Requested changes to Electrotechnology UEE06 – as at 3 Oct 06

CSU, EKAS clause or LS	Change	Comment
UEENEEE024A Compile and produce an electrotechnology report	**Existing unit** **Delete the following EKAS**	
	2.2.25 Research concepts	
	2.2.33 Working in a team	
	2.2.35 Data collection techniques	
	2.2.36 Data analysis and presentation	
	2.18.8.2 Occupational Health and Safety, enterprise responsibilities	
UEENEEK042A Participate in environmentally sustainable work practices	**New unit written** **New EKAS clause:** **2.20.22 Environmentally sustainable work practice** Evidence shall show an understanding of sustainable work practice enterprise responsibilities to an extent indicated by the following aspects: a) Notion of sustainable work practice b) Effects of neglecting sustainable work practice c) The greenhouse effect - causes, consequences. d) International and national greenhouse imperatives. e) The role of regulators and similar bodies f) Economic benefits of sustainable initiatives. g) Techniques for reducing carbon produced energy and hence	For extensive use throughout NTP

	greenhouse gases • domestic, commercial and industrial strategies • trade related technologies and methods • energy efficient retrofits (overview). • renewable energy technologies (overview).	
UEENEEK034A Install stand-alone photovoltaic power systems.	New unit for CIII Renewable Energy	BCSE
UEENEEK015A Verify compliance and functionality of renewable energy installations	New unit for CIII Renewable Energy New EKAS 2.20.22 See below	BCSE
New EKAS Clause 2.20.22	2.20.22 Electrical installations, ELV RE installation requirements Evidence shall show an understanding of requirements for RE SPS ELV installations to an extent indicated by the following aspects: a) Requirements for installation of wiring and equipment b) Compliant methods for providing protection c) Requirements for installation design and selection of equipment d) Testing and verification requirements	BCSE
UEENEEK045A Implement and monitor policies and procedure for environmentally sustainable work practice	**New unit written** **New EKAS clause:** **2.20.23 Environmentally sustainable work practice - supervision** a) Provisions of relevant environmental legislation b) Principles and practice of effective sustainable work practice management c) Workplace sustainable work practice non compliance, range and selection of control measures d) Organisational systems and policies and procedures needed for legislative	

	compliance e) Impact of characteristics and composition of the workforce on sustainable work practice management f) Relevance of sustainable work practice management to other organisational management policies, procedures and systems. g) Analysis of entire work environment and judge sustainable work practice interventions h) Analysis of relevant workplace data i) Ability to assess resources needed for risk control.	
EKAS 2.20.3	Correction to dot points in (g) Wind energy resources. Dot points 7 and 8 should be combined.	8 units
EKAS 2.20.16.1 EKAS 2.20.16.2	Rearranged for newly created units into 3 parts rather than 2 See attachment A	BCSE
UEENEEK025A Solve basic problems in photovoltaic energy apparatus	Delete EKAS 2.20.14 Photovoltaic power systems	Level too high (in CII)
EKAS 2.8.1.2 Fundamental electrical principles EKAS 2.8.2.1 Direct current principles	Remove first item in 2.8.2.1 (factors affecting resistance) and insert in 2.8.1.2 at end See attachment B	Better balance between AE1 and AE2 Hours unchanged
UEE4 09 06 CIV in Industrial Electronics and Control	Add the following units to both cores UEENEEH043A UEENEEH044A	
UEENEEP001A Disconnect and reconnect fixed wired electrical	Delete EKAS clauses shown	

equipment connected to a Low Voltage supply	~~2.1.5.1 Power cable and conductor terminations~~ ~~2.2.2 Enterprise reporting and recording system~~ ~~2.5.1.2 Drawings and diagrams~~ 2.8.1.1 Basic electrical principles ~~2.8.8 Electrotechnology science and materials~~ 2.18.1 Occupational Health and Safety principles 2.18.2 Electrical Safe working practices 2.19.29 Disconnect/Reconnect 2.8.8 a) Trade calculations encompassing: • mathematical techniques • relevant calculations • linear measurement, areas, volumes, ratios b) Engineering mechanics encompassing: • base physical quantities • concepts, principles, S.I. units, their applications in • engineering calculations in relation to physical quantities and • associated formulae • mass, velocity, acceleration, force, weight, density, angles • energy/work/power • moments/torque • centre of gravity • mechanical advantage • levers • pulley blocks • efficiency • friction • vectors • resolution of forces • forces in strung conductors • forces on poles and towers • determination of sag	

	• pressure/stress • elementary fluid mechanics c) Engineering materials encompassing: • classification • ferrous and non-ferrous metals • steels, alloys, • properties • tensile strength • temperature and expansion in metals • stress and strain • ductility • applications • corrosion • galvanic corrosion • hardwoods and soft woods	
UEENEEK024A Assemble and set up photovoltaic apparatus in domestic dwellings	Change wording in performance criterion 2.3 2.3 Photovoltaic apparatus ~~are~~ is installed to comply standards and job specifications with sufficient space to ~~affect~~ effect terminations **Remove prerequisite:** UEENEEK025A Solve basic problems in photovoltaic energy apparatus	
UEENEEK031A Design wind energy conversion systems to 10kW	Add rearranged EKAS clauses 2.20.16.1 Types, construction and operating features of small WECS 2.20.16.3 WECS siting and performance assessment	Restructured for BCSE

Attachment A

2.20.16.1 ~~Fundamentals of wind energy conversion~~ Types, construction and operating features of small WECS

Evidence shall show an understanding of wind energy conversion systems (WECs) fundamentals to the extent indicated by the following aspects:

a) Basic operation of lift and drag type WECS

b) Characteristics of WECS in terms of power and torque, efficiency (power and output co-efficients), solidity and tip speed ratio.

c) Major categories and sub-categories of WECS.

d) Advantages and disadvantages of each type of WECS.

e) Suitable materials for the construction of WECS taking into consideration fatigue stresses and environmental conditions such as salt air, humidity and ice.

f) Typical system configurations and components for: stand-alone power systems and water pumping.

g) Strategies and/or mechanisms to control: mechanical stresses on the WECS in gale force winds and power output for battery charging.

h) Appropriate types of WECS for a particular application.

2.20.16.2 ~~Wind energy conversion systems~~ Installation and maintenance of small WECS

Evidence shall show an understanding of wind energy conversion systems (WECs) to the extent indicated by the following aspects:

a) Installation and maintenance of a WECS

select an appropriate tower for the installation of a WECS taking into consideration: soil type and footings, local council approvals, appropriate codes

such as AS1170.2,transport of tower.

appropriate methods, using appropriate safety procedures, for: raising tower and WECS, lightning protection, tower maintenance, safety in the erection and maintenance of the tower and WECS, site management to minimise environmental impacts.

appropriate electrical transmission voltage and cable size from the WECS to the load or energy storage.

appropriate installation, commissioning, fault diagnosis and rectification, and maintenance methods using appropriate safety procedures. This will include: WECS power output, voltage regulation, transmission cable voltage drop, manual and automatic furling, shut-down.

schematic and wiring diagrams for the WECS showing the general circuit layout and protection between the WECS, energy storage, inverter and loads according to AS/NZS 3000, AS4509 and lightning protection requirements.

suitable layout for the location of energy storage to meet AS/NZS 3000, AS 3011.1 and AS4509.

safety procedures for the installation, commissioning, fault diagnosis and maintenance of system components.

maintenance schedule for the system.

2.20.16.3 WECS siting and performance assessment

Evidence shall show an understanding of wind energy conversion systems (WECS) fundamentals to the extent indicated by the following aspects:

a) Wind characteristics

definition of the terms: weather charts, isobars, fronts and troughs, cyclone and

anti-cyclone, atmospheric boundary layer, geotropic wind, gradient wind, wind shear, wind rose

major global wind circulations and the formation of major wind flows over your continent.

major features of the atmospheric boundary layer including: variation of wind speed with height according to logarithmic and power Laws, effects of surface roughness

atmospheric stability and temperature inversions turbulence.

major local winds including: trade winds, sea and land breezes, katabatic and anabatic winds.

likely effects on the major local winds from local topography, surface roughness, isolated barriers and temperature inversions.

typical diurnal, monthly and seasonal patterns of winds over the local area.

the formation and likely effects of extreme winds and wind shear.

b) Wind speed data measurement and analysis

definition of the terms: porosity, internal boundary layer, speed-up factor, temperature inversion factor, wind speed frequency distribution, lull period, calms.

interpretation of local and regional wind speed and direction data such as local records (Eg. Meteorological Bureau data), ecological indicators and wind speed/energy maps.

wind speed and direction using data logging anemometers.

manufacturer's calibration curves for anemometers to correct recorded data.

calculation at a site, monthly and yearly average wind speed , and wind power density from existing, nearby data or on-site measurements, using appropriate software

estimation of the wind speed at a WECS tower of suitable height and location given: wind speed data recorded at two or more elevations at the site, and wind speed data recorded at one elevation and appropriate surface roughness, temperature inversion and speed-up factors at the site.

c) Site selection

the likely effects of local topography, surface roughness, isolated barriers and temperature inversions on a WECS at a given site.

assessment of available local or regional wind speed, wind energy and direction data.

selection of the most appropriate site-monitoring location taking into consideration factors such as: topography, accessibility, surface roughness, shielding from isolated barriers (obstacles), turbulence, temperature inversions, power transmission distance , environmental and heritage impacts eg. noise, visual, bird life, national parks or aboriginal sites.

measurement of wind speed and direction data at an appropriate site and height(s) using a data logging anemometer over a sufficient period of time.

analysis of the recorded wind speed and direction data to determine if the site is suitable for wind energy utilisation.

d) Selection of WECS

selection of suitable WECS specifications to suit site load and wind speed data according to AS4509 including: cut-in, rated and furling wind speeds, blade diameter, rated power at an appropriate rated wind speed, materials of construction.

select a suitable commercially available WECS that most closely fits the specifications above.

suitable tower requirements at the site including site access, soil type and foundations, structural certification and planning approvals.

calculation of the monthly and annual energy output of the selected WECS at the site from wind speed data and load data using appropriate computer software and in accordance with AS4509.

height of the tower and the size of the WECS for optimum use.

suitable system configurations.

balance of system components including: battery storage, inverter, regulator,

transmission cable, back-up battery charger and generator.

equipment reliability and manufacturer/suppliers back-up service including availability of spare parts and service personnel

installed capital and life cycle costs of various system configurations according to AS3595 and AS4536.

environmental, cultural and social factors that impact on the implementation of a WECS such as: external costs, WECS manufacturing processes and embodied energy and energy payback time, noise levels, visual amenity, RFI.

Attachment B

2.8.1.2 Fundamental electrical principles

Evidence shall show an understanding of electrical principles to an extent indicated by the following aspects:

a) Fundamental and derived units encompassing:

basic units of measurement.

SI derived units for force, pressure, energy/work temperature and power.

conversion of units to multiple and submultiple units.

transposition of a given equation for any variable in the equation.

value of electrical and related mechanical quantities given in any combination of units, multiple units or submultiple units.

b) Power, work and energy encompassing:

relationship between power, work and energy.

input, output, efficiency or losses of electrical systems and machines in terms of units / multiple units of power.

effect of losses in electrical wiring and machines.

c) Electrical characteristics of materials encompassing:

characteristics of solid conductors, electrolytes, insulators and semi-conductors.

mechanisms of electrical conduction in solids, liquids and gases.

The terms “electric charge”, “electric current” and “electromotive force.”

d) The simple circuit encompassing:

symbols used to represent an electrical energy source, a load, a switch and a circuit protection device in circuit diagram.

purpose of each component in the circuit.

effects of an open-circuit, a closed-circuit and a short-circuit.

e) Resistance encompassing:

relationship between voltage and current from measured values in a simple circuit.

Value of voltage, current and resistance in a circuit given any two of these quantities.

power dissipated in a circuit from voltage, current and resistance values.

relationship between voltage, current and resistance and the power dissipated in a circuit.

f) Effects of current encompassing:

physiological effects of current.

the fundamental principles (listed in AS/NZS 3000) for protection against the physiological effects of current.

basic principles by which electric current can result in the production of heat; the production of light; the production of magnetic fields; a chemical reaction.

typical uses of the effects of current.

mechanisms by which metals corrode.

The fundamental principles (listed in AS/NZS 3000) for protection against the damaging effects of current.

g) Sources of electrical energy – conversion of other forms to electrical energy encompassing:

basic principles which electricity is produced from a chemical reaction (primary cells, secondary cells and fuel cells); produced from a magnetic field coupled with motion; produced from light; produced from heat; produced from force.

single emf source equivalent circuit.

h) Using measuring instruments encompassing:

safe working procedures when working with instruments.

handling and storage of instruments to ensure they are protected from damaged.

selection of an instrument to measure voltage, current or resistance.

connection of instruments into a circuit to measure voltage, current and resistance

reading analogue scales and digital readouts in measuring voltage, current and resistance.

i) Factors affecting resistance encompassing:

how the factors of length, cross-sectional area and material affect the resistance of conductors.

effects of temperature change on the resistance of various conducting materials.

the resistance of a conductor from factors such as conductor length, cross-sectional area, resistivity and changes in temperature.

effects of resistance on the current-carrying capacity and voltage drop in cables.

2.8.2.1 Direct current circuit principles

Evidence shall show an understanding of electrical principles to an extent indicated by the following aspects:

~~a) Factors affecting resistance encompassing:~~

~~The factors of length, cross-sectional area and material effect the resistance of conductors.~~

~~effects of temperature change on the resistance of various conducting materials.~~

~~the resistance of a conductor from factors such as conductor length, cross-sectional area, resistivity and changes in temperature.~~

~~effects of resistance on the current-carrying capacity and voltage drop in cables.~~

a) Resistors encompassing:

features of fixed and variable resistor types and typical applications.

characteristics of temperature, voltage and light dependent resistors and typical applications of each.

specifying a resistor for a particular application.

resistance of a colour coded resistor from colour code table and confirm the value by measurement.

b) Series circuits encompassing:

setting up and connecting a single-source series dc circuit.

Measurement of resistance, voltage and current values in a single source series circuit.

the voltage, current, resistances or power dissipated from measured or given values of any two of these quantities.

relationship between the voltage drops around a circuit and the applied voltage.

relationship between voltage drops and resistance in a simple voltage divider network.

output voltage and current levels of connecting cells in series.

c) Parallel circuits encompassing:

setting up and connecting a single-source parallel circuit.

Measurement of resistance, voltage and current values in a single-source parallel circuit.

the voltage, current, resistance or power dissipated from measured or given values of any of these quantities.

relationship between currents entering a junction and currents leaving a junction.

relationship between branch currents and resistances in a two branch current divider network.

voltage and current levels of connecting cells in parallel.

d) Series/parallel circuits encompassing:

setting up and connecting a single-source series / parallel circuit.

Measurement of resistance, voltage and current values in a single-source series / parallel circuit.

the voltage, current, resistances or power dissipated from measured or given values of any two of these quantities.

relationship between voltages, currents and resistances in a bridge network.

voltage and current levels of connecting cells in series parallel.

e) Measurement of electrical quantities encompassing:

hazards involved in using electrical instruments and the safety control measures that should be taken.

operating characteristics of analogue and digital meters.

selecting an appropriate meter in terms of units to be measured, range, loading effect and accuracy for a given application.

measuring resistance using direct, volt-ammeter and bridge methods.

instruments used in the field to measure voltage, current, resistance and insulation resistance and the typical circumstances in which they are used.

f) Capacitance encompassing:

definition of capacitance and explain how a capacitor is charged.

the units by which capacitance is measured.

relationship between capacitance, voltage and charge.

Behaviour of a series d.c. circuit containing resistance and capacitance components.

g) Capacitors encompassing:

hazards involved in working with capacitance effects and the safety control measures that should be taken.

factors which determine the capacitance of a capacitor and explain how these factors are present in all circuits to some extent.

effects of capacitors connected in parallel by calculating their equivalent capacitance.

effects on the total capacitance of capacitors connected in series.
common faults in capacitors.
testing of capacitors to determine serviceability.