edition	
Publisher	Newnes
ISBN	0750664320

Course Material	Book
Author	Simetrix
Publishing Year	0
Title	Spice circuit simulator - free version
Subtitle	
Edition	
Publisher	www.catena.uk.com
ISBN	

Notes

This module provides the essential underpinning knowledge of the principles that lie at the core of much of the technology that is used within the electrical building services systems. This underpinning knowledge is valid in its own right for students following this discipline but also supports and makes sense of the modules of electrical installations, power supplies and BMS etc.