

-SQA-SCOTTISH QUALIFICATIONS AUTHORITY

**Hanover House
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NATIONAL CERTIFICATE MODULE DESCRIPTOR

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| -Module Number- | 0074428 | -Session-1987-88 |
| -Superclass- | XS | |

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| -Title- | MOTOR VEHICLE PERFORMANCE TESTING (x 1/2) |
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-DESCRIPTION-

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| Type and Purpose | A <u>specialist</u> module which extends knowledge of the performance characteristics of an internal combustion engine and the comparison of the power generated with the power required to maintain vehicle motion. It is designed for students who wish to progress to the Higher Certificate Course in Motor Vehicle Engineering. |
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| Preferred Entry Level | Satisfactory completion of an appropriate modular programme or adequate industrial experience. |
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| Learning Outcomes | <p>The student should:</p> <ol style="list-style-type: none">1. know terms and units associated with engine performance;2. evaluate engine torque and power from test data and present results in graphical form;3. evaluate specific fuel consumption, thermal efficiency and volumetric efficiency;4. know the reasons for power loss between engine and road wheels and calculate transmission efficiency;5. evaluate from data, the tractive resistance, tractive effort and maximum acceleration of a vehicle;6. assess relative values of road speed and engine power from graphs of power required and power available. |
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Content/
Context

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

Corresponding to Learning Outcomes 1-6:

1. Terminology and units such as m.e.p., m.e. engine b.p., torque, fuel consumption, air consumption, mass and motion, etc.
2. Data to include type of engine cycle, number of cylinders, bore and stroke dimensions, m.e.p., m.e., engine speed and details of dynamometer and load overcome.

Formulae should be introduced to permit the calculation of i.p., b.p., f.p., and torque. Sufficient values at different speeds should be available to enable the results to be presented graphically on a base of speed.

3. The mass of fuel may be given or calculated from flow meter readings. The calorific value of the fuel should be obtained from published data of fuel used.

Values of actual air consumption to be compared against calculated theoretical displacement.

4. The effects of friction, slip in the transmission. The relationship of road wheel and engine flywheel power in different gear ratios.
5. The relationship of tractive effort to engine torque, gear ratio, efficiency and road wheel tyre radius.

The components of tractive resistance such as gradient resistance, rolling resistance, and air resistance.

The relationship of the accelerating force to the vehicle mass.

6. Curves of engine power available and power required drawn on a graph with a base of road speed to determine maximum power available for acceleration, speeds at which acceleration occurs, and maximum speed of vehicle.

Suggested Learning and Teaching Approaches

Learning should take place in a workshop or laboratory environment using engine test equipment to provide data from which the learning outcomes may be achieved.

Graphical modes of information display are particularly relevant and comparisons should be made between derived results and manufacturer's specifications.

It is recommended that calculators be used where possible to reduce the time involved in the determination of tabular results and mathematical evaluation of formulae.

Where applicable the scientific principles involved should be discussed and the students motivated to find reasons for technical developments, eg. reduced friction in the transmission, aerodynamics of vehicles, etc.

From a programme of assignments (involving worked examples and exercises), some of which may integrate more than one learning outcome, the student should present test results which will form the basis of summative assessment.

Safety and safe practices must be an integral part of each activity.

Assessment Procedures

Acceptable performance in the module will be satisfactory achievement of the performance criteria specified for each learning outcome.

The following abbreviations are used below:

LO Learning Outcome

IA Instrument of Assessment

PC Performance Criteria

LO1 IA Assignment report in which the student is given data to work from.

PC The student writes a report which:

- (a) correctly uses six terms and units associated with engine performance;
- (b) evaluates and presents engine torque and power characteristics in a tabulated and graphical form;
- (c) evaluates engine power, torque, s.f.c, t.e. and v.e. to relate to manufacturers' specification so that results are comparable.

- LO4 IA (1)One written short answer question.
- PC The student satisfactorily states three main reasons for power loss.
- IA(2)Calculation exercise.
- PC The student calculates transmission efficiency for a given example.
- LO5 IA One written short answer question.
- PC The student satisfactorily evaluates vehicle tractive resistance, tractive effort and maximum acceleration from given data.
- LO6 IA One written short answer question.
- PC The student satisfactorily evaluates vehicle speed from given data.