



The NI Apprenticeship in Mechanical Engineering

DRAFT



Framework for Northern Ireland

1. Occupational Framework Title

NI Apprenticeship in Mechanical Engineering

2. Occupational Profile

Mechanical Engineering apprentices work across a broad range of job roles in the sector, such as a Skilled Machinist, Toolmaker, Mechanical Equipment Overhaul and Test Technician, Skilled Fitter, Composite Technician, Pipe Fitter and Assembler.

CORE OCCUPATIONAL STANDARD

Across the job roles in Mechanical Engineering, apprentices will be able to understand and demonstrate the following core knowledge, skills, behaviours and transversal skills relevant to their chosen specialism.

Core Knowledge

- Understand the typical hazards that can occur
- What health, safety and environmental procedures and precautions to follow
- How to use engineering data, drawings and reports
- How to set up, operate and close down equipment correctly
- What tools/equipment/accessories are required, how to check the condition and use them
- The procedure for obtaining replacement parts, materials and other consumables required
- Appropriate checking/ test methods and equipment
- How to handle and dispose of unwanted components, waste materials and substances safely
- How to deal with faults and problems
- How to analyse test results
- How to evaluate and record results

Core Skills

- Follow the relevant instructions, assembly drawings, specifications
- Use the appropriate tools and equipment and check they are in a safe and usable condition
- Check that all safety procedures and mechanisms are in place
- Produce trial pieces and make adjustments as necessary
- Operate the machine/equipment safely and correctly and produce components to the required quality
- Carry out quality sampling checks at suitable intervals
- Complete the relevant documentation

Core Behaviours and Transversal Skills

The following transversal skills and behaviours should be developed through naturally occurring activities in the job role within the apprenticeship. They should be included and recorded in the competence and knowledge qualifications.

Behaviours

- A strong work ethic
- Dependability
- Integrity
- Positive attitude
- Responsibility
- Motivation
- Team player
- Honesty and commitment

Skills

- Literacy
- Numeracy
- Communication
- Digital Skills
- Self-management
- Working with others
- Work professionalism
- Problem solving and decision making

Specialist Pathways

| Specialist Pathway | Knowledge | Skills |
|---------------------------------|---|--|
| <p><i>Skilled Machinist</i></p> | <p>Operation of the machine controls in hand, power and/or CNC modes</p> <p>The basic principles of operation of the machine and its accessories, and typical operations that they can perform</p> <p>How to handle and store machine tools safely and correctly</p> <p>The range of workholding methods and devices</p> <p>Factors which determine speeds and feeds to be used and the depth of cut that can be taken</p> <p>The types of cutting fluids that are used, and precautions to be taken when handling and using them</p> <p>CNC Machining specific</p> <p>The computer coding language used in CNC programs</p> <p>How to prepare and use repetitive and part-programs and canned cycles</p> <p>The function keys and operating system of the machine computer control system being operated</p> <p>How to save the programs in the appropriate format, and the importance of storing programs and storage devices safely and correctly, away from contaminants and possible corruption</p> | <p>Mount, set and secure the required workholding devices, workpiece and cutting tools to make the component to specification</p> <p>CNC Machining specific</p> <p>Use the correct control program and ensure it is correctly loaded into the machine controller</p> <p>Follow the correct procedures for calling up the program and dealing with any error messages or faults</p> <p>Confirm program integrity and make any adjustments to ensure the component is made to specification</p> |

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| | <p>The implications if the computer you are using does become infected with a virus and who to contact if it does occur</p> | |
| <i>Toolmaker</i> | <p>Operation of the machine controls in hand, power and/or CNC modes</p> <p>The basic principles of operation of the machine and its accessories, and typical operations that they can perform</p> <p>How to handle and store machine tools safely and correctly</p> <p>The range of workholding methods and devices</p> <p>Factors which determine speeds and feeds to be used and the depth of cut that can be taken</p> <p>The types of cutting fluids that are used, and precautions to be taken when handling and using them</p> <p>How to train new and inexperienced machine operators to carry out the tasks, including practical demonstrations</p> | <p>Prove the machine is working satisfactorily before handing the machine over for production use</p> <p>Demonstrate the correct operation of the machine to the production operator</p> <p>Ensure the production operator understands the operation of the machine and the production requirements</p> |
| <i>Mechanical Equipment Overhaul and Test Technician</i> | <p>The quality control procedures to be followed during the overhauling operations</p> <p>The extent to which the equipment is to be dismantled for overhaul</p> <p>Dismantling, inspection, testing and reassembly techniques</p> <p>How to lift and move large components/ modules and assemblies</p> | <p>Follow the relevant overhauling schedules, using the correct tools and techniques</p> <p>Identify the components/modules to be removed and mark components to aid re-assembly</p> <p>Isolate and disconnect the equipment</p> <p>Use appropriate slinging and lifting methods to move heavy equipment as required</p> <p>Dismantle equipment to the agreed level, using correct tools and techniques</p> <p>Ensure that all removed components/modules are correctly identified and stored in the correct location</p> <p>Carry out all required inspections</p> <p>Identify any defects or variations from the specification</p> |
| <i>Skilled Fitter</i> | <p>The assembly, fitting and joining methods, techniques and procedures</p> | <p>Check the specified components are available and that they are in a usable</p> |

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| | <p>to use, and the importance of keeping to them</p> <p>The various methods used to modify assemblies</p> <p>How the components are to be aligned, adjusted and positioned before securing, and the appropriate tools and equipment to use</p> <p>How check to ensure the accuracy, position, security, function and completeness of the assembly</p> <p>How to detect assembly defects</p> <p>The methods and equipment used to transport, lift and handle components and assemblies</p> | <p>condition</p> <p>Repair and modify assemblies as required</p> <p>Assemble components in the correct positions using the appropriate methods and techniques</p> <p>Secure components using the specified connectors and securing devices</p> <p>Check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification</p> |
| <p><i>Composite Technician</i></p> | <p>The assembly, fitting/trimming and bonding methods, techniques and procedures to be used</p> <p>How the components are to be aligned, adjusted and positioned before bonding, and the appropriate tools and equipment to use</p> <p>The sealants and adhesives to be used and the precautions that must be taken when working with them</p> <p>How to conduct checks to ensure the accuracy, position, security, function and completeness of the assembly</p> <p>The different methods used to identify defects in composite mouldings</p> | <p>Check the specified components are available and that they are in a usable condition</p> <p>Assemble components in the correct positions</p> <p>Secure components using the specified connectors and securing devices</p> <p>Check the materials to be bonded and bonding agents comply with the specification</p> <p>Carry out the bonding and curing operations</p> <p>Make bonds of the required quality and within the specified dimensional accuracy</p> <p>Check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification</p> |
| <p><i>Pipe Fitter and Assembler</i></p> | <p>The assembly, fitting and joining methods, techniques and procedures to be used, and the importance of keeping to them</p> <p>Principles and methods of marking out pipework</p> <p>Methods used to hand bend and form the pipe, and the appropriate tools and equipment to use</p> <p>Characteristics of the various materials that are to be used for the bending</p> | <p>Check the specified fittings are available and that they are in a usable condition</p> <p>Bend and form pipework to the required specification</p> <p>Assemble and secure fittings in the correct positions</p> <p>Check the completed assembly to ensure that all operations have been completed and the finished assembly</p> |

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| | <p>operations</p> <p>The range of pipe fittings that can be used, and how to identify them</p> <p>The methods used to connect and assemble pipework</p> <p>How to conduct checks to ensure the accuracy, position, security, function and completeness of the assembly</p> <p>Methods of testing the system</p> | <p>meets the required specification</p> <p>Prepare and test pipework systems</p> |
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3. Entry requirements

As a guide, the NI Apprenticeship in Mechanical Engineering is suitable for applicants who have five GCSEs grade C (or equivalent new grade 4) or above including Maths, English, and a Science. Candidates may be considered on an exceptional basis for entry if they do not meet the stated requirements. If applicants have shown an interest in engineering, or have previous work experience or employment in the sector, then this would be relevant to include in their application.

Typically applicants would have:

- completed a NI Traineeship in Mechanical Engineering **or**
- completed a NI Traineeship in another related area **or**
- Essential Skills qualifications **or**
- applied as a direct entry from school

and be:

- willing to undertake a course of training both on-the-job and off-the-job and apply this learning in the workplace
 - able to follow instructions and diagrams, with literacy and numeracy to work with data
 - a good team worker, who can also work under own initiative
 - keen and motivated to work in an engineering or manufacturing environment
- Apprentices must complete the NVQ Extended Diploma at Level 3 as it contains the Performing Engineering Operations (PEO) foundation basic training required by all engineering apprentices. However if the relevant PEO units have already been achieved and certificated in a previous programme, then they will be able to credit these against the requirements of the Extended Diploma.
 - The Level 3 NVQ Diploma may only be used by adult apprentices 25 years old and over, or apprentices 16-24 years who have achieved a NI Traineeship in a relevant occupation, who must:
 - a) have received appropriate health and safety training relevant to work area/environment that they will be working and
 - b) have worked in an engineering or manufacturing environment and have skills knowledge and understanding broadly comparable to relevant practical NVQ/SVQ Level 2 units detailed in Performing Engineering Operations, Performing Manufacturing Operations or other skill specific NVQ/SVQ Level 2 in engineering or manufacturing.

4. Duration

This Apprenticeship in Mechanical Engineering typically takes 42 months for apprentices starting this apprenticeship with no or little engineering experience.

Adult apprentices or those with relevant experience or who have already achieved some of the required qualifications may require less time to complete the programme.

5. National Occupational Standards (NOS)

This Apprenticeship in Mechanical Engineering is underpinned by National Occupational Standards (NOS) which indicate the standards of competency performance that apprentices must achieve when carrying out functions in the workplace, together with specifications of the underpinning knowledge and understanding.

The relevant NOS for this framework are in Mechanical Manufacturing Engineering Suite 3, where:

- the competency qualifications standards are linked directly to the NOS
- the underpinning knowledge qualification specifications are linked where possible to the NOS

Specific details of these can be found in [Appendix 1](#).

6. Qualifications

Qualifications are based on competency and knowledge. Competence and technical knowledge are separately identified and separately assessed to ensure apprentices not only demonstrate the competence to do the job, but also develop the underpinning technical skills, knowledge and understanding of the wider industry and market.

If apprentices have already achieved any of the qualifications, or have relevant experience of working in the sector, this prior achievement can be recognised.

The relevant competency qualifications derived from these NOS are:

- Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering
- Level 3 NVQ Diploma in Mechanical Manufacturing Engineering
- SVQ 3 Mechanical Manufacturing Engineering at SCQF Level 6

They contain pathways relevant to the job roles listed in Section 2.

This table summarises what qualifications must be taken – qualification details are given in [Appendix 2](#).

| Competency | Knowledge (Technical Certificate) |
|--|---|
| <p>Apprentices must complete a work based NVQ L3/SVQ 3 as selected by their employer and offered by one of these Awarding Organisations:</p> <ul style="list-style-type: none"> • EAL • City & Guilds • Pearson | <p>Apprentices must complete one of the Technical Certificates listed in Appendix 2</p> <p>Each Technical Certificate is relevant to both NVQ and SVQ qualifications, so there is no restriction by qualification choice.</p> |

7. Assessment

Qualifications must be assessed and this can be through a variety of different methods. Some may be assessed internally (such as by tests or project work) or externally (such as by exams) or require a portfolio of evidence.

The competence qualifications must be assessed in a work environment. The knowledge qualifications may have some type of external assessment.

Assessors must hold the Level 3 Award in Assessing Competence in the Work Environment and have current, verifiable, relevant and sufficient technical competence to evaluate and judge performance and knowledge evidence requirements.

8. Enhancements

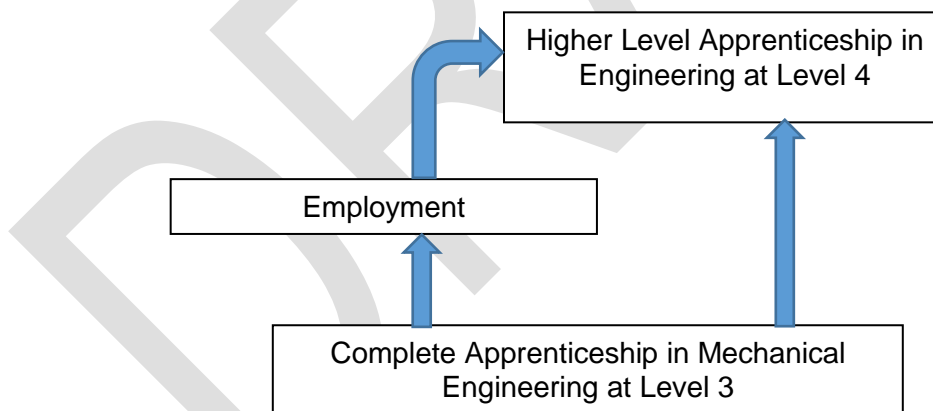
No additional enhancements have been identified by employers to date

9. Progression

When apprentices have completed this framework, they have two options open to them.

They can gain employment within an engineering company, perhaps in one of the skilled job roles described earlier, leading to internal promotion to team leader or supervisory roles. In time, they may also choose to complete a Higher Level Apprenticeship in Engineering.

Alternatively it gives an opportunity to progress directly to a Higher Level Apprenticeship in Engineering.



The following websites are useful to help apprentices plan career progression:

www.apprenticeships.org.uk/types-of-apprenticeships/engineering-and-manufacturing-technologies.aspx

nationalcareersservice.direct.gov.uk/advice/planning/jobfamily/Pages/manufactureandengineering.aspx

Appendix 1

The Level 3 NVQ Diploma in Mechanical Manufacturing Engineering qualification is derived from the following standards:

| | URN | Title of the Occupational Standard |
|---------------------------|-------------|---|
| Core NOS for all pathways | SEMMAN12301 | Complying with statutory regulations and organisational safety requirements |
| | SEMMAN2302 | Using and interpreting engineering data and documentation |
| | SEMMAN303 | Working efficiently and effectively in engineering |

| Machining Pathway | URN | Title of the Occupational Standard |
|-------------------|--|--|
| Available NOS | SEMMME304 | Setting centre lathes for production |
| | SEMMME305 | Machining components using centre lathes |
| | SEMMME306 | Setting turret lathes for production |
| | SEMMME307 | Machining components using turret lathes |
| | SEMMME308 | Setting milling machines for production |
| | SEMMME309 | Machining components using milling machines |
| | SEMMME310 | Setting shaping, planing or slotting machines for production |
| | SEMMME311 | Machining components using shaping, planing or slotting machines |
| | SEMMME312 | Setting gear cutting machines for production |
| | SEMMME313 | Machining components using gear cutting machines |
| | SEMMME314 | Setting gear grinding machines for production |
| | SEMMME315 | Machining components using gear grinding machines |
| | SEMMME316 | Setting horizontal boring machines for production |
| | SEMMME317 | Machining components using horizontal boring machines |
| | SEMMME318 | Setting vertical boring machines for production |
| | SEMMME319 | Machining components using vertical boring machines |
| | SEMMME320 | Setting electro-discharge machines for production |
| | SEMMME321 | Machining components using electro-discharge machines |
| | SEMMME322 | Setting grinding machines for production |
| | SEMMME323 | Machining components using grinding machines |
| SEMMME324 | Setting honing and lapping machines for production | |
| SEMMME325 | Machining components using honing and lapping machines | |
| SEMMME326 | Setting broaching machines for production | |
| SEMMME327 | Machining components using broaching machines | |
| SEMMME328 | Setting metal spinning machines for production | |
| SEMMME329 | Producing components using metal spinning machines | |

| CNC Machining Pathway | URN | Title of the Occupational Standard |
|-----------------------|-----------|---|
| Available NOS | SEMMME330 | Loading and proving CNC machine tool programs |
| | SEMMME331 | Carrying out CNC machine tool programming |
| | SEMMME332 | Setting CNC turning machines for production |
| | SEMMME333 | Machining components using CNC turning machines |
| | SEMMME334 | Setting CNC milling machines for production |
| | SEMMME335 | Machining components using CNC milling machines |
| | SEMMME336 | Setting CNC grinding machines for production |
| | SEMMME337 | Machining components using CNC grinding machines |
| | SEMMME338 | Setting CNC punching machines for production |
| | SEMMME339 | Machining components using CNC punching machines |
| | SEMMME340 | Setting CNC laser profiling machines for production |
| | SEMMME341 | Machining components using CNC laser profiling machines |
| | SEMMME342 | Setting CNC electro-discharge machines for production |
| | SEMMME343 | Machining components using CNC electro-discharge machines |

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| | SEMMME344 | Setting CNC vertical boring machines for production |
| | SEMMME345 | Machining components using CNC vertical boring machines |
| | SEMMME346 | Setting CNC horizontal boring machines for production |
| | SEMMME347 | Machining components using CNC horizontal boring machines |
| | SEMMME348 | Setting CNC gear cutting machines for production |
| | SEMMME349 | Machining components using CNC gear cutting machines |
| | SEMMME350 | Setting CNC machining centres for production |
| | SEMMME351 | Machining components using CNC machining centres |

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| Machine Tool Setting Pathway | SEMMME352 | Handing over machine tools to production operators |
| | SEMMME353 | Setting capstan and turret lathes for production |
| | SEMMME354 | Setting single-spindle automatic turning machines for production |
| | SEMMME355 | Setting multi-spindle automatic turning machines for production |
| | SEMMME356 | Setting single and multi-spindle drilling machines for production |
| | SEMMME357 | Setting tool and cutter grinding machines for production |
| | SEMMME358 | Setting special-purpose machines for production |
| | SEMMME359 | Setting power presses for production |
| | SEMMME308 | Setting milling machines for production |
| | SEMMME322 | Setting grinding machines for production |
| | SEMMME310 | Setting shaping, planing or slotting machines for production |
| | SEMMME312 | Setting gear cutting machines for production |
| | SEMMME314 | Setting gear grinding machines for production |
| | SEMMME320 | Setting electro-discharge machines for production |
| | SEMMME324 | Setting honing and lapping machines for production |
| | SEMMME326 | Setting broaching machines for production |
| | SEMMME332 | Setting CNC turning machines for production |
| | SEMMME334 | Setting CNC milling machines for production |
| | SEMMME336 | Setting CNC grinding machines for production |
| | SEMMME338 | Setting CNC punching machines for production |
| | SEMMME340 | Setting CNC laser profiling machines for production |
| SEMMME342 | Setting CNC electro-discharge machines for production | |
| SEMMME348 | Setting CNC gear cutting machines for production | |
| SEMMME350 | Setting CNC machining centres for production | |
| Available NOS | | |

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| Fitting and Assembly Pathway | SEMMME360 | Producing components using hand fitting techniques |
| | SEMMME361 | Assembling mechanical products |
| | SEMMME362 | Producing components by manual machining |
| | SEMMME363 | Fitting fluid power components to mechanical assemblies |
| | SEMMME364 | Fitting pipework systems to mechanical assemblies |
| | SEMMME365 | Fitting electrical/electronic components to mechanical assemblies |
| | SEMMME366 | Producing power turbine combustion assemblies |
| | SEMMME367 | Producing power turbine compressor assemblies |
| | SEMMME368 | Producing turbine assemblies |
| | SEMMME369 | Producing power turbine gearbox assemblies |
| | SEMMME370 | Producing power turbine major assemblies |
| | SEMMME371 | Producing piston engine assemblies |
| | SEMMME372 | Repairing and modifying mechanical assemblies |
| | SEMMME373 | Checking that completed assemblies comply with specification |
| | Available NOS | |

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| Pipe Fitting and Assembly Pathway | SEMMME374 | Pipe bending and forming by hand methods |
| | SEMMME375 | Pipe bending and forming using bending machines |
| | SEMMME376 | Assembling screwed pipework |

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| Available NOS | SEMMME377 | Assembling small bore non-ferrous pipework |
| | SEMMME378 | Assembling non-metallic pipework |
| | SEMMME379 | Preparing and testing pipework systems |
| | SEMMME380 | Producing socket and flange fillet welded joints in pipe using a manual welding process |

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| Composite Manufacture Engineering Pathway Available NOS | SEMMME381 | Producing composite mouldings using pre-preg laminating techniques |
| | SEMMME382 | Producing composite mouldings using wet lay-up techniques |
| | SEMMME383 | Producing composite assemblies |
| | SEMMME384 | Bonding composite mouldings |
| | SEMMME385 | Repairing composite mouldings |
| | SEMMME386 | Applying finishes to composite mouldings |
| | SEMMME387 | Trimming composite mouldings using hand tools |
| | SEMMME388 | Identifying defects in composite mouldings |

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| Mechanical Overhaul and Test Pathway Available NOS | SEMMME3100 | Slinging, lifting and moving equipment, components or materials for overhauling activities |
| | SEMMME3101 | Dismantling mechanical equipment in preparation for overhaul |
| | SEMMME3102 | Checking mechanical components for serviceability during overhauling activities |
| | SEMMME3103 | Carrying out non-destructive flaw detection on components during overhauling activities |
| | SEMMME3104 | Restoring mechanical components to usable condition by repair |
| | SEMMME3105 | Producing replacement components for overhauling activities |
| | SEMMME3106 | Checking that overhauled mechanical assemblies comply with specification |
| | SEMMME3107 | Overhauling industrial power turbines by module replacement |
| | SEMMME3108 | Overhauling industrial power turbine compressor assemblies |
| | SEMMME3109 | Overhauling industrial power turbine combustion assemblies |
| | SEMMME3110 | Overhauling turbine assemblies from industrial power turbines |
| | SEMMME3111 | Overhauling piston engines |
| | SEMMME3112 | Overhauling gearbox assemblies |
| | SEMMME3113 | Overhauling industrial clutch and brake assemblies |
| | SEMMME3114 | Overhauling pump assemblies |
| | SEMMME3115 | Overhauling valve assemblies |
| | SEMMME3116 | Overhauling components of hydraulic equipment |
| | SEMMME3117 | Overhauling components of pneumatic, vacuum or compressed air equipment |
| | SEMMME3118 | Carrying out tests on overhauled industrial power turbines |
| SEMMME3119 | Carrying out tests on overhauled piston engines (fixed dynamometer) | |

Appendix 2

Qualifications – Apprentices need to complete:

One Competency qualification and One Knowledge Certificate

| Competency | | Knowledge (Technical Certificate) | |
|--|------------|--|------------|
| Title | QAN | Title | QAN |
| <p>This qualification allows candidates to achieve PEO Level 2 foundation training (if required or not already achieved by a Traineeship)</p> | | | |
| EAL Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering | 600/1701/6 | EAL Level 3 Certificate in Engineering Technologies | 601/5800/1 |
| | | or | |
| Pearson Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering | 601/2548/2 | EAL Level 3 Diploma in Engineering Technologies | 601/5801/3 |
| | | or | |
| City & Guilds Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering | 601/0081/3 | EAL Level 3 Diploma in Engineering Technologies | 601/5801/3 |
| | | or | |
| | | EAL Level 3 Extended Diploma in Engineering Technologies | 601/5802/5 |
| | | or | |
| <p>OR this qualification for use in the framework by older apprentices aged 25 years and above</p> | | | |
| EAL Level 3 NVQ Diploma in Mechanical Manufacturing Engineering | 500/9852/4 | EAL Level 3 Technical Extended Diploma in Engineering Technologies | 603/0564/2 |
| | | or | |
| City & Guilds Level 3 NVQ Diploma in Mechanical Manufacturing Engineering | 501/1803/1 | Pearson BTEC Level 3 Diploma in Advanced Manufacturing Engineering (Development Technical Knowledge) | 601/9054/1 |



Pearson Level 3 NVQ
Diploma in Mechanical
Manufacturing Engineering 501/0794/X

or
Pearson BTEC Level 3
Extended Diploma in
Advanced Manufacturing
Engineering (Development
Technical Knowledge) 601/9060/7

OR these qualifications for use in the framework
by apprentices aged 16 years and above

or
City & Guilds Level 3 Diploma
in Engineering 600/0882/9

EAL SVQ3 Mechanical
Manufacturing Engineering
(Composite Manufacture
Engineering) at SCQF Level
6 GC8F 23

or
City & Guilds Level 3
Advanced Technical
Certificate in Engineering 601/4535/3

EAL SVQ3 Mechanical
Manufacturing Engineering
(Pipe Fitting and Assembly)
at SCQF Level 6 GC8G 23

or
City & Guilds Level 3
Advanced Technical Diploma
in Engineering 601/4507/9

EAL SVQ3 Mechanical
Manufacturing Engineering
(Fitting and Assembly) at
SCQF Level 6 GC8H 23

or
City & Guilds Level 3
Advanced Technical Extended
Diploma in Engineering 601/4506/7

EAL SVQ3 Mechanical
Manufacturing Engineering
(Machine Tool Setting) at
SCQF Level 6 GC8J 23

or
City & Guilds L3 Diploma in
Machining - Development
Knowledge 603/1706/1

EAL SVQ3 Mechanical
Manufacturing Engineering
(CNC Machining) at SCQF
Level 6 GC8K 23

EAL SVQ3 Mechanical
Manufacturing Engineering
(Machining) at SCQF Level 6 GC8L 23

EAL SVQ3 Mechanical
Manufacturing Engineering
(Mechanical Overhaul and
Test) at SCQF Level 6 GC8M 23