

**-SQA-SCOTTISH QUALIFICATIONS AUTHORITY**

**Hanover House  
24 Douglas Street  
GLASGOW G2 7NG**

---

**NATIONAL CERTIFICATE MODULE DESCRIPTOR**

---

<b>-Module Number-</b>	<b>0074137</b>	<b>-Session-1987-88</b>
<b>-Superclass-</b>	<b>XJ</b>	

---

<b>-Title-</b>	<b>REPAIR AND REWINDING OF D.C. MACHINES (x 1<sup>1</sup>/<sub>2</sub>)</b>
----------------	---

---

**-DESCRIPTION-**

Type and Purpose	A <u>specialist</u> module which enables the student to acquire an understanding of the principles and practice of the repair and rewinding procedures used in direct current rotating machines.
------------------	--

---

Preferred Entry Level	74135 Basic Dismantling and Reassembly of Electrical Machines and 64167 Electrical Machine Principles.
-----------------------	---

Learning Outcomes	<p>The student should:</p> <ol style="list-style-type: none"><li>1. know the systems of windings for direct current machines series and shunt fields and armatures.</li><li>2. know methods of establishing the polarity of main poles and interpoles of direct current machines.</li><li>3. establish winding data for direct current machine main pole, interpoles and armature.</li><li>4. know the procedures for removing windings from main pole, interpole and armature of direct current machines.</li><li>5. prepare and fit sample coils for main pole, interpoles and armature of direct current machines.</li><li>6. test direct current machines.</li></ol>
-------------------	--

Content/  
Context

Safety regulations and safe working practices and procedures should be observed at all times.

Corresponding to Learning Outcomes 1-6:

1. Construction, operation and windings of series shunt and compound machines. British Standard terminal markings.
2. Necessity for correct connection of coils relative to the type of direct current motor.
3. Relationship between operating voltage, speed, current capacity, number of turns, size of wire, former size for main poles and interpoles. Evolute, coil span, overhang and commutator connections for lap and wave armature windings.
4. Dismantling of pole pieces and removal of field coils and interpoles.

De-soldering of commutator risers.

Pre-heat or chemical stripping of armature coils.

Removal of some or all of armature windings as necessary to affect repair.

5. Type of insulation to British Standard Classification and selection.

Preparation and insulation of pole pieces.

Winding and fitting of interpole and field coil.

Preparation and insulation of slots.

Winding and fitting of sample lap and wave armature windings to form two complete circuits.

Use of wedges and banding.

Soldering to commutator risers.

Necessity for checking condition of commutator.

Insulation and resistance test before stoving and varnishing of field and interpoles.

6. Insulation and resistance test (e.g. drop tests) before and after banding of armature.

Insulation and resistance tests (e.g. drop tests) after stoving and varnishing.

Necessity for dynamic balancing of armature.

Insulation and resistance tests.

Assembly of machines including correct positioning of brush gear and ensuring correct size, grade and pressure of brushes.

Speed test.

Necessity for load testing to check proper commutation.

Suggested Learning and Teaching Approaches

This module primarily involves workshop activities.

The approach to LO1, LO2, and LO4 could be instructional and that to LO3, LO5 and LO6 should involve workshop practice, individually or in groups.

Learning outcomes could be combined to form a series of practical projects. Every opportunity should be taken to provide practical examples and to ensure the student obtains "hands on" experience of components and techniques. Safety and good workmanship elements must be stressed continuously.

Assessment Procedures

Acceptable performance in the module will be satisfactory achievement of the performance criteria specified for each Learning Outcome.

Where cutting scores are stated these are intended to be for guidance. The precise cutting score for a test will depend on the difficulty of the test and will have to be decided by the Tutor aided by the Assessor.

The following abbreviations are used below:

LO Learning Outcome  
IA Instrument of Assessment  
PC Performance Criteria

- LO1 IA Twelve short answer questions in which the student, given diagrams of actual systems, is required to identify these systems and give a short written or oral description of each.
- Four questions should be on series machines.
- Four questions should be on shunt machines.
- Four questions should be on compound machines.
- PC Series, shunt and compound machines should be clearly identified and their methods of operation accurately described.
- Cutting score 70% or 80%.
- LO2 IA Written exercise in which the student is required to describe a method of establishing the polarity of main poles and interpoles of direct current machines.
- PC Description of method to include all procedures necessary and procedures to be in correct sequence. To comply with British Standard terminal markings.
- LO3 IA Practical exercise and a written list. The student is required to examine an electric motor, extract information from nameplate and, by taking measurements, draw up a short written list of the necessary data for a d.c. machine.
- PC List to include: relationship between operating voltage, speed, current capacity, number of turns, size of wire, former size for main poles and interpoles. Evolute, coil span, overhang and commutator connections for lap and wave armature windings.
- LO4 IA Short written exercise in which the student is required to describe a method of removing windings from main pole, interpole and armature of d.c. machines using the following procedures:
- (a) dismantling;
  - (b) de-soldering;
  - (c) 'burn-off'

(d) chemical stripping

PC Description to include all procedures necessary and all safety precautions.

LO5 IA Practical exercise in which the student, from given rewinding data for main pole, interpole and armature, is required to:

(a) manufacture and fit one sample field coil;

(b) manufacture and fit one sample interpole coil;

(c) manufacture and fit three sample armature coils.

PC All procedures to be carried out neatly and accurately.

Fitting to include:

(i) insulation of armature slots;

(ii) soldering to commutator risers;

(iii) use of wedges and banding.

All safety precautions to be followed.

LO6 IA Practical exercise in which the student is required to carry out tests on a d.c. machine to establish:

(a) insulation resistance;

(b) continuity;

(c) drop test of armature;

(d) speed.

and interprets the results.

PC Uses all correct testing equipment and procedures, following all safety precautions.

Interprets results correctly in line with expected results.