NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES

DEPARTMENT OF APPLIED PHYSICS

BSc HONOURS IN EARTH SCIENCES PART IV

ENVIRONMENTAL GEOSCIENCE AND IMPACT ASSESSMENT

SES 4202

First Semester Examination Paper

March 2025

This examination paper consists of 4 pages

Time Allowed:	**3 hours**
Total Marks:	**100**
Special Requirements:	**None**
Examiner's Name:	**Dr. P Mandingaisa**

INSTRUCTIONS

ANSWER ALL PARTS OF QUESTION 1 IN SECTION A AND ANY THREE QUESTIONS FROM SECTION B. SECTION A CARRIES 40 MARKS AND SECTION B CARRIES 60 MARKS.

MARK ALLOCATION

QUESTION	MARKS
1	40
2	20
3	20
4	20
5	20
6	20
Maximum possible marks	100

Section A

Question 1

a) Define the following terms;

i. leachate, [2]

ii. acid mine drainage, and [3]

iii. landfill. [2]

b) Identify and explain any three (3) environmental challenges associated with abandoned mines. [6]

c) What are the environmental impacts of rising groundwater levels on;

i. soil, [2]

ii. vegetation, and [2]

iii. local ecosystems. [2]

d) Describe any three (3) factors that influence the movement of heavy metals in the environment. [6]

e) Outline any (5) geological factors that should be considered when selecting a site for radioactive waste storage. [5]

f) How does the Environmental Impact Assessment (EIA) contribute to sustainable development? [5]

g) Outline any five (5) key advantages of using geophysical methods in the detection and monitoring pollution in contaminated environments [5]

Section B

Question 2

a) What type of environmental and geological features can be identified using drone-based magnetometer surveys? [3]

b) Outline the advantages of using drone technology in environmental surveys. [3]

c) Explain how GPS-based flight plans enhance the effectiveness of drone-based environmental monitoring. [4]

d) Describe and explain the use of satellite images in detecting and monitoring pollution in the environment? [10]

Question 3

a) Describe the main pathways through which heavy metals enter groundwater? [5]

b) Outline any five (5) key challenges in modelling contaminant migration in groundwater. [5]

c) Describe any five (5) methods used in tracking and modelling contaminant migration in groundwater. [10]

Question 4

a) Outline any two geophysical methods (apart from GPR) recommended in the survey of each of the following contaminants;

i. hydrocarbon spills, [2]

ii. saline intrusion, and [2]

iii. landfill leachate. [2]

b) Discuss how ground penetrating radar (GPR) can be used to identify contaminants at these following sites;

i. landfill sites, [4]

ii. abandoned mine workings, and [5]

iii. groundwater contamination zones [5]

Question 5

a) Name any five (5) types of projects in Zimbabwe which require an Environmental Impact Assessment (EIA) certificate before implementation. [5]

b) What are the key components that should be included in an Environmental Impact Assessment (EIA) report. [5]

c) Discuss the importance of stakeholder engagement during the development of an Environmental Impact Assessment report. [5]

d) What challenges might arise during the implementation phase of a project after completion of an EIA report. [5]

Question 6

a) Name any three (3) major anthropogenic gases emitted from landfill sites. [3]

b) Describe the key environmental impacts of landfills. [5]

c) What measures can be implemented to reduce the emission of toxic gases from

landfills. [5]

d) Explain the steps you would take to survey and characterize a landfill site. [7]

END OF EXAMINATION