

1 Module Details	
Module Name	Surface Mount Soldering Skills
Nominal duration	It is expected that students with the appropriate entry knowledge and skills will successfully complete this module in 36 - 40hours
Module code	NUE127
Discipline code	0703230
2 Module purpose	This module will provide students with the knowledge and skills to perform high reliability surface mount soldering.
3 Prerequisites	NE 184.1 Electronic hand Soldering Technology
4 Relationship to competency standards	This module provides some of the knowledge and skills underpinning competency in the following standards: National Electrotechnology Industry Standards, Units NES201, NES202, NES401, NES111 Metals & Engineering Standards, Unit 5.2A
5 Content	<ol style="list-style-type: none"> 1. Identification of Surface Mount Components <ul style="list-style-type: none"> • Chip resistors • Chip Capacitors • Metal Electrode Face (MELF) components • Small Outline Transistors (SOT's) • Small Outline Integrated Circuits (SOIC's) • Plastic leaded chip carriers (PLCC's) • Leadless Ceramic Chip Carrier (LCCC) • Quad flat packs (QFP's) • Ball grid arrays (BGA's) 2. Requirements of standard ANSI/J-STD-001 with respect to surface mount soldering <ul style="list-style-type: none"> • Requirements of the different classes of workmanship within the standard • PCB and component cleaning • SMT thermal requirements • Acceptable/Unacceptable solder joints • Post solder cleaning • Hot air pens and solder paste 3. Surface mount soldering <ul style="list-style-type: none"> • Component removal • PWB preparation • Component preparation • Component placement • Solder Application • Post solder PWB cleaning • PWB inspection 4. Post Solder inspection of SMD's <ul style="list-style-type: none"> • Visual inspection • Classification to requirements of standard 5. Introduction to BGA's

	<ul style="list-style-type: none"> • BGA packages • Preheat requirements • Top heat requirements • Removal • Ball replacement • Mount replacement BGA • Solder reflow BGA • PWB cleaning and inspection
6 Assessment strategy	
Assessment methods	<p>Assessment should be progressive reflecting a holistic approach to ensure the module purpose is met. In general, to assist in ensuring validity, reliability and fairness assessment instruments should include practical exercises, assignments and written tests consisting of a number of item types, such as multiple choice, short answer and problem solving. The assessment should focus on the practical skills emphasised in the module.</p>
Conditions of assessment	<p>Learning and assessment may take place in either a classroom/laboratory or an industrial workshop environment</p>
7 Learning Outcome Details	
Learning Outcome 1	<p>Identify surface mount components used in PWB assembly and rework</p>
Assessment criteria	<p>1.1 Describe a range of typical surface mount components</p> <p>1.2 Identify any given component from a random selection of surface mount components</p>
Learning Outcome 2	<p>Describe the standards required for a surface mount solder joint as laid down in ANSI/J-STD-001.</p>
Assessment criteria	<p>2.1 Describe the cleaning requirements of components and PCB's prior to SMT soldering.</p> <p>2.2 Explain SMT soldering thermal requirements and the correct use of a variable temperature, electronically controlled soldering station.</p> <p>2.3 Explain the reasons and procedures for gold removal during SMT soldering.</p> <p>2.4 Describe the accept/reject criteria for SMT soldered joints.</p> <p>2.5 Explain the difference in requirements between the classes of workmanship within the standard.</p> <p>2.6 Explain the SMT thermal requirements and the correct use</p>

	of hot air pens and solder paste.
Learning Outcome 3	Demonstrate the removal and replacement of surface mount components, including those using 0.050" and fine pitch technology, on a suitably designed PWB.
Assessment criteria	<p>3.1 Demonstrate the correct method(s) used to remove a range of typical surface mount devices (SMDs) from a PWB.</p> <p>3.2 Demonstrate the correct procedure used to prepare a PWB for surface mount component soldering.</p> <p>3.3 Demonstrate the correct method used when soldering a range of typical SMDs using conduction heating and solder wire.</p> <p>3.4 Demonstrate the correct method used when soldering a range of typical SMDs using hot air pens and solder paste.</p> <p>3.5 Demonstrate the correct method(s) used to clean a PWB.</p>
Learning Outcome 4	Inspect a PWB utilising surface mount technology to ensure conformance to ANSI/J-STD-001.
Assessment criteria	<p>4.1 Inspect a populated, surface mount PWB using the appropriate inspection techniques.</p> <p>4.2 Inspect and classify individual solder joints to the requirements of ANSI/J-STD-001.</p>
Learning Outcome 5	Describe the techniques for soldering and rework of Ball Grid Arrays (BGA)
Assessment criteria	<p>5.1 Describe integrated circuit packages using BGA technology</p> <p>5.2 Describe current techniques for BGA soldering and rework.</p> <p>5.3 Describe the equipment requirements for BGA soldering and rework</p> <p>5.4 Describe the limitations of manual BGA soldering and rework.</p>
Delivery Strategy	Delivery strategies must be suitable for learning both

Resource requirements

Theoretical and practical aspects described in the module Purpose. It is considered that the most effective way to Achieve this is by the integration of theory and practice where Students learn by experimentation and through research and Practical exercises. It is recommended that learning and Assessment be facilitated in a holistic manner, which may Require a learning outcome sequence other than that Indicated in the module. This module is designed to be taught in either a classroom/workshop or on industrial premises

It is important that occupational health and safety issues, static discharge avoidance and workplace cleanliness are reinforced throughout the delivery of this module.

Resources should be sufficient for students to carry out Practical exercises on an individual basis. This will require:

1. Variable temperature, electronically controlled soldering stations.
2. Vacuum type desoldering stations.
3. Soldering tweezers
4. Hot air SMT rework stations.
5. Paste dispensing stations.
6. Visual inspection stations with times 10 and times 20 magnification.

Useful references include

US National Standards: ANSI/J-STD-001: Requirements for Soldered Electrical and Electronic Assemblies

IPC-A-610: Acceptability of Electronic Assemblies

IPC 7711: Rework of Electronic Assemblies

IPC 7721: Repair of Electronic Assemblies

IEC 61340-5-1: ELECTROSTATICICS – Part 5 Specification for the protection of electronic devices from electrostatic phenomena Section 1: General Requirements

IEC 61340-5-2: ELECTROSTATICICS – Part 5 Specification for the protection of electronic devices from electrostatic phenomena – Section 2: User Guide

IPC-HDBK-001. Handbook and Guide to requirements for Soldered Electrical and Electronic Assemblies

Occupational health and safety requirements

A safe and healthy environment will be provided for students And teachers as well as safety procedures followed with regard to teaching/learning activities. In addition the following should be considered.

1. Fume extraction.
2. Storage and use of chemicals.
3. Use of equipment and components at elevated temperatures.
4. Eye protection from lead and wire offcuts