



March 2021

Information on critical competences for holistic assessment

Group award title: NC in Mechanical Engineering (at SCQF level 6)

Group award code: G97J 46

https://www.sqa.org.uk/sqa/files_ccc/NQGA-Engineering-levels-5-and-6.pdf

Group award aim (specific)

- ◆ Provide awards that will allow candidates to work now, or in the future, at craft or technician levels in an engineering environment.
- ◆ Provide awards that create a route towards meeting the academic requirements for Engineering Technician status.
- ◆ Provide awards that on successful completion will allow candidates to progress to an HNC or HND or degree in an engineering or related subject discipline.
- ◆ Allow candidates to develop knowledge, understanding and skills in Communication, Numeracy and Information and Communication Technology that underpin and support their studies in engineering.
- ◆ Allow candidates to develop knowledge, understanding and skills in an area of engineering which relates directly to the title of the award the candidate is studying.
- ◆ Allow candidates a degree of specialisation in engineering relevant to the area of engineering covered by the award.
- ◆ On successful completion of an award allow candidates to achieve Core Skills in Communication, Numeracy and Information and Communication Technology. Furthermore to provide candidates with opportunities to develop the Problem Solving and Working with Others Core Skills.
- ◆ Allow candidates to develop knowledge, understanding and skills in statics, dynamics and thermofluids and undertake some degree of specialisation in the theory underpinning mechanical engineering at SCQF level 6.
- ◆ Allow candidates to specialise further in mechanical engineering or mechanical plant maintenance or a combination of the two at SCQF level 6. Candidates may also take a further unit in Mathematics (as one of their 4 optional units) if they wish to specialise further in this subject.

Key critical competences and units

Critical competences are shown in **bold**.

F3HX 12 Mathematics: Technician 1

This unit is intended primarily for those candidates who wish to develop their knowledge and understanding of Mathematics at SCQF level 6 with a view to supporting and underpinning their studies in an engineering discipline. In such cases, delivery of the unit should be set within the context of the award to which it contributes. The unit is designed to develop aspects of the candidate's skills in **numeracy, graphical communication, trigonometry and algebra**, and to apply these skills in the appropriate engineering context. It is envisaged that the content of each Outcome is delivered and assessed with specific reference to the candidate's engineering specialism, where appropriate.

F5D4 12 Engineering: Applying Information Technology

This unit is designed to extend knowledge and expertise on features of an **operating system** and available **software application packages** including software packages relevant to an **engineering environment**. The candidate will gain practical experience in the use of the features in these types of software, and in the development of **internet search techniques**. The unit will also provide candidates with information regarding the selection of appropriate software for specific tasks.

F5K8 12 Statics (Mandatory)

This unit is designed to provide candidates with basic knowledge and understanding of Statics. During the delivery of the unit candidates will learn to differentiate between **scalar and vector quantities** and identify the properties and effects of the application of **force on a body, component and structure**. They will also develop the knowledge and skills to solve problems involving **forces in a plane** as well as being able to analyse simple, **idealised frameworks**. Candidates will also learn to determine the effects of **force on simple components**.

F5K6 12 Engineering Dynamics: An Introduction (Mandatory)

This mainly theory based unit is designed to provide candidates with basic knowledge and understanding of engineering dynamic quantities, laws and principles so that they can use these to solve problems in dynamics. During the delivery of this Unit, candidates will learn about the basic quantities, and their units, used in engineering dynamics. They will also develop the knowledge and understanding to solve **linear system problems** involving the use of the **equations of motion, velocity/time diagrams** and **Newton's Laws**. Candidates will also learn to solve **linear system problems involving work, energy, conservation of energy and power**. They will also develop the knowledge and understanding to solve **angular dynamic system** problems.

F5JE 12 Thermofluids (Mandatory)

This unit is designed to provide candidates with knowledge and understanding of engineering thermofluids. During delivery of the unit candidates will learn to determine the **properties of working fluids** and sketch thermodynamic properties on **pressure-volume (p-V) diagrams**. Candidates will also develop the knowledge and understanding to solve problems involving the **non-flow and steady flow energy equations** and solve problems relating to **hydrostatic pressure** and **pressure measurements**. Candidates will also learn

to solve problems involving the application of the **mass continuity** and **Bernoulli's equations** as applied to incompressible flow in pipes.

F5K9 12 Strength of Materials

This largely theory based unit is designed to provide candidates with basic knowledge and understanding of Strength of Materials in an engineering context. During unit delivery, candidates will learn to use **shear force** and **bending moment diagrams** to solve problems involving **simply supported beams and cantilevers**. They will also develop the knowledge and understanding to apply **simple bending theory** to idealised beams and apply **simple torsion theory** to solve problems involving shafts of circular cross-sectional area.

F5K7 12 Engineering Dynamics

This unit is designed to provide candidates with knowledge and understanding of engineering dynamic quantities, laws and principles so that they can use these to solve problems in dynamics. During delivery of the Unit, candidates will learn to solve problems involving **velocity vector diagrams**. They will also learn the commonalities and differences between **linear and angular dynamic quantities and equations** and use the angular equations to solve problems involving angular dynamic systems including those associated with solid uniform discs. Candidates will also learn to solve problems involving a system containing one linear and one angular element. They will also develop knowledge and understanding to solve problems involving **centripetal and centrifugal forces** and will also learn to apply the principle of the **conservation of momentum** to the solution of **linear dynamic problems**.

F5JF 12 Engineering Thermodynamics

This is a mainly theoretical unit designed to provide candidates with knowledge and understanding of Engineering Thermodynamics. During the delivery of the unit candidates will learn about **property changes** and **energy transfer processes in closed and open thermodynamic systems**. They will also develop the knowledge and understanding to describe **heat transfer processes** and perform simple calculations involving such processes. Candidates will also have an opportunity to investigate in some depth energy transfers in an open system such as an internal combustion engine or basic steam power cycle or refrigerator etc.

F5JB 12 Pneumatics and Hydraulics

This largely practical unit is designed to provide candidates with knowledge, understanding and skills of pneumatic and hydraulic circuits. During delivery of the unit candidates will learn how to **interpret pneumatic and hydraulic components** and **component symbols** and describe the operation of **fluid power components**. They will develop the knowledge and skills to **draw and simulate pneumatic and hydraulic circuits**. Candidates will also learn how to **design, assemble and test pneumatic or hydraulic circuits** as well as developing the knowledge and skills to perform basic **fault finding techniques on pneumatic or hydraulic circuits and rectify faults**. Candidates will develop practical skills and safe working practices whilst assembling and testing pneumatic or hydraulic systems. This unit is suitable for candidates training to be maintenance, mechanical or multi-disciplinary engineering technicians.

F5JC 12 Power Drives

The unit is designed to allow candidates to develop their knowledge and understanding in mechanical power transmission drives. During delivery of the unit candidates will develop the knowledge and understanding to explain the features and terms associated with **power transmission drives**. They will also learn to **evaluate power transmission products and match such products to given applications**. Candidates will also develop the knowledge and understanding to **design a mechanical power drive** and create a parts list to realise their design. They will also develop the knowledge and understanding of methods used to check installed mechanical power drives for installation and developed faults.

Key critical evidence

Candidates may have completed some units and have other units that are partially complete or incomplete.

It is anticipated that the majority of candidate evidence will be gathered by traditional or online methods (such as simulation and online testing), as well as through completed practical work.

Some units require evidence of practical activity, which may be difficult to gather under the current circumstances. It may be the case that alternative evidence can be used from other units. However, any evidence gathered must be appropriate to the level of the unit and the award.

If you have any questions, please contact qualifications.development@sqa.org.uk.