-SQA-SCOTTISH QUALIFICATIONS AUTHORITY

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NATIONAL CERTIFICATE MODULE DESCRIPTOR

-Module Number- **0094005** **-Session-1989-90**
-Superclass- **RC**

-Title- **INTRODUCTION TO DYNAMICS ($x^1/_2$)**

-DESCRIPTION-

Purpose

This module is designed to introduce the student to the principles and applications of the laws governing motion and to apply this knowledge to the solution of problems.

It will be of interest to students who wish to pursue a career in an Engineering discipline.

Preferred Entry Level

81057 Mathematics: Grade 3
64002 Fundamentals of Technology: Mechanical

Learning Outcomes

The student should:

1. use velocity-time diagrams and equations to solve problems involving uniformly accelerated linear motion;

2. apply Newton's law of rectilinear motion to solve problems;

3. solve problems in energy, work and power.

Content/ Context

<u>Corresponding to Learning Outcomes 1-3</u>

1. Linear displacement, linear velocity, linear acceleration, construction and use of velocity-time diagrams to simplify the solution of practical problems.

   Derivation and use of equations of motion for uniformly accelerated linear motion.

2. Application of the equations P = MQ + F to solve problems involving constant forces and/or uniform acceleration.

Linear impulse and change of momentum. Principle of conservation of linear momentum.

3. Determination, by calculation or graphical means, of the work done when a constant/linearly varying force causes linear displacement.

   Potential energy ; kinetic energy of translation ; conservation of energy.

   Calculations involving work transfer, power and mechanical efficiency in a system subject to translational motion over horizontal surfaces.

Suggested Learning and Teaching Approaches

Concepts should be reinforced by practical demonstrations exploiting modern methods and instrumentation. Basic units should be stressed throughout the module.

The teaching and learning of Learning Outcomes should be considered as an integrated whole where possible. Laboratory investigations should be used to reinforce the principles involved and demonstrate the practical nature of the subject.

The use of prepared computer software for data handling and problem solving is recommended.

Assessment Procedures

Acceptable performance in the module will be satisfactory achievement of all 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 USE VELOCITY-TIME DIAGRAMS AND EQUATIONS TO SOLVE PROBLEMS INVOLVING UNIFORMLY ACCELERATED LINEAR MOTION

PC The student:

(a) sketches and uses a velocity-time diagram;
(b) uses equations of motion from a given list of equations.

IA Short Answer Questions

The student will be presented with short answer questions to test the understanding and application of velocity-time diagrams and equations to solve problems involving uniformly and accelerated linear motion.

The exercise will contain 2 questions, 1 involving a sketch and use of a velocity-time diagram to solve a problem and 1 involving the use of equations of motion to solve a problem.

Satisfactory achievement of the Learning Outcome will be based on all Performance Criteria being met. This will be demonstrated by the correct interpretation and application of the principles involved in the solution of problems outlined in Performance Criteria (a) and (b).

LO2 APPLY NEWTON'S LAW OF RECTILINEAR MOTION TO SOLVE PROBLEMS

PC The student:

(a) determines the final common velocity of a system of two colliding masses;
(b) calculates the magnitude of the force necessary to accelerate:
    (I) a given mass along a horizontal surface;
    (ii) a given mass vertically against the force of gravity.

IA Short Answer Questions

The student will be presented with short answer questions to test the understanding and application of Newton's Law of rectilinear motion and the principles involved to solve problems.

The exercise will contain 3 questions, allocated as follows:

1 question relating to Performance Criterion (a), 1 question for Performance Criterion (b) (i) and 1 question for Performance Criterion (b) (ii).

Satisfactory achievement of the Learning Outcome will be based on all Performance Criteria being met. This will be demonstrated by the correct interpretation and application of the principles involved in the solution of all 3 problems outlined in Performance Criteria (a) and (b).

LO3 SOLVE PROBLEMS IN ENERGY, WORK AND POWER

PC The student:

(a) constructs a force displacement diagram from given information;

(b) uses the force displacement diagram to determine work done;

(c) calculates power and uses the relationship between:

- (I) power input;
- (ii) power output;
- (iii) efficiency;

(d) applies the principle of conservation of energy.

IA Structured Questions

The student will be presented with structured questions to test the understanding and ability to apply appropriate principles to solve problems in energy, work and power.

The exercise will comprise 3 questions divided into parts. One question will have 2 parts relating to Performance Criteria (a) and (b), the second will have 3 parts relating to Performance Criterion (c) and the third 2 parts covering Performance Criterion (d).

Satisfactory achievement of the Learning Outcome will be based on all Performance Criteria being met. This will be demonstrated by the correct interpretation and application of the principles involved to solve all problems outlined in Performance Criteria (a) to (d).