Unit 114: Understand fault diagnosis and rectification

Sample scheme of work

This sample scheme of work covers both classroom and practical based learning for Unit 114. It is based on 2 hours per session for 16 sessions. It is an example only of a possible scheme of work and is based on theory and practical within an FE centre, but can be amended to suit all learning facilities with the necessary adjustments to meet individual learners' needs.

Unit 114 is designed as a stand-alone unit and should be used in conjunction with the standards set for the qualification to ensure full coverage of the learning requirements.

You can use the sample scheme of work as it is, adjust it or extract content to create a scheme of work to suit your delivery needs. It can also be adjusted by adding theory and practical workshops to support learners who have/need additional learning time.

Reference is made within the scheme of work to **worksheets, activities, sample questions and PowerPoint presentations** that are available on SmartScreen.co.uk for tutors to use with learners. Any other resources listed are not provided on SmartScreen but provide guidance for the tutor as to others they may produce. Delivery timings are given; however, these can be amended to suit the group. The content of presentations, discussions, explanations etc are left to the professionalism of the course tutor.

Centres should also incorporate the following themes, where appropriate, as strands running through each of the sections within the qualification. Although they are not specifically referred to in the section content section, City & Guilds regards these as essential in the teaching of the qualification:

- health and safety considerations, in particular the need to impress upon learners the fact that they must preserve the health and safety of others as well as themselves
- Functional Skills (mathematics, English and ICT)
- extension tasks and differentiation, inclusion, entitlement and equality issues
- spiritual, moral, social and cultural issues
- environmental education and related European issues
- Every Child Matters
- personal learning and thinking skills (PLTS)
- use of information learning technology (ILT).

Unit 114: Understand fault diagnosis and rectification

Sample scheme of work

Course/qualification: 5357 _____ **Tutor's name**: _____

Number of sessions: 16 **Delivery hours**: 32 hours **Venue**: _____ **Group**: _____

Aims of course

To enable learners to:

Understand principles, practices and legislation associated with diagnosing and correcting electrical faults in electrical systems and equipment in buildings, structures and the environment in accordance with statutory and non-statutory regulations and requirements. Its content is the knowledge needed by a learner to underpin the application of skills used for fault diagnosis and correction in electrical systems and equipment in buildings, structures and the environment.

Session	Objectives/learning outcomes The learner will:	Activities and resources	Assessment criteria
1	Have a good knowledge of the unit content and requirements Although all units are stand-alone, the nature and content of this unit will dictate that the normal unit induction will have been carried out in previous units Understand the principles, regulatory requirements and procedures for completing the safe isolation of	Specify and undertake the correct procedure for completing the safe isolation of an electrical circuit with regards to: • assessment of safe working practices • correct identification of circuits to be isolated • the selection of suitable points of isolation • the selection of correct test and proving instruments in accordance with relevant industry guidance and standards • the use of correct testing methods • the selection of locking devices for securing isolation • the use of correct warning notices	Observation Question and answer Worksheet outcomes **PowerPoint 1** **Worksheet 1** **Lesson Plan 1**

Session	Objectives/learning outcomes The learner will:	Activities and resources	Assessment criteria
	electrical circuits and complete electrical installations	The correct sequence for isolating circuits Induction aims and objectives **Resources:** Interactive whiteboard, internet access, textbooks, demonstration board **Lesson Plan 1** **Worksheet 1** **PowerPoint 1**	
2	Understand the health and safety requirements relevant to fault diagnosis	State the dangers of electricity in relation to fault diagnosis work Identify the **health and safety requirements** relevant to diagnosing and correcting electrical faults in electrical systems and equipment **Health and Safety Requirements:** • working in accordance with risk assessments / permits to work/method statements • safe use of tools and equipment • safe and correct use of measuring instruments • provision and use of PPE • reporting of unsafe situations **Resources:** Interactive whiteboard, internet access, textbooks, demonstration board	Observation Q&A
3	Understand the health and safety requirements relevant to fault diagnosis	Specify **safe working procedures** that should be adopted for completion of fault diagnosis and correction work. **Safe working procedures:** • effective communication with others. i.e. people on the	Observation Q&A

Session	Objectives/learning outcomes The learner will:	Activities and resources	Assessment criteria
		premises, customers etc. • use of barriers • positioning of notices • safe isolation • use of equipment to GS 38 standard **Resources:** Interactive whiteboard, internet access, textbooks, demonstration board	
4	Understand the importance of reporting and communication in fault diagnosis	Describe the documentation relevant to fault diagnosis State the **implications** of the fault diagnosis for customers and clients. **Implicatons:** • loss of circuits • equipment **Resources:** Interactive whiteboard, internet access, textbooks, demonstration board **Activity 4**	Observation Q&A **Activity 4**
5	Understand the importance of reporting and communication in fault diagnosis	Explain the **communication requirements** relevant to fault diagnosis **Communication requirements:** • Informing relevant persons about information on electrical fault diagnosis and correction work • why it is important to provide relevant persons with information on fault diagnosis and correction work clearly, courteously and accurately	Observation Q&A

Session	Objectives/learning outcomes The learner will:	Activities and resources	Assessment criteria
		• explain why relevant people need to be kept informed during completion of fault correction work: o other workers/colleagues o customers/clients o representatives of other services **Resources:** Interactive whiteboard, internet access, textbooks, demonstration board	
6	Understand the nature and characteristics of electrical faults	Identify types, causes and consequences of **electrical faults** Describe typical types of faults and their likely **locations in wiring systems** and equipment. **Electrical faults:** • Loss of supply • Low voltage/voltage drop • Component/equipment malfunction/failure • Operation of overload or fault current devices • Arcing - loose connection • High resistance - loose connection • Transient voltages - lighting strike • Excess current - overload • Insulation failure - deterioration, mechanical damage o Short-circuit o Open Circuit o Earth fault • Signal faults **Resources:** Interactive whiteboard, internet access, textbooks, demonstration board	Observation Q&A **Lesson Plan 6** **PowerPoint 6** **Activity 6**

Session	Objectives/learning outcomes The learner will:	Activities and resources	Assessment criteria
		Lesson Plan 6 **PowerPoint 6** **Activity 6**	
7	Understand the nature and characteristics of electrical faults	Describe typical types of faults and their likely **locations in wiring systems** and equipment. **Locations in wiring systems:** • Wiring Systems • Terminations and connections • Equipment/accessories (switches, luminaires, switchgear and control equipment) • Instrumentation/metering **Resources:** Interactive whiteboard, internet access, textbooks, demonstration board	Observation Q&A
8	Understand the fault diagnosis procedure	State precautions that must be taken when carrying out fault diagnosis with regard to **particular locations, equipment and circumstances** Explain the **logical stages** of fault diagnosis. Select the appropriate **test instrument/s** for fault diagnosis work Describe how **test instruments** are confirmed to be fit for purpose and functioning correctly Specify an appropriate and logical procedures for carrying out fault diagnosis tests Analyse and determine if test results are acceptable **Particular locations, equipment and circumstances:** • lone working • hazardous areas • fibre-optic cabling	Observation Q&A **Lesson Plan 8** **PowerPoint 8** **Activity 8**

Session	Objectives/learning outcomes The learner will:	Activities and resources	Assessment criteria
		• electro-static discharge (friction, induction, separation) • electronic devices (damage by over voltage) • IT equipment (e.g. shutdown, damage) • high frequency or capacitive circuits • presence of batteries (e.g. lead acid cells, connecting cells) • additional sources of energy • time controlled devices **Resources:** Interactive whiteboard, internet access, textbooks, demonstration board **Lesson Plan 8** **PowerPoint 8** **Activity 8**	
9	Understand the fault diagnosis procedure	Explain the **logical stages** of fault diagnosis. **Logical stages:** • Identification of symptoms • Collection and analysis of data • Use of sources/types of information such as BS 7671, Certificates/Reports, Installation Specifications, drawings/diagrams, manufacturer's information and operating instructions • Maintenance records • Experience (personal and of others) i.e. speaking to operators/customers to determine nature/characteristics of the fault • Checking and testing (e.g. supply, protective devices) • Interpreting results/information	Observation Q&A Worksheet outcomes **Lesson Plan 9** **Worksheet 9** **Activity 9**

Session	Objectives/learning outcomes The learner will:	Activities and resources	Assessment criteria
		• Fault correction • Functional testing • Restoration All live test equipment in accordance with HSE guidance document GS 38 **Resources:** Interactive whiteboard, internet access, textbooks, demonstration board **Lesson Plan 9** **Worksheet 9** **Activity 9**	
10	Understand the fault diagnosis procedure	Select the appropriate **test instrument/s** for fault diagnosis work Describe how **test instruments** are confirmed to be fit for purpose and functioning correctly Specify appropriate and logical procedures for carrying out fault diagnosis **tests** Analyse and determine if **test** results are acceptable **Test instrument/s:** • voltage indicator • low resistance ohm meter • insulation resistance testers • ELFI and PFC tester • RCD tester • tong tester/clamp on ammeter • phase sequence tester • Dead testing • Live testing	Observation Q&A **Worksheet 10** **PowerPoint 10** **Activity 10**

Session	Objectives/learning outcomes The learner will:	Activities and resources	Assessment criteria
		Tests: • continuity • insulation resistance • polarity • earth fault loop impedance • RCD operation • current and voltage measurement • phase sequence • functional testing/checking **Resources:** Interactive whiteboard, internet access, textbooks, demonstration board **Worksheet 10** **PowerPoint 10** **Activity 10**	
11	Understand the procedures and techniques for correcting electrical faults	Identify **factors** which can affect repair or replacement of equipment **Factors** • Cost • Availability of replacement parts, resources and staff • Down time (planning) • Legal and personal responsibility (e.g. contracts, warranties, relevant personnel) • Access to systems and equipment • Provision of emergency or stand by supplies • Client demand (continuous supply, out of hours working) **Resources:**	Observation Q&A **Lesson Plan 11** **PowerPoint 11** **Activity 11** **Worksheet 11**

Session	Objectives/learning outcomes The learner will:	Activities and resources	Assessment criteria
		Interactive whiteboard, internet access, textbooks, demonstration board **Lesson Plan 11** **PowerPoint 11** **Activity 11** **Worksheet 11**	
12	Understand the procedures and techniques for correcting electrical faults	specify the procedures for **verifying** that the fault has been corrected, suitable for the situation, using technical analysis. state methods to ensure the safe disposal of any waste and that the work area is left in a safe and clean condition **verifying** • functional testing/checking • continuity • insulation resistance • polarity • earth fault loop impedance • RCD operation • current and voltage measurement/ checking presence of supply • phase sequencing **waste disposal** • safe disposal **resources:** interactive whiteboard, internet access, textbooks, demonstration board **lesson plan 12**	Observation Q&A **Lesson Plan 12** **Worksheet 12** **Activity 12**

Session	Objectives/learning outcomes The learner will:	Activities and resources	Assessment criteria
		worksheet 12 **activity 12**	
13	Perform fault diagnosis	Follow safe working procedures Evaluate and apply appropriate fault diagnosis **methods** and techniques **Methods** • logical stages of fault diagnosis • identification of symptoms • collection and analysis of data • use of sources/types of information - circuit schedule etc. • installation specifications, drawings/diagrams, • determining nature/characteristics of the fault with discussion with 'customer' (lecturer) • checking and testing • interpreting results/information • functional testing **Resources:** Interactive whiteboard, internet access, textbooks, demonstration board **Worksheet 13** **Activity 13**	Observation Q&A **Worksheet 13** **Activity 13**
14	Perform fault diagnosis	Diagnose electrical faults using engineering decision and evaluation of symptoms and findings Recommend the appropriate action/s to correct the fault • interpreting results/information • functional testing	Observation Q&A **Worksheet 14**

Session	Objectives/learning outcomes The learner will:	Activities and resources	Assessment criteria
		Resources: Interactive whiteboard, internet access, textbooks, demonstration board **Worksheet 14**	
15	Revision	Unit review and recap. Further group discussion and additional fault finding practice. Completion of assignment. **Resources:** Interactive whiteboard, internet access, textbooks, demonstration board **Worksheet 15**	Observation Q&A **Worksheet 15**
16	Revision/Final assessment	Revision material and Final Assessment. **Resources:** Interactive whiteboard, internet access, textbooks, demonstration board **Sample questions**	Observation Q&A **Sample questions**