

Title:	Electrical Utility and Power APPROVED
Long Title:	Electrical Utility and Power Systems
Module Code:	ELEC7006
Credits:	5
NFQ Level:	Intermediate
Field of Study:	Electrical Engineering
Valid From:	Semester 1 - 2014/15 (September 2014)
Module Delivered in	2 programme(s)
Module Coordinator:	JOSEPH CONNELL
Module Author:	
Module Description:	This module will examine low, medium and high voltage systems in a power systems context.
Learning Outcomes	
<i>On successful completion of this module the learner will be able to:</i>	
LO1	Select suitable equipment relating to the planning of electrical installations in the context of high voltage (HV), medium voltage(MV)and low voltage (LV) systems.
LO2	Describe the factors relating to low voltage (LV), medium voltage(MV)and high voltage (HV) substation siting, planning and plant layout.
LO3	Describe the construction, principle and use of electric machines, and carry out steady-state performance calculations.
LO4	Explain the function, operation and safety requirements for high voltage (HV), medium voltage(MV)and low voltage (LV) systems
Pre-requisite learning	
Module Recommendations	
<i>This is prior learning (or a practical skill) that is strongly recommended before enrolment in this module. You may enrol in this module if you have not acquired the recommended learning but you will have considerable difficulty in passing (i.e. achieving the learning outcomes of) the module. While the prior learning is expressed as named CIT module(s) it also allows for learning (in another module or modules) which is equivalent to the learning specified in the named module(s).</i>	
No recommendations listed	
Incompatible Modules	
<i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module. You may not earn additional credit for the same learning and therefore you may not enrol in this module if you have successfully completed any modules in the incompatible list.</i>	
No incompatible modules listed	
Co-requisite Modules	
No Co-requisite modules listed	
Requirements	
<i>This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed. You may not enrol on this module if you have not acquired the learning specified in this section.</i>	
No requirements listed	
Co-requisites	
No Co Requisites listed	

Module Content & Assessment

Indicative Content

Transformers and Associated Equipment

Transformer construction: types, dimensions and configuration. Equivalent circuit. Impedance voltage, voltage variation and short-circuit level. Parallel operation. Protective devices for transformers. Noise levels and methods of noise abatement. Reactive power compensation. Instrument transformers

Low Voltage Installations.

Low voltage switchgear to international standards. Low voltage fuses. Protective switchgear for wiring systems. Selectivity. Air Circuit Breakers (ACBs). Moulded Case Circuit Breakers (MCCBs). Miniature Circuit Breakers (MCBs). Residual Current Devices (RCDs). Metering

Medium Voltage Installations

Switchgear apparatus, circuits ring and radial (dual). BIL. Disconnectors. Switch disconnectors. Earthing switches. HRC fuse links. Circuit breakers (Vacuum, SF6 and Oil). Vacuum contactors. Switchgear installations. Personnel safety in medium voltage switchgear installations. Cable selection at medium voltage.

High voltage apparatus

Disconnectors, earthing switches, circuit breakers. Interrupting principles and severe switching conditions. Switchgear operating mediums and conducting materials.

Rotating Electrical Machines

AC and DC rotating electrical machines. Construction, cooling losses, overload capacity, power output and equivalent circuit. Torque speed curves (motor and load). Asynchronous induction generators and their application to wind energy systems. Starting and stopping methods, protection, cascading, regenerative braking. Speed control. Dynamic balancing and vibration analysis. Reactive power compensation. Control and supervision. Testing and commissioning.

Regulations and Safety

Regulations, protection, electromagnetic compatibility, practical measures for safety for personnel and installations, touch protection in installations up to 1kV. ETCI Regulations, Building Regulations, Fire Regulations. Protection against direct contact. Protection against contact in installation above 1kV. Earthing: materials, dimensioning. Ground resistance and measurement. Neutral point resistors. Lightning protection and surge arresters. Electromagnetic compatibility (EMC): Origin and propagation of interference quantities, effects of interference, means of achieving EMC. Climate and corrosion protection. Hazardous and offshore.

Assessment Breakdown	%
Course Work	30.00%
End of Module Formal Examination	70.00%

Course Work

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Practical/Skills Evaluation	A week-by-week assessment of practical competency through laboratory-based assignments with reports.	1,2,3,4	20.0	Every Week
Short Answer Questions	Assessment of lecture material covered during weeks 1 to 6	1,2,4	10.0	Week 7

End of Module Formal Examination

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Formal Exam	End-of-Semester Final Examination	1,2,3,4	70.0	End-of-Semester

Reassessment Requirement

Repeat examination

Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.

The institute reserves the right to alter the nature and timings of assessment

Module Workload

Workload: Full Time				
<i>Workload Type</i>	<i>Workload Description</i>	<i>Hours</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	Electrical theory	2.0	Every Week	2.00
Lab	Practical projects and demonstrations	2.0	Every Week	2.00
Independent & Directed Learning (Non-contact)	Further study of class notes and recommended resources.	3.0	Every Week	3.00
Total Hours				7.00
Total Weekly Learner Workload				7.00
Total Weekly Contact Hours				4.00

This module has no Part Time workload.

Module Resources
<i>Recommended Book Resources</i>
<ul style="list-style-type: none"> • Edward Hughes, John Hiley, Keith Brown, Ian McKenzie Smith, 2008, <i>Hughes Electrical & Electronic Technology</i>, 9ed Ed., Pearson Education UK [ISBN: 978-0-13-206011-0] • Theodore Wildi 2006, <i>Electrical machines, drives, and power systems</i>, Sixth Ed., Pearson Prentice Hall Upper Saddle River, N.J. [ISBN: 978-0131776913]
<i>Supplementary Book Resources</i>
<ul style="list-style-type: none"> • Geoffrey Stokes 2008, <i>Handbook of ELectrical Installation Practise</i>, Fourth Ed., Blackwell Science UK [ISBN: 1405147679]
<i>This module does not have any article/paper resources</i>
<i>This module does not have any other resources</i>

Module Delivered in			
Programme Code	Programme	Semester	Delivery
CR_EEPSY_8	<u>Bachelor of Engineering (Honours) in Electrical Engineering</u>	5	Mandatory
CR_EELEC_7	<u>Bachelor of Engineering in Electrical Engineering</u>	5	Mandatory