Wired for Imagination : SUBJECT GUIDE:
Solve Problems in Low Voltage A.C. Circuit

National ID		Unit of Competency (UoC) Name	
UEENEEG102A		Solve Problems in Low Voltage A.C. Circuits	

For additional information – see Training.gov.au link

Year and Semester:	2019
Prerequisites:	• **UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace** • **UEENEEE104A Solve problems in D.C circuits** • **UEENEEG101A Solve problems in electromagnetic devices and related circuits**
Delivery Approach	13 Lessons consisting of; Video theory from *"Electrical Principles"*, Video worked theory exercises and Video demonstration of practicals. Also practice video assessments with worked explanations.
Teacher Name(s) and Contact Details:	Ken Meyer ☎0419226478 kenneth.meyer55@gmail.com

.

Subject Summary:

This unit covers ascertaining correct operation of single and three phase a.c. circuits and solving circuit problems as they apply to servicing, fault finding, installation and compliance work functions. It encompasses safe working practices, multiphase circuit arrangements, issues related to protection, power factor and MEN systems and solutions to circuit problems derived from calculated and measured parameters.

Practice Assessments:.

No	Assessment Name – brief description of assessment	Dates
Skills Assessment Portfolio Part 1	**Task A – Single Phase a.c. Circuit – CRO measurements (1 Hour)** **Task B – Single Phase Series RLC a.c. Circuit (1 Hour)** **Task C – Single Phase Parallel RLC a.c. Circuit (1 Hour)** **Information for Students**: You may have two (2) attempts for this assessment within the allotted time. If your first attempt is not successful, your teacher will discuss your results with you and then make a second attempt. If your second attempt is not successful, you will be required to re-enrol in this unit again. Only one re-assessment attempt will be granted for each assessment item. **Time Allowed:** 3 Hours Total **Materials Provided:** Nil. **Assessment Range and Conditions:** Student may have a copy of AS3000, Textbook "Electrical trade principles", internet access, equation sheet. Student must supply their own calculator, pens pencils and drawing equipment.. **Assessment Criteria:** To achieve a Satisfactory result, your assessor will be looking for your ability to demonstrate the key skills/tasks/knowledge detailed in the Assessment Task to industry standard at all checkpoints. A result of 100% in every assessment point is a Satisfactory Result. This is a limited open book assessment	
Skills Assessment Portfolio Part 2	**Task D – Three Phase Unbalance Star Connected Load (1.5 Hours)** **Task E – Three Phase Delta Connected Load (1.5 Hours)** **Information for Students**: You may have two (2) attempts for this assessment within the allotted time. If your first attempt is not successful, your teacher will discuss your results with you and then make a second attempt. If your second attempt is not successful, you will be required to re-enrol in this unit again. Only one re-assessment attempt will be granted for each assessment item. **Time Allowed:** 3 Hours Total **Materials Provided:** Nil. **Assessment Range and Conditions:** Student may have a copy of AS3000, Textbook "Electrical trade principles", internet access, equation sheet. Student must supply their own calculator, pens pencils and drawing equipment.. **Assessment Criteria:** To achieve a Satisfactory result, your assessor will be looking for your ability to demonstrate the key skills/tasks/knowledge detailed in the Assessment Task to industry standard at all checkpoints. A result of 100% in every assessment point is a Satisfactory Result. This is a limited open book assessment	
KA1	**Knowledge Assessment Topics 1 to 7. (Practice Video parts 1-3)** **Information for Students**: You may have two (2) attempts for this assessment. If your first attempt is not successful, your teacher will discuss your results with you and will arrange a second attempt. **Time Allowed:** 3 Hours **Materials Provided:** Working out paper **Assessment Range and Conditions:** All work must be the students own work. Student may have a copy of and must provide their own, of AS3000, AS3008, Textbook "Electrical trade principles", internet access clean equation sheet. Student must supply their own calculator, pens pencils and drawing equipment. Student **may not use** or have access to: smart phone, unit practical workbook, personal notes. Student must provide their own device for all on-line assessments. **Assessment Criteria:** To achieve a Satisfactory result, your assessor will be looking for your ability to demonstrate the key skills/tasks/knowledge detailed in the Assessment Task to industry standard. A result of 100% in every topic is a Satisfactory Result. This is a limited open book assessment. *Books you may use and you must provide are: Textbook, AS3000, AS3008, and Clean Equation Sheet.* *You must also provide all pens, pencils, drawing equipment and a calculator.*	

KA2	**Knowledge Assessment Topics 8 to 15 (Practice Video parts 1-3)** **Information for Students**: You may have two (2) attempts for this assessment. If your first attempt is not successful, your teacher will discuss your results with you and will arrange a second attempt. **Time Allowed:** 3 Hours **Materials Provided:** Working out paper **Assessment Range and Conditions:** All work must be the students own work. Student may have a copy of and must provide their own, of AS3000, AS3008, Textbook "Electrical trade principles", internet access clean equation sheet. Student must supply their own calculator, pens pencils and drawing equipment. Student **may not use** or have access to: smart phone, unit practical workbook, personal notes. Student must provide their own device for all on-line assessments. **Assessment Criteria:** To achieve a Satisfactory result, your assessor will be looking for your ability to demonstrate the key skills/tasks/knowledge detailed in the Assessment Task to industry standard. A result of 100% in every topic is a Satisfactory Result. This is a limited open book assessment. *Books you may use and you must provide are: Textbook, AS3000, AS3008, and Clean Equation Sheet.* *You must also provide all pens, pencils, drawing equipment and a calculator.*	

What you will need:

To be successful in this subject you must have all the following resources:

- Drawing Set (Compass (large Span), protractor, 30mm ruler), four colours of pens or pencils. (Black, Red, Blue, Green)
- Scientific Calculator (Preference Casio FX82, FX100, or FX991)
- Graph paper (5mm). You will need a large amount of this. Suggest you purchase a full pad.
- Multimeter (CAT III or IV) optional.
- Bring your own device (BOD) is required for this unit. All knowledge assessment are web-based and much of the content in the form of Video and Audio podcasts. You must bring your own device to all lessons.
- For this subject requires the following texts to be purchased including or similar to the following learning resources: Please note that all Audio Podcasts and Videos are based in these texts.
  - Phillips, P, Electrical Principles, Cengage Learning, Second Edition.
  - AS3000:2018 (Wiring Rules) and AC3008 (Cable Selection)

Schedule:

Session (Date optional)	What's on this session
0	AC Lab Passport (Who to use AC measuring equipment and training aids). Connecting Series and Parallel AC circuits. Learning how to learn in Electrotechnology. Cognitive Toolbox. Student must purchase textbook, Workbook, graph paper, drawing instruments etc. Three ways to learn AC. Hard Way, Very Hard Way, Vary Hard Long Way. Revision of Ohms Law, Series, Parallel and combination circuits. 
1	Workbook chapter 1 . Textbook Chapter 15.1 -15.4 (page 332) should be reviewed prior to class, via Video, Reading or Podcast. AC Lesson #1 Alternating Current Complex Quantities (Parts 15.0 -15.4) • Trigonometry • Pythagoras • CRO Operation • Sinusoidal Wave Formations Self-directed learning: Topic 2
2	Workbook chapter 2. Textbook Chapter 15.5 -15.6 (page 346) . Lesson #2 Phasors Diagrams, Addition and Subtraction (Parts 15.0-15.5,15.6) • Phasor Diagrams • Phasor Relationship • Using Phasor Diagrams
3	Workbook chapter 3. Textbook Chapter 16.1 -16.7 (page 359) Lesson # 3 Single Element AC Circuits. Pure R,L and C (Parts 16.1-16.2) • Resistive AC Circuits • Inductive AC Circuits • Capacitive AC Circuits
4	Workbook chapter 4 Textbook Chapter 17.1 -17.4 (page 378) Lesson # 4 RC and RL and RLC Series AC Circuits (Parts 17.1-17.4) • Impedance • RC series AC Circuits • RL series AC Circuits • RLC series AC Circuits • Impedance and Voltage relationships • Series Resonance

5	Workbook chapter 5. Textbook Chapter 18.1 -18.6 (page 401) Lesson #5 Parallel AC Circuits. (Part 18.1 – 18.6) • RC Parallel AC Circuits • LC Parallel AC Circuits • RLC Parallel AC Circuits • Parallel Resonance
6	Workbook chapter 6 . Textbook Chapter 19.1 -19.3 (page 419). Lesson #6 Power in AC Circuits (Parts 19.1-19.3) • AC Power • Power Factor • AC Single Phase Power measurement
7	Workbook chapter 7. Textbook Chapter 19.4 -19.5 (page 419) Lesson #7 Power factor improvement and Harmonics and Resonance revision (Parts 19.4,19.5 & 20.8) • Power Factor • Power Factor improvement • Harmonics • Series Resonance • Parallel Resonance
8	Workbook chapter 8. Textbook Chapter 20.1 -20.2 (page 436). Lesson #8 Three Phase Systems Introduction (Parts 20.1 & 20.2) • Multiphase Systems • Three Phase Systems
9	Workbook chapter 9. Textbook Chapter 20.3 & 20.5 (page 440). Lesson #9 Topic 11 Three phase star-connections, Wye, 3&4 Wire. (Parts 20.3 & 20.5) • Star Connected Systems • Star Connected Systems Conditions • Function of Neutral Conductors • Neutral Conductors • Australian Standards Requirements

10	Workbook chapter 10 . Textbook Chapter 20.4 (page 444). Lesson #10 Three phase delta-connections, Mesh and Interconnected systems (Part 20.4) • Delta Connections • Delta Systems • Three Phase Interconnections
11	Workbook chapter 11 . Textbook Chapter 20.6-20.7 (page 444). Lesson #11 Energy and power requirements of a.c. systems circuits (Part 20.6 & 20.7) • Three Phase Power • Power Factor • Measuring Three Phase Power
12	Topic 12 : Teacher Handouts. Teacher PowerPoint. Should be reviewed prior to class, via Video, Reading or Podcast. Lesson #12 Earth Fault loop Impedance • Earth Loop Impedance • Australian Standards • Measuring Fault Loop Impedance

Knowledge Assessment Summary by Topics

Knowledge Assessment #1 T1 - 7	**Knowledge Assessment #2 T8 – T15**
T1 : Q1 – Q3 (AC Quantities)	T8 : Q30 - Q33 (Power Factor)
T2 : Q4 – Q5 (Phasor diagrams)	T9 : Q34 – Q39 (Resonance and Harmonics)
T3 : Q6 – Q12 (Single element RLC)	T10 : Q40 – Q43 (3 Phase Systems)
T4 : Q13 – Q18 (RL-RC Series)	T11 : Q44 – Q46 (Star connections 3 Wire)
T5 : Q19 – Q21 (RLC in series)	T12 : Q47 – Q51 (Star connections 4 Wire)
T6 : Q22 – Q25 (Parallel AC)	T13 : Q53 – Q57 (Delta connections)
T7 : Q26 – Q29 (AC Power)	T14 : Q58 – Q60 (3 Phase Power)
	T15 : Q61 – Q63 (Earth fault loop impedance)

Additional Information: